



Data Science

A/T/V

Written under the Technologies Framework

Supporting Qualifications from **Information and Communications Technology Training Package** (refer to *training.gov.au*)

ICT20120 Certificate II in Applied Digital Technologies

ICT30120 Certificate III in Information Technology

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The ACT Senior Secondary System

The ACT senior secondary system recognises a range of university, vocational or life skills pathways.

The system is based on the premise that teachers are experts in their area: they know their students and community and are thus best placed to develop curriculum and assess students according to their needs and interests. Students have ownership of their learning and are respected as young adults who have a voice.

A defining feature of the system is school-based curriculum and continuous assessment. School-based curriculum provides flexibility for teachers to address students' needs and interests. College teachers have an opportunity to develop courses for implementation across ACT schools. Based on the courses that have been accredited by the BSSS, college teachers are responsible for developing programs of learning. A program of learning is developed by individual colleges to implement the courses and units they are delivering.

Teachers must deliver all content descriptions; however, they do have flexibility to emphasise some content descriptions over others. It is at the discretion of the teacher to select the texts or materials to demonstrate the content descriptions. Teachers can choose to deliver course units in any order and teach additional (not listed) content provided it meets the specific unit goals.

School-based continuous assessment means that students are continually assessed throughout years 11 and 12, with both years contributing equally to senior secondary certification. Teachers and students are positioned to have ownership of senior secondary assessment. The system allows teachers to learn from each other and to refine their judgement and develop expertise.

Senior secondary teachers have the flexibility to assess students in a variety of ways. For example: multimedia presentation, inquiry-based project, test, essay, performance and/or practical demonstration may all have their place. College teachers are responsible for developing assessment instruments with task specific rubrics and providing feedback to students.

The integrity of the ACT Senior Secondary Certificate is upheld by a robust, collaborative and rigorous structured consensus-based peer reviewed moderation process. System moderation involves all year 11 and 12 teachers from public, non-government and international colleges delivering the ACT Senior Secondary Certificate.

Only students who desire a pathway to university are required to sit a general aptitude test, referred to as the ACT Scaling Test (AST), which moderates student scores across courses and colleges. Students are required to use critical and creative thinking skills across a range of disciplines to solve problems. They are also required to interpret a stimulus and write an extended response.

Senior secondary curriculum makes provision for student-centred teaching approaches, integrated and project-based learning inquiry, formative assessment and teacher autonomy. ACT Senior Secondary Curriculum makes provision for diverse learners and students with mild to moderate intellectual disabilities, so that all students can achieve an ACT Senior Secondary Certificate.

The ACT Board of Senior Secondary Studies (BSSS) leads senior secondary education. It is responsible for quality assurance in senior secondary curriculum, assessment and certification. The Board consists of nominees from colleges, professional bodies, universities, industry, parent/carer organisations and unions. The Office of the Board of Senior Secondary Studies (OBSSS) consists of professional and administrative staff who support the Board in achieving its objectives and functions.

ACT Senior Secondary Certificate

Courses of study for the ACT Senior Secondary Certificate:

- provide a variety of pathways, to meet different learning needs and encourage students to complete their secondary education
- enable students to develop the essential capabilities for twenty-first century learners
- empower students as active participants in their own learning
- engage students in contemporary issues relevant to their lives
- foster students' intellectual, social and ethical development
- nurture students' wellbeing, and physical and spiritual development
- enable effective and respectful participation in a diverse society.

Each course of study:

- comprises an integrated and interconnected set of knowledge, skills, behaviours and dispositions that students develop and use in their learning across the curriculum
- is based on a model of learning that integrates intended student outcomes, pedagogy and assessment
- outlines teaching strategies which are grounded in learning principles and encompass quality teaching
- promotes intellectual quality, establish a rich learning environment and generate relevant connections between learning and life experiences
- provides formal assessment and certification of students' achievements.

Vocational Education and Training in ACT Senior Secondary Schools

The Board of Senior Secondary Studies is responsible for the certification of senior secondary school studies in government and non-government schools in the ACT. Students can undertake Vocational Education and Training (VET) as part of a senior secondary certificate and completion by a student can provide credit towards both a recognised VET qualification and an ACT Senior Secondary Certificate.

The BSSS certifies VET qualifications and Statements of Attainment on behalf of ACT colleges and high schools that offer Australian VET Qualifications and are Registered Training Organisations (RTOs) or have a Third-Party Service Agreement (TPSA) with an RTO. The Board also recognises VET qualifications delivered by external RTOs and facilitates the allocation of credit towards the ACT Senior Secondary Certificate based on the achievement of competencies and nominal training hours attribution.

The BSSS is not an RTO and is not responsible for those aspects that relate to VET delivery in schools or externally that fall within the role of the RTO.

Vocational programs must be assessed in accordance with RTO requirements. Students undertaking A, T and M accredited programs with vocational components will be assessed against the criteria and achievement standards referenced in the framework to produce A-E grades and scores. They will also be assessed against competency standards as described in the relevant training package.

The BSSS certifies VET that:

- is listed on the national training.gov.au website
- is delivered and assessed by an ACT college or high school, which is an RTO or has a Third-Party Service Agreement (TPSA) with an RTO that has scope from the Australian Skills Quality Authority (ASQA) to deliver specified qualifications
- is delivered and assessed in accordance with relevant Training Package requirements, and
- is listed in the Victorian Purchasing Guide

Vocational learning contributes to the ACT Senior Secondary Certificate in a variety of ways where:

- BSSS accredited A, T, and M vocational courses are embedded with competencies delivered by colleges are reported with A–E grades
- BSSS E courses recognise study at external RTOs and are reported with the grade 'P' (Pass)
- Australian School Based Apprenticeships (ASBAs) are reported as E courses with the grade 'P' (Pass).
- W units are registered units that recognise time spent in required on the job placements as part of a VET program which has not led to the award of competencies. These are awarded by schools and are reported with the grade 'P' (Pass).

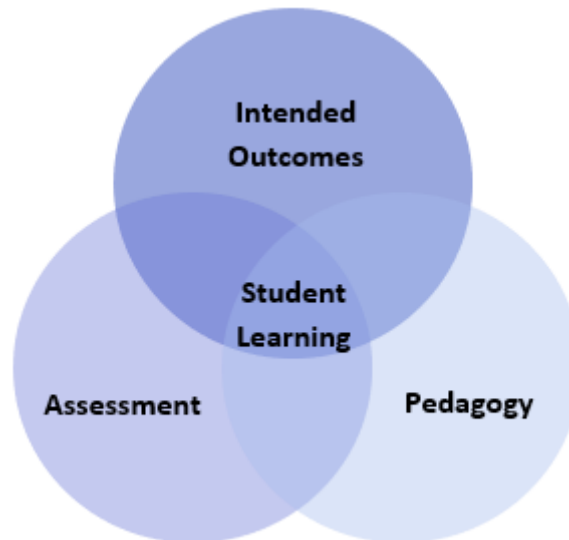
The BSSS credit arrangements recognise VET studies externally:

- through direct credit when the qualification or Units of Competence relate to a VET course that is being studied by the student
- towards the Senior Secondary Certificate, providing the VET does not duplicate content.

Implementing Vocational Education and Training Courses (Appendix F) provides further course information, including training package requirements, and should be read in conjunction with course documents.

Underpinning beliefs

- All students are able to learn.
- Learning is a partnership between students and teachers.
- Teachers are responsible for advancing student learning.



Learning Principles

1. Learning builds on existing knowledge, understandings and skills.
(Prior knowledge)
2. When learning is organised around major concepts, principles and significant real world issues, within and across disciplines, it helps students make connections and build knowledge structures.
(Deep knowledge and connectedness)
3. Learning is facilitated when students actively monitor their own learning and consciously develop ways of organising and applying knowledge within and across contexts.
(Metacognition)
4. Learners' sense of self and motivation to learn affects learning.
(Self-concept)
5. Learning needs to take place in a context of high expectations.
(High expectations)
6. Learners learn in different ways and at different rates.
(Individual differences)
7. Different cultural environments, including the use of language, shape learners' understandings and the way they learn.
(Socio-cultural effects)
8. Learning is a social and collaborative function as well as an individual one.
(Collaborative learning)
9. Learning is strengthened when learning outcomes and criteria for judging learning are made explicit and when students receive frequent feedback on their progress.
(Explicit expectations and feedback)

General Capabilities

All courses of study for the ACT Senior Secondary Certificate should enable students to develop essential capabilities for twenty-first century learners. These ‘capabilities’ comprise an integrated and interconnected set of knowledge, skills, behaviours and dispositions that students develop and use in their learning across the curriculum.

The capabilities include:

- literacy
- numeracy
- information and communication technology (ICT)
- critical and creative thinking
- personal and social
- ethical understanding
- intercultural understanding

Courses of study for the ACT Senior Secondary Certificate should be both relevant to the lives of students and incorporate the contemporary issues they face. Hence, courses address the following three priorities. These priorities are:

- Aboriginal and Torres Strait Islander histories and cultures
- Asia and Australia’s engagement with Asia
- Sustainability

Elaboration of these General Capabilities and priorities is available on the ACARA website at www.australiancurriculum.edu.au.

Literacy

Students develop literacy as they learn how to communicate ideas, concepts and proposals to a variety of audiences. They read and interpret detailed written instructions technologies, often including diagrams and procedural writings such as software user manuals and design briefs. Students interpret online documentation and tutorial materials that support coding, prepare software instructions and write reports, project outlines, proposals and evaluations. They use computer-generated images to communicate product or systems design ideas to suit particular contexts and audiences. Students understand and use terminology specific to design and technology, in both written and oral forms, to communicate ideas about product or systems design.

Numeracy

Data Science gives students opportunities to interpret and use mathematical knowledge and skills in a range of real-life situations. Students use number to calculate and create algorithms; interpret and draw conclusions from data; measure and record; and develop, refine and test concepts using computational thinking in decision-making processes. Students examine the usefulness of results and prepare validation plans for calculating outputs of digital solutions. They use code that enables manipulation of numerical data in digital solutions and apply appropriate mathematical concepts and thinking in programming. Students may use graphs, spreadsheets, diagrams, codes, and statistics to communicate technical data or systems information.

Information and Communication Technology (ICT) Capability

Data Science enables students to develop an understanding of the characteristics of data, digital systems, audiences, procedures and computational thinking. They apply this understanding when they investigate, communicate and create digital solutions. Students learn to formulate problems, logically organise and analyse data, and represent them in abstract forms. Students use ICT when they investigate and analyse information, evaluate design ideas and communicate and collaborate online. They develop design ideas, generate plans and system diagrams to communicate their designs, and produce solutions using digital technologies.

Critical and Creative Thinking

Students develop capability in critical and creative thinking through challenging problems that do not have straightforward solutions. Students identify and deconstruct problems of interest, refine concepts and reflect on the decision-making process by engaging in systems, design and computational thinking. They identify, explore and clarify technologies information and use that knowledge in a range of situations. Students consider how data, information, systems and tools impact on our lives, and how these elements might be better designed and managed. Visualising possibilities, modelling and scoping solutions, designing and working with digital tools, equipment and software helps students to build their visual and spatial thinking, test hypotheses and to create solutions, products and services.

Personal and Social Capability

Students develop personal and social capability as they engage in project management and development in a collaborative workspace. They direct their own learning, plan and carry out investigations, and become independent learners who can apply design thinking, technologies understanding and skills when making decisions. Students develop social and employability skills through working cooperatively in teams, sharing and discussing ideas about problems, progress, and innovative solutions, and listening to and respecting the perspectives of others. There are collaborative opportunities for sharing resources and processes, making group decisions, resolving conflict and showing leadership.

Ethical Understanding

Students develop the capacity to understand and apply ethical and socially responsible principles when collaborating with others and creating, sharing and using technologies. When engaged in systems thinking, students evaluate their findings against the criteria of legality, environmental sustainability, economic viability, health, social and emotional responsibility, and social awareness. Students learn about safe and ethical procedures for investigating and working with people, data and materials. They consider their own roles and responsibilities as discerning citizens and learn to detect bias and inaccuracies. Understanding the protection of data, intellectual property and individual privacy in the school environment helps students to be ethical digital citizens.

Intercultural Understanding

Students consider how technologies are used in diverse communities at local, national, regional and global levels, including their impact and potential to transform people's lives. They explore ways in which past and present practices enable people to use technologies to interact with one another across cultural boundaries. Students investigate how cultural identities and traditions influence the function and form of solutions, products, services and environments designed to meet the needs of daily life now and in the future. In their interactions with others in online communities, students consider the dynamic and complex nature of cultures, including values, beliefs, practices and assumptions.

Cross-Curriculum Priorities

Opportunities exist for students to use Data Science as a means of better understanding these priorities as they engage with interpretation and presentation of relevant data.

Aboriginal and Torres Strait Islander Histories and Cultures

The Aboriginal and Torres Strait Islander histories and cultures priority provides the opportunity for all young Australians to gain a deeper understanding and appreciation of Aboriginal and Torres Strait Islander histories and cultures, deep knowledge traditions and holistic world views. This knowledge and understanding will enrich all learners' ability to participate positively in the ongoing development of Australia through a deepening knowledge and connection with the world's oldest continuous living cultures.

Asia and Australia's Engagement with Asia

The Asia and Australia's engagement with Asia priority ensures that students learn about and recognise the diversity within and between the countries of the Asia region. They develop knowledge and understanding of Asian societies, cultures, beliefs and environments, and the connections between the peoples of Asia, Australia, and the rest of the world. Asia literacy provides students with the skills to communicate and engage with the peoples of Asia so they can effectively live, work and learn in the region. Students investigate a range of contexts that draw on Asia and Australia's engagement with Asia.

Sustainability

The Sustainability priority provides the opportunity for students to develop the knowledge, skills, values and world views necessary for them to act in ways that contribute to more sustainable patterns of living. This priority is futures-oriented, focusing on protecting environments and creating a more ecologically and socially just world through informed action. Actions that support more sustainable patterns of living require consideration of environmental, social, cultural and economic systems and their interdependence. Representations of data are critical to decision making in sustainability issues.

Data Science

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Rationale

Data Science is the key to solving the problems of global issues such as climate change, consumerism, energy, health and poverty through data analysis, statistical inference, predictive modelling and related methods in order to understand and analyse phenomena. Students explore and develop solutions to interesting problems in a range of contexts, forming opinions and challenging attitudes using data as evidence to form compelling and persuasive arguments for change and innovation.

Since the advent of computers, individuals and organizations increasingly process information digitally. Data processing occurs through the use of tools such as spreadsheets and databases, and progresses to more automated methods as the quantity and complexity of data being analysed increases. Cloud-based technologies have led to increasingly large data sets and big data and Machine Learning techniques now form the basis of automation in many fields of science, social science and the humanities, health and technology.

Data science is the basis of recommendation algorithms, natural language processing, computer vision, artificial intelligence in games and embedded devices, and many other modern scientific applications. Students model and implement digital solutions, manipulating, visualising and presenting data to influence decision making and predict the consequences of the actions of individuals, groups and large-scale social change.

Understanding both the power of these analytical techniques and the risks, challenges and ethical dilemmas they present, provides students with a solid foundation for further study, research and employment in a broad range of industries.

Goals

This course should enable students to:

- analyse problems or challenges to determine needs for solutions or products
- apply the process of design (investigate, design, plan, manage, create, evaluate solutions)
- use critical and creative thinking to design innovative solutions
- produce or create solutions or products to address a need, problem or challenge
- evaluate and use technologies in a range of contexts
- demonstrate problem solving skills
- communicate to different audiences using a range of methods
- engage confidently with and responsibly select and manipulate appropriate technologies – data, systems, and equipment.

Unit Titles

- Data Representation and Analysis
- Big Data Analysis and Techniques
- Machine Learning
- Data Research Project
- Negotiated Study

Organisation of Content

Data Representation and Analysis

This unit explores the ways that digital information is encoded, represented, manipulated, stored, compressed and transmitted. Students develop an understanding of where data comes from, and how to manipulate it using computational tools. Through the interpretation and visualisation of data, students identify patterns and trends, and use these findings to develop narratives and arguments in a variety of contexts.

Big Data Analysis and Techniques

The data-rich world that we live in introduces many complex questions related to public policy, law, ethics and social impact. The goals of this unit are to develop a well-rounded and balanced view about data in the world, including the positive and negative effects of it. Students will develop skills in using data analysis processes, relevant algorithms and techniques, and computational tools to analyse Big Data using a multidisciplinary approach.

Machine Learning

This unit explores how Machine Learning is used to develop models for prediction, analysis, diagnosis and recommendation. Students will develop an understanding of Machine Learning, and the algorithms, techniques and processes used in supervised and unsupervised models. They will use Machine Learning to analyse authentic datasets from a range of sources, and investigate the inherent bias in training data. They will be able to build models or applications which enable predictions or recommendations, contextualising the social impact of their Machine Learning application.

Data Research Project

This unit enables students to undertake their own research project to develop and test hypotheses using real-world data sets. They further develop their data analysis skills, and explore patterns in data that yield interesting results. Students will present conclusions drawn from their analysis, and communicate their findings through visualisations and arguments that inform and maximise impact.

Negotiated Study

A Negotiated Study unit has an important place in senior secondary courses. It is a valuable pedagogical approach that empowers students to make decisions about their own learning. A negotiated study unit is decided upon by a class, group(s) or individual student in consultation with the teacher and with the Principal's approval. The program of learning for a negotiated study unit must meet all the content descriptions as appears in the unit. Students must have studied a minimum of two standard 1.0 units from this course.

Assessment

The identification of criteria within the achievement standards and assessment tasks types and weightings provide a common and agreed basis for the collection of evidence of student achievement.

Assessment Criteria (the dimensions of quality that teachers look for in evaluating student work) provide a common and agreed basis for judgement of performance against unit and course goals, within and across colleges. Over a course, teachers must use all these criteria to assess students' performance but are not required to use all criteria on each task. Assessment criteria are to be used holistically on a given task and in determining the unit grade.

Assessment Tasks elicit responses that demonstrate the degree to which students have achieved the goals of a unit based on the assessment criteria. The Common Curriculum Elements (CCE) is a guide to developing assessment tasks that promote a range of thinking skills (see Appendix B). It is highly desirable that assessment tasks engage students in demonstrating higher order thinking.

Rubrics are constructed for individual tasks, informing the assessment criteria relevant for a particular task and can be used to assess a continuum that indicates levels of student performance against each criterion.

Assessment Criteria

Students will be assessed on the degree to which they demonstrate:

- knowledge and understanding
- skills.

Assessment Task Types

	Design Process	Design Solution(s)
	Suggested tasks: • design development • design documentation • essay • extended response • oral presentation • podcast • portfolio (design process) • project management • report • research task • return brief • review • seminar • short response • storyboard • web portfolio • workshop	Suggested tasks: • digital artefact • digital asset • major project • network • portfolio • product • prototyping • software application • storyboard • website
Weightings in A/V 1.0 and 0.5 units	30 - 70%	30 - 70%
Weightings in T/V 1.0 and 0.5 units	40 - 60%	40 - 60%

Additional Assessment Information

- For a standard unit (1.0), students must complete a minimum of three assessment tasks and a maximum of five.
- For a half standard unit (0.5), students must complete a minimum of two and a maximum of three assessment tasks.
- Assessment tasks for a standard (1.0) or half-standard (0.5) unit must be informed by the Achievement Standards.
- Students should experience a variety of task types and different modes of communication to demonstrate the Achievement Standards.

Achievement Standards

Years 11 and 12 achievement standards are written for A/T courses.

A Year 12 student in any unit is assessed using the Year 12 achievement standards. A Year 11 student in any unit is assessed using the Year 11 achievement standards. Year 12 achievement standards reflect higher expectations of student achievement compared to the Year 11 achievement standards. Years 11 and 12 achievement standards are differentiated by cognitive demand, the number of dimensions and the depth of inquiry.

An achievement standard cannot be used as a rubric for an individual assessment task. Assessment is the responsibility of the college. Student tasks may be assessed using rubrics or marking schemes devised by the college. A teacher may use the achievement standards to inform development of rubrics. The verbs used in achievement standards may be reflected in the rubric. In the context of combined Years 11 and 12 classes, it is best practice to have a distinct rubric for Years 11 and 12. These rubrics should be available for students prior to completion of an assessment task so that success criteria are clear.

Achievement Standards Technologies A Course Year 11

	<i>A student who achieves an A grade typically</i>	<i>A student who achieves a B grade typically</i>	<i>A student who achieves a C grade typically</i>	<i>A student who achieves a D grade typically</i>	<i>A student who achieves an E grade typically</i>
Knowledge and understanding	- analyses the design process and explains decision making - analyses technology concepts and principles and explains the properties of materials or data or systems to address a need, problem, or challenge - analyses technologies, explains ethical and sustainable application - thinks critically, drawing on data and information to solve complex problems and analyses opportunities for application of technology	- explains the design process and describes decision making - explains technology concepts and principles and describes the properties of materials or data or systems to address a need, problem, or challenge - explains technologies, describes ethical and sustainable application - thinks critically, drawing on data and information to solve problems and explains opportunities for application of technology	- describes the design process with reference to decision making - describes technology concepts and principles with some reference to properties of materials or data or systems to address a need, problem, or challenge - describes technologies with some reference to ethical and sustainable application - draws on data and information to solve problems and describes opportunities for application of technology	- identifies major features of the design process with minimal reference to decision making - identifies major technology concepts and principles with some reference to properties of materials or data or systems to address a need, problem, or challenge - identifies major features of technologies with minimal reference to ethical and sustainable application - identifies some opportunities for application of technology with minimal use of information and data	- identifies some features of the design process - identifies few technology concepts and principles with minimal reference to properties of materials or data or systems to address a need, problem, or challenge - identifies some features of technologies with minimal reference to ethical and sustainable application - identifies some opportunities for application of technology with minimal evidence of use of information and data
Skills	- applies technology concepts, strategies and methodologies with control and precision demonstrating understanding of the historical and cultural context and its impact - creates innovative and high-quality design solutions/products using techniques and approaches and justifies ideas - analyses potential prototypes and solutions analysing their appropriateness and effectiveness via iterative improvement and review - communicates complex ideas and insights effectively in a range of mediums and justifies ideas coherently using appropriate evidence, metalanguage, and accurate referencing - reflects with insight on their own thinking and evaluates inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively	- applies technology concepts, strategies and methodologies with control demonstrating understanding of the historical and cultural context and its impact - creates high-quality design solutions/products using techniques and approaches and-explains ideas - explains potential prototypes and solutions and explains their appropriateness and effectiveness via iterative improvement and review - communicates ideas effectively in a range of mediums and justifies ideas coherently using appropriate evidence, metalanguage and referencing - reflects on their own thinking and analyses inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively	- applies technology concepts, strategies and methodologies with some control demonstrating understanding of context and its impact - creates functional design solutions/products using techniques and approaches and explains ideas - describes potential prototypes and solutions and explains their appropriateness and effectiveness via iterative improvement and review - communicates ideas appropriately in mediums and explains ideas coherently using appropriate evidence, metalanguage and referencing - reflects on their own thinking and explains inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively	- applies technology concepts, strategies and methodologies with minimal control demonstrating understanding of its impact - creates simple, functional design solutions/products using some techniques and approaches and describes ideas - identifies potential prototypes and solutions and describes their appropriateness and effectiveness via iterative improvement and review - communicates ideas in mediums and describes ideas with some use of appropriate evidence with minimal use of metalanguage and referencing - reflects on their own thinking with some reference to planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively	- applies technology concepts, strategies and methodologies with limited control demonstrating minimal evidence of understanding its impact - creates simple design solutions/products using some basic techniques and approaches and description of ideas - identifies potential prototypes and solutions with minimal reference to their appropriateness and effectiveness via iterative improvement and review - communicates basic ideas in few mediums and describes ideas with of no minimal use of appropriate evidence and referencing - reflects on their own thinking with minimal reference to planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively

Achievement Standards Technologies T Course Year 11

	<i>A student who achieves an A grade typically</i>	<i>A student who achieves a B grade typically</i>	<i>A student who achieves a C grade typically</i>	<i>A student who achieves a D grade typically</i>	<i>A student who achieves an E grade typically</i>
Knowledge and understanding	- critically analyses the design process and evaluates constraints and implications for decision making - synthesises technology theories, concepts and principles and evaluates the properties of materials or data or systems to address a need, problem, or challenge - critically analyses technologies and evaluates ethical and sustainable application of technology - thinks critically and creatively, drawing on data and information to solve complex problems	- analyses the design process and explains constraints and implications for decision making - analyses technology theories, concepts and principles and explains the properties of materials or data or systems to address a need, problem, or challenge - analyses technologies and explains ethical and sustainable application of technology - thinks critically, drawing on data and information to solve complex problems	- explains the design process and describes constraints and implications for decision making - explains technology theories, concepts and principles and describes the properties of materials or data or systems to address a need, problem, or challenge - explains technologies and describes ethical and sustainable application of technology - thinks critically, drawing on data and information to solve problems	- describes the design process with some reference to constraints and implications for decision making - describes technology theories, concepts, and principles with some reference to properties of materials or data or systems to address a need, problem, or challenge - describes technologies with some reference to ethical and sustainable application of technology - draws on data and information to solve problems and describes opportunities	- identifies features of the design process with minimal reference to decision making - identifies technology theories, concepts, and principles with some reference to properties of materials or data or systems to address a need, problem, or challenge - identifies some features of technologies with minimal reference to ethical and sustainable application of technology - applying minimal use of information and data
Skills	- applies technology concepts, strategies and methodologies with control and precision demonstrating understanding of the historical and cultural context and its impact - creates innovative and high quality design solutions/products using techniques and approaches and justifies ideas coherently - analyses potential prototypes and solutions analysing their appropriateness and effectiveness via iterative improvement and review - communicates complex ideas and insights effectively in a range of mediums to a variety of audiences using appropriate evidence, metalanguage, and accurate referencing - reflects with insight on their own thinking and that of others and evaluates inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work independently and collaboratively	- applies technology concepts, strategies and methodologies with control demonstrating understanding of the historical and cultural context and its impact - creates high-quality design solutions/products using techniques and approaches and justifies ideas coherently - analyses potential prototypes and solutions explaining their appropriateness and effectiveness via iterative improvement and review - communicates ideas effectively in a range of mediums to a variety of audiences using appropriate evidence, metalanguage, and accurate referencing - reflects on their own thinking and analyses inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work independently and collaboratively	- applies technology concepts, strategies and methodologies with some control demonstrating understanding of context and its impact - creates functional quality design solutions/products using techniques and approaches and explains ideas coherently - explains potential prototypes and solutions describing their appropriateness and effectiveness via iterative improvement and review - communicates ideas appropriately in a range of mediums to a variety of audiences using appropriate evidence, metalanguage, and accurate referencing - reflects on their own thinking and explains inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work independently and collaboratively	- applies technology concepts, strategies and methodologies with minimal control demonstrating understanding of its impact - creates simple, functional design solutions/products using some techniques and approaches and explains ideas - describes potential prototypes and solutions with some reference to their appropriateness and effectiveness via iterative improvement and review - communicates ideas in mediums to a variety of audiences using some evidence, metalanguage, and referencing - reflects on their own thinking with some reference to inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work independently and collaboratively	- applies technology concepts, strategies and methodologies with limited control demonstrating minimal evidence of understanding its impact - creates design solutions/products using some basic techniques and approaches and describes ideas - identifies potential prototypes and solutions with minimal reference to their appropriateness and effectiveness via iterative improvement and review - communicates basic ideas in mediums to a variety of audiences using minimal evidence, metalanguage, and some referencing - reflects on their own thinking with minimal reference to planning, time management, use of appropriate techniques and strategies and capacity to work independently and collaboratively

Achievement Standards Technologies A Course Year 12

	<i>A student who achieves an A grade typically</i>	<i>A student who achieves a B grade typically</i>	<i>A student who achieves a C grade typically</i>	<i>A student who achieves a D grade typically</i>	<i>A student who achieves an E grade typically</i>
Knowledge and understanding	- analyses the design process and explains opportunities, constraints and implications for decision making - analyses technology theories, concepts and principles and explains the properties of materials or data or systems to address a need, problem, or challenge - analyses technologies in a range of contexts and explains ethical and sustainable application - thinks critically, drawing on data and information to solve complex problems and analyses opportunities for application of technology	- explains the design process and describes opportunities, constraints and implications for decision making - explains technology theories, concepts and principles and describes the properties of materials or data or systems to address a need, problem, or challenge - explains technologies in a range of contexts and describes ethical and sustainable application - thinks critically, drawing on data and information to solve problems and explains opportunities for application of technology	- describes the design process with reference to opportunities, constraints and implications for decision making - describes technology theories, concepts, and principles with some reference to properties of materials or data or systems to address a need, problem, or challenge - describes technologies in a range of contexts with some reference to ethical and sustainable application - draws on data and information to solve problems and describes opportunities for application of technology	- identifies major features of the design process with minimal reference to opportunities, constraints and implications for decision making - identifies major technology theories, concepts, and principles with some reference to properties of materials or data or systems to address a need, problem, or challenge - identifies major features of technologies with minimal reference to ethical and sustainable application - identifies some opportunities for application of technology with limited use of information and data	- identifies some features of the design process with minimal understanding of opportunities, constraints, and implications - identifies few technology theories, concepts, and principles with minimal reference to properties of materials or data or systems to address a need, problem, or challenge - identifies some features of technologies with no reference to ethical and sustainable application - identifies some opportunities for application of technology with minimal evidence of use of information and data
Skills	- applies technology concepts, strategies and methodologies with control and precision demonstrating understanding of the historical and cultural context and its impact - creates innovative and high-quality design solutions/products using efficient techniques and approaches and justifies ideas - analyses potential prototypes and solutions, and analyses their appropriateness and effectiveness via iterative improvement and review - communicates complex ideas and insights effectively in a range of mediums and justifies ideas coherently using appropriate evidence, metalanguage, and accurate referencing - reflects with insight on their own thinking and evaluates inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively	- applies technology concepts, strategies and methodologies with control demonstrating understanding of the historical and cultural context and its impact - creates high-quality design solutions/products using techniques and approaches and explains ideas - explains potential prototypes and solutions, and explains their appropriateness and effectiveness via iterative improvement and review - communicates ideas effectively in a range of mediums and justifies ideas coherently using appropriate evidence, metalanguage and referencing - reflects on their own thinking and analyses inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively	- applies technology concepts, strategies and methodologies with some control demonstrating understanding of context and its impact - creates functional design solutions/products using some techniques and approaches and explains ideas - describes potential prototypes and solutions, and describes their appropriateness and effectiveness via iterative improvement and review - communicates ideas appropriately in mediums and explains ideas coherently using appropriate evidence, metalanguage and referencing - reflects on their own thinking explains inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively	- applies technology concepts, strategies and methodologies with minimal control demonstrating understanding of its impact - creates functional design solutions/products using some techniques and approaches and describes ideas - identifies potential prototypes and solutions, and identifies their appropriateness and effectiveness via iterative improvement and review - communicates ideas in mediums and describes ideas with some use of appropriate evidence with minimal use of metalanguage and referencing - reflects on their own thinking with some reference to planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively	- applies technology concepts, strategies and methodologies with limited control demonstrating minimal evidence of understanding its impact - creates simple design solutions/products using basic techniques and approaches and description of ideas - identifies potential prototypes and solutions with minimal reference to their appropriateness and effectiveness via iterative improvement and review - communicates basic ideas in few mediums and describes ideas with minimal use of appropriate evidence and referencing - reflects on their own thinking with minimal reference to planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively

Achievement Standards Technologies T Course Year 12

	<i>A student who achieves an A grade typically</i>	<i>A student who achieves a B grade typically</i>	<i>A student who achieves a C grade typically</i>	<i>A student who achieves a D grade typically</i>	<i>A student who achieves an E grade typically</i>
Knowledge and understanding	- critically analyses the design process and evaluates opportunities, constraints and implications for decision making - critically analyses strategies, methodologies and procedures and evaluates their validity and reliability - synthesises technology theories, concepts and principles and evaluates the properties of material or data or systems to address a need, problem, or challenge - critically analyses technologies in a range of contexts and evaluates ethical and sustainable application of technology - thinks critically and creatively, drawing on data and information to solve complex problems and evaluates opportunities for application of technology	- analyses the design process and explains opportunities, constraints and implications for decision making - analyses strategies, methodologies and procedures and explains their validity and reliability - analyses technology theories, concepts and principles and explains the properties of materials or data or systems to address a need, problem, or challenge - analyses technologies in a range of contexts and explains ethical and sustainable application of technology - thinks critically, drawing on data and information to solve complex problems and analyses opportunities for application of technology	- explains the design process and describes opportunities, constraints and implications for decision making - explains strategies, methodologies and procedures and describes their validity and reliability - explains technology theories, concepts and principles and describes the properties of materials or data or systems to address a need, problem, or challenge - explains technologies in a range of contexts and describes ethical and sustainable application of technology - thinks critically, drawing on data and information at times to solve problems and explains opportunities for application of technology	- describes the design process with some reference to opportunities, constraints and implications for decision making - describes strategies, methodologies, and procedures with some reference to validity and reliability - describes technology theories, concepts, and principles with some reference to properties of materials or data or systems to address a need, problem, or challenge - describes technologies in a range of contexts with some reference to ethical and sustainable application of technology - draws on data and information at times to solve problems and describes opportunities for application of technology	- identifies features of the design process with minimal reference to decision making - identifies some strategies, methodologies, and procedures with minimal reference to validity and reliability - identifies technology theories, concepts, and principles with some reference to properties of materials or data or systems to address a need, problem, or challenge - identifies some features of technologies in a range of contexts with minimal reference to ethical and sustainable application of technology - identifies some opportunities for application of technology with limited use of information and data
Skills	- applies technology concepts, strategies and methodologies demonstrating an understanding of the historical and cultural context and impact on individuals, groups, communities, and society - creates innovative and high-quality design solutions/products using techniques and approaches and justifies ideas logically and coherently - critically analyses potential prototypes and solutions evaluating their appropriateness and effectiveness via iterative improvement and review - communicates complex ideas and insights effectively in a range of mediums to a variety of audiences using appropriate evidence, metalanguage, and accurate referencing - reflects with insight on their own thinking and that of others and evaluates inter and intrapersonal skills including planning, time management, use of appropriate techniques & strategies and capacity to work independently and collaboratively	- applies technology concepts, strategies and methodologies with control demonstrating understanding of the historical and cultural context and impact on individuals, groups, communities, and society - creates high quality design solutions/products using techniques and approaches and justifies ideas coherently - analyses potential prototypes and solutions analysing their appropriateness and effectiveness via iterative improvement and review - communicates ideas effectively in a range of mediums to a variety of audiences using appropriate evidence, metalanguage, and accurate referencing - reflects on their own thinking and that of others and analyses inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively	- applies technology concepts, strategies and methodologies with some control demonstrating understanding of context and the impact on individuals, groups, communities, and society - creates functional design solutions/products using techniques and approaches and justifies ideas - explains potential prototypes and solutions explaining their appropriateness and effectiveness via iterative improvement and review - communicates ideas appropriately in a range of mediums to a variety of audiences using appropriate evidence, metalanguage, and accurate referencing - reflects on their own thinking and that of others and explains inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively	- applies technology concepts, strategies and methodologies with minimal control demonstrating understanding of the impact on individuals, groups, communities, and society - creates functional design solutions/products using some techniques and approaches and explains ideas - describes potential prototypes and solutions describing their appropriateness and effectiveness via iterative improvement and review - communicates ideas in mediums to a variety of audiences using some evidence, metalanguage and referencing - reflects on their own thinking with some reference to inter and intrapersonal skills including planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively	- applies technology concepts, strategies and methodologies with limited control demonstrating little evidence of understanding of the impact on individuals, groups, communities, and society - creates simple, functional design solutions/products using basic techniques and approaches and describes ideas - identifies potential prototypes and solutions identifying their appropriateness and effectiveness via iterative improvement and review - communicates basic ideas in mediums to a variety of audiences using minimal evidence, metalanguage, and some referencing - reflects on their own thinking with minimal reference to planning, time management, use of appropriate techniques and strategies and capacity to work both independently and collaboratively

Data Representation & Analysis**Value: 1.0****Data Representation & Analysis a****Value 0.5****Data Representation & Analysis b****Value 0.5****Unit Description**

This unit explores the ways that digital information is encoded, represented, manipulated, stored, compressed and transmitted. Understanding where data comes from, having intuitions about what could be learned or extracted from it, being able to use computational tools to digitally manipulate data, visualise it and identifying patterns, trends, and to use data to develop narratives and arguments are the primary skills addressed in the unit.

Specific Unit Goals

This unit should enable students to:

A Course	T Course
- understand the requirements and issues surrounding the representation, manipulation, collection, encoding, compression, transmission and visualisation of data - explore and apply the strategies and techniques of problem solving in the context of data analysis - create applications which enable interactive investigation of data for an identified problem or domain - examine a range of data analysis techniques and strategies - collaborate with stakeholders, clients and peers in the process of problem identification and resolution	- understand the complex requirements and issues surrounding the representation, manipulation, collection, encoding, compression, transmission and visualisation of data - explore and apply the strategies and techniques of problem solving in the context of data analysis - create innovative applications which enable interactive investigation of data for an identified problem or domain - evaluate a range of data analysis techniques and strategies - collaborate with stakeholders, clients and peers in the process of problem identification and resolution

Content Descriptions

All knowledge, understanding and skills below must be delivered:

A Course	T Course
Design process	
- define the requirements of a problem, and select, acquire or generate the data necessary to solve it - apply a design process to identify and select the most appropriate solution to the chosen problem	- investigate and define the requirements of a problem, and select, acquire or generate the data necessary to solve it - apply a design process to identify and select the most appropriate solution to the chosen problem

A Course	T Course
• implement digital solutions using artefacts generated from data analysis processes, to discover and tell stories derived from real-world data	• implement digital solutions using artefacts generated from data analysis processes, to discover and tell stories derived from real-world data • critically evaluate the implications and consequences of acting on conclusions made through analysis, considering interpretation bias, underlying assumptions, and data quality
Strategies, methodologies and procedures	
• explore and understand data collection methods, considering storage requirements, security strategies and validation techniques • use structured data to model entities and relationships in a range of formats, for example: spreadsheets, databases • apply algorithms and analysis techniques to transform, interpret and interrogate data, considering distorting factors • implement forms of data visualisation to effectively communicate findings, for example: graphs, plots, diagrams, animations	• evaluate data collection methods, considering storage requirements, security strategies and validation techniques • use structured data to model entities and relationships in a range of formats, for example: spreadsheets, databases, XML, JSON • select, adapt and apply algorithms and analysis techniques to transform, interpret and interrogate data, considering distorting factors • conceptualise and implement relevant forms of data visualisation to effectively communicate findings, for example: graphs, plots, diagrams, animations
Theories, concepts and materials	
• understand how the structure, type, quality, nature and purpose of data inform its representation • apply algorithms and analysis techniques to trends and patterns in data, distinguishing between coincidence, correlation and causation • apply a range of techniques to organise data, for example grouping, filtering, sorting, calculating, combining	• critically analyse how the structure, type, quality, nature and purpose of data inform its representation • critically analyse the sources and techniques used in the acquisition of data, and how our own biases and opinions can influence our interpretation of results • select and implement algorithms and analysis techniques to trends and patterns in data, distinguishing between coincidence, causation and calculate correlation, for example, Anscombe's Quartet • select and implement a range of techniques to organise data, including grouping, filtering, sorting, calculating, combining

A Course	T Course
Contexts	
- analyse the historical and cultural influence of data-driven decision making and disruptive innovation on individual and social utility - understand the privacy, security and legal implications of the use of personal, group and population data in data science applications - analyse ethical and sustainable considerations in the design and practice of data science	- critically analyse the historical and cultural influence of data-driven decision making and disruptive innovation on individual and social utility - critically analyse the privacy, security and legal implications of the use of personal, group and population data in data science applications - critically analyse ethical and sustainable considerations in the design and practice of data science
Communication	
- communicate accurately with others using correct terms in an appropriate format, both orally and in writing - communicate ideas and insights in a range of appropriate mediums to a variety of audiences - describe how data analysis is used to solve problems, and justify the choices made throughout the design process - justify ideas coherently using appropriate evidence and accurate referencing	- communicate accurately with others using correct terms in an appropriate format, both orally and in writing - communicate ideas and insights in a range of appropriate mediums to a variety of audiences - explain how data analysis is used to solve problems, and justify the choices made throughout the design process - justify ideas coherently using appropriate evidence and accurate referencing
Reflection	
- reflect on the conclusions of their data analysis, the impact of those conclusions, and the learning gained through the process - reflect on own learning style and performance, including planning and time management, to develop strategies to improve own learning	- reflect on the conclusions of their data analysis, the impact of those conclusions, and the learning gained through the process - reflect on own learning style and performance, including planning and time management, to develop strategies to improve own learning

A guide to reading and implementing content descriptions

Content descriptions specify the knowledge, understanding and skills that students are expected to learn and that teachers are expected to teach. Teachers are required to develop a program of learning that allows students to demonstrate all the content descriptions.

A program of learning is what a college provides to implement the course for a subject meeting students' needs and interests. It is at the discretion of the teacher to emphasis some content descriptions over others. The teacher may teach additional (not listed) content if it meets the specific unit goals.

For colleges wishing to deliver the VET qualification, there is flexibility for a teacher (provided the RTO has scope) to develop a program of learning aligned with the elements of the VET competencies and A/T content descriptions. The knowledge, skills and understandings within the competencies reflect the knowledge, skills and understandings of the BSSS course unit content descriptions.

Alternatively, a college may choose the A/T course without the VET qualification. In delivering the course teachers write a program of learning aligned with students' needs and interests, meeting the A/T content descriptions.

Units of Competency

Competence must be demonstrated over time and in the full range of ICT contexts. Teachers must use this unit document in conjunction with the Units of Competence from the **ICT20120 Certificate II in Applied Digital Technologies** or **ICT30120 Certificate III in Information Technology**, which provide performance criteria, range statements and assessment contexts.

Teachers must address **all content** related to the competencies embedded in this unit. Reasonable adjustment may be made only to the mode of delivery, context and support provided according to individual student needs.

Competencies are attached to units and must be delivered in those units. However, ongoing assessment of competencies can occur while the student is enrolled as an ACT Senior Secondary student.

In order to be deemed competent to industry standard, assessment must provide authentic, valid, sufficient and current evidence as indicated in the relevant Training Package.

Certificate II in Applied Digital Technologies

The following **core** units must be delivered and assessed over the semester (if applicable):

Code	Competency Title
BSBSUS211	Participate in sustainable work practices
BSBWHS211	Contribute to the health and safety of self and others

Any **elective** competencies selected to meet packaging rules from the list below may also be delivered:

Code	Competency Title
ICTICT2226	Operate simple database applications
ICTWEB306	Develop web presence using social media

Certificate III in Information Technology

The following **core** units must be delivered and assessed over the semester (if applicable):

Code	Competency Title
BSBCRT311	Apply critical thinking skills in a team environment
ICTPRG302	Apply introductory programming techniques

Any **elective** competencies selected to meet packaging rules from the list below may also be delivered:

Code	Competency Title
ICTICT216	Design and create basic organisational documents
ICTPMG301	Contribute as part of an IT project management team
ICTICT214	Operate application software packages
ICTDBS416	Create basic relational databases
ICTDAT402	Clean and verify data

It is essential to access www.training.gov.au for detailed up to date information relating to the above competencies.

Assessment

Refer to pages 10-12.

Big Data Analysis & Techniques

Value: 1.0

Big Data Analysis & Techniques a

Value 0.5

Big Data Analysis & Techniques b

Value 0.5

Unit Description

The data-rich world that we live in introduces many complex questions related to public policy, law, ethics and social impact. The goals of this unit are to develop a well-rounded and balanced view about data in the world, including the positive and negative effects of it. Students develop skills in using data analysis processes, relevant algorithms and techniques and computational tools to analyse Big Data using a multidisciplinary approach.

Specific Unit Goals

This unit should enable students to:

A Course	T Course
- develop an understanding of the nature, structure and handling techniques required for managing big data sets - analyse and visualise big data sets to address problems, and model entities and their relationships - reflect upon big data sources, types, formats, and structures - understand and apply a range of strategies and techniques for big data cleaning and standardisation - collaborate with stakeholders, clients and peers to interpret, visualise and communicate the results of big data analysis	- critically analyse the nature, structure and handling techniques required for managing big data sets - analyse and visualise big data sets to address complex problems, and model processes, entities and their relationships - critically reflect upon big data sources, types, formats, and structures - select and implement a wide range of strategies and techniques for big data cleaning and standardisation - collaborate with stakeholders, clients and peers to interpret, visualise and communicate the results of big data analysis

Content Descriptions

All knowledge, understanding and skills below must be delivered:

A Course	T Course
Design process	
- define problems typically solved by large data sets, and select and acquire the data necessary to solve them from large data sets - apply a design process to identify and assess the range and scope of potential problems derived from the domain of large data sets - implement digital solutions generated with data sets, to discover unfolding stories and gain new insights	- investigate and define problems typically solved by large data sets, and select and acquire the data necessary to solve them from large data sets - apply a design process to identify and assess the range and scope of potential problems derived from the domain of large data sets - implement digital solutions generated from the analysis of large real-world data sets, to discover unfolding stories and gain new insights

A Course	T Course
	critically evaluate the implications and consequences of acting on conclusions made through analysis, considering interpretation bias, underlying assumptions, and data quality
Strategies, methodologies and procedures	
- explore data collection methods and access considerations, including network connectivity, bandwidth, cloud storage, and privacy and security requirements - use structured data to model entities and relationships in formats suitable for processing big data - apply algorithms and analysis techniques to transform, interpret data, considering distorting factors, and filtering and/or slicing strategies to manage scale - implement forms of data visualisation to effectively communicate findings, for example: graphs, plots, diagrams, animations	- evaluate data collection methods and access considerations, including network connectivity, bandwidth, cloud storage, and privacy and security requirements - use structured data to model entities and relationships in a range of formats suitable for processing big data - select, adapt and apply algorithms and analysis techniques to transform, interpret and interrogate data, considering distorting factors, and filtering and/or slicing strategies to manage scale - conceptualise and implement relevant forms of data visualisation to effectively communicate findings, for example: graphs, plots, diagrams, animations
Theories, concepts and materials	
- define how Big Data impacts our ability to manage, control, maintain and quality assure data, and how volume impact processing - analyse the impact the use of large data sets has on individuals and societies, for example, the impacts on developing and implementing government policies - apply algorithms and techniques suitable for the analysis of large data sets, for example, trend and/or cluster analysis - apply a range of techniques to organise data, using data processing libraries and tools designed specifically for large data sets	- critically analyse how Big Data impacts our ability to manage, control, maintain and quality assure data, and how volume, velocity and variety impact processing - critically analyse the impact the use of large data sets has on individuals and societies, for example, the impacts on developing and implementing government policies - select and implement algorithms suitable for the analysis of large data sets, for example, trend analysis, cluster analysis, anomaly detection and MapReduce - select and implement a range of techniques to organise and analyse data, using data processing libraries and tools designed specifically for large data sets, for example, pandas data frames

A Course	T Course
Contexts	
- analyse the historical and cultural influence of data-driven decision making and disruptive innovation on individual and social utility - understand the privacy, security and legal implications of the use of personal, group and population data in data science applications - analyse ethical and sustainable considerations in the design and practice of data science	- critically analyse the historical and cultural influence of data-driven decision making and disruptive innovation on individual and social utility - critically analyse the privacy, security and legal implications of the use of personal, group and population data in data science applications - critically analyse ethical and sustainable considerations in the design and practice of data science
Communication	
- communicate accurately with others using correct terms in an appropriate format, both orally and in writing - communicate ideas and insights in a range of appropriate mediums to a variety of audiences - describe how analysis of large data sets impacts the strategies used to solve problems, and justify the choices made throughout the design process - justify ideas coherently using appropriate evidence and accurate referencing	- communicate accurately with others using correct terms in an appropriate format, both orally and in writing - communicate ideas and insights in a range of appropriate mediums to a variety of audiences - explain how analysis of large data sets impacts the strategies used to solve problems, and justify the choices made throughout the design process - justify ideas coherently using appropriate evidence and accurate referencing
Reflection	
- reflect on the conclusions of their data analysis, the impact of those conclusions, and the learning gained through the process - reflect on own learning style and performance, including planning and time management, to develop strategies to improve own learning	- reflect on the conclusions of their data analysis, the impact of those conclusions, and the learning gained through the process - reflect on own learning style and performance, including planning and time management, to develop strategies to improve own learning

A guide to reading and implementing content descriptions

Content descriptions specify the knowledge, understanding and skills that students are expected to learn and that teachers are expected to teach. Teachers are required to develop a program of learning that allows students to demonstrate all the content descriptions.

A program of learning is what a college provides to implement the course for a subject meeting students' needs and interests. It is at the discretion of the teacher to emphasis some content descriptions over others. The teacher may teach additional (not listed) content if it meets the specific unit goals.

For colleges wishing to deliver the VET qualification, there is flexibility for a teacher (provided the RTO has scope) to develop a program of learning aligned with the elements of the VET competencies and A/T content descriptions. The knowledge, skills and understandings within the competencies reflect the knowledge, skills and understandings of the BSSS course unit content descriptions.

Alternatively, a college may choose the A/T course without the VET qualification. In delivering the course teachers will write a program of learning aligned with students' needs and interests, meeting the A/T content descriptions. In order to be deemed competent to industry standard, assessment must provide authentic, valid, sufficient and current evidence as indicated in the relevant Training Package.

Units of Competency

Competence must be demonstrated over time and in the full range of ICT contexts. Teachers must use this unit document in conjunction with the Units of Competence from the **ICT20120 Certificate II Applied Digital Technologies** or **ICT30120 Certificate III in Information Technology**, which provide performance criteria, range statements and assessment contexts.

Teachers must address **all content** related to the competencies embedded in this unit. Reasonable adjustment may be made only to the mode of delivery, context and support provided according to individual student needs.

Competencies are attached to units and must be delivered in those units. However, ongoing assessment of competencies can occur while the student is enrolled as an ACT Senior Secondary student.

In order to be deemed competent to industry standard, assessment must provide authentic, valid, sufficient and current evidence as indicated in the relevant Training Package.

Certificate II in Applied Digital Technologies

The following **core** units must be delivered and assessed over the semester (if applicable):

Code	Competency Title
ICTICT213	Use computer operating systems and hardware

Any **elective** competencies selected to meet packaging rules from the list below may also be delivered:

Code	Competency Title
ICTICT223	Install software applications
ICTSAS211	Develop solutions for basic ICT malfunctions and problems
ICTSAS215	Protect and secure information assets

Certificate III in Information Technology

The following **core** units must be delivered and assessed over the semester (if applicable):

Code	Competency Title
BSBXCS303	Securely manage personally identifiable information and workplace information
BSBXTW301	Work in a team
ICTICT313	Identify IP, ethics and privacy policies in ICT environments

Any **elective** competencies selected to meet packaging rules from the list below may also be delivered:

Code	Competency Title
ICTPRG430	Apply introductory object-oriented language skills
ICTPRG435	Write scripts for software applications
ICTWEB304	Build simple web pages
ICTWEB431	Create and style simple markup language documents

It is essential to access www.training.gov.au for detailed up to date information relating to the above competencies.

Assessment

Refer to pages 10-12.

Machine Learning

Value: 1.0

Machine Learning a

Value 0.5

Machine Learning b

Value 0.5

Unit Description

This unit explores how Machine Learning is used to develop models for prediction, analysis, diagnosis and recommendation. Students develop an understanding of Machine Learning, and the algorithms, techniques and processes used in supervised and unsupervised models. They use Machine Learning to analyse authentic datasets from a range of sources, and investigate the inherent bias in training data. They build models or applications which enable predictions or recommendations, contextualising the social impact of their Machine Learning application.

Specific Unit Goals

This unit should enable students to:

A Course	T Course
- analyse the impact of bias and data selection on Machine Learning systems - explore technologies used for Machine Learning and apply to real-world problems taking into account the functional and non-functional needs of clients and stakeholders - create, train and implement systems of Machine Learning for generating predictions, recognising patterns or suggesting recommendations - reflect upon the impacts of, and processes, techniques and models used for their Machine Learning application - collaborate with a wide range of stakeholders, clients, peers to analyse a problem and design a solution	- critically analyse the impact of bias and data selection on Machine Learning systems - evaluate technologies used for Machine Learning and apply to real-world problems taking into account the functional and non-functional needs of clients and stakeholders - create, train and implement systems of Machine Learning for generating predictions, recognising patterns or suggesting recommendations - critically evaluate and reflect upon the impacts of, and processes, techniques and models used for their Machine Learning application - collaborate with a wide range of stakeholders, clients, peers to analyse a problem and design a solution

Content Descriptions

All knowledge, understanding and skills below must be delivered:

A Course	T Course
Design process	
- define problems appropriate for the Machine Learning domain, and select and acquire the training and source data necessary to solve them - apply a design process to identify the relevant Machine Learning strategies, algorithms and approaches most suited to address the selected problem - implement digital solutions using Machine Learning techniques that reveal new insights and use these to predict, recommend or inform future actions	- investigate and define problems appropriate for the Machine Learning domain, and select and acquire the training and source data necessary to solve them - apply a design process to identify the relevant Machine Learning strategies, algorithms and approaches most suited to address the selected problem - implement digital solutions using Machine Learning techniques that reveal new insights and use these to predict, recommend or inform future actions - critically analyse the implications and consequences of acting on conclusions made through analysis, considering interpretation bias, underlying assumptions, and data quality in both the training and result data sets
Strategies, methodologies and procedures	
- explore and understand data collection methods, considering storage requirements, processing needs, platform restrictions, privacy and security requirements and ethical practices - use structured data to model entities and relationships in a range of formats suitable for the Machine Learning models chosen - apply algorithms and analysis techniques to transform, interpret and interrogate data, considering distorting factors - implement forms of data visualisation to effectively communicate findings, for example: graphs, plots, diagrams, animations	- evaluate data collection methods, considering storage requirements, processing needs, platform restrictions, privacy and security requirements and ethical practices - use structured data to model entities and relationships in a range of formats suitable for the Machine Learning models chosen - select, adapt and apply algorithms and analysis techniques to transform, interpret and interrogate data, considering distorting factors - conceptualise and implement relevant forms of data visualisation to effectively communicate findings, for example: graphs, plots, diagrams, animations

A Course	T Course
Theories, concepts and materials	
- understand how automated processing and Machine Learning models are influenced by data quality, bias and designer intent, and the need to manage and control the risks and impact of Machine Learning applications - analyse the role and implications of Machine Learning and automation, including both broader societal impacts and model efficacy - apply Machine Learning algorithms, for example, naïve bayes, multivariable regression - apply Machine Learning models to organise and analyse data, using data processing libraries and tools, for example, support vector machine	- analyse how automated processing and Machine Learning models are influenced by data quality, bias and designer intent, and the need to manage and control the risks and impact of Machine Learning applications - critically analyse the role and implications of Machine Learning and automation, including both broader societal impacts and model efficacy - select and implement Machine Learning algorithms, for example, naïve bayes, multivariable regression, k-means clustering - select and implement a range of Machine Learning models to organise and analyse data, using data processing libraries and tools, for example, single layer perceptron, support vector machine
Contexts	
- analyse the historical and cultural influence of data-driven decision making and disruptive innovation on individual and social utility - understand the privacy, security and legal implications of the use of personal, group and population data in data science applications - analyse ethical and sustainable considerations in the design and practice of data science	- critically analyse the historical and cultural influence of data-driven decision making and disruptive innovation on individual and social utility - critically analyse the privacy, security and legal implications of the use of personal, group and population data in data science applications - critically analyse ethical and sustainable considerations in the design and practice of data science
Communication	
- communicate accurately with others using correct terms in an appropriate format, both orally and in writing - communicate ideas and insights in a range of appropriate mediums to a variety of audiences - describe how Machine Learning impacts the strategies used to solve problems, and justify the choices made throughout the design process - justify ideas coherently using appropriate evidence and accurate referencing	- communicate accurately with others using correct terms in an appropriate format, both orally and in writing - communicate ideas and insights in a range of appropriate mediums to a variety of audiences - explain how Machine Learning impacts the strategies used to solve problems, and justify the choices made throughout the design process - justify ideas coherently using appropriate evidence and accurate referencing

A Course	T Course
Reflection	
• reflect on the conclusions of their data analysis, the impact of those conclusions, and the learning gained through the process • reflect on own learning style and performance, including planning and time management, to develop strategies to improve own learning	• reflect on the conclusions of their data analysis, the impact of those conclusions, and the learning gained through the process • reflect on own learning style and performance, including planning and time management, to develop strategies to improve own learning

A guide to reading and implementing content descriptions

Content descriptions specify the knowledge, understanding and skills that students are expected to learn and that teachers are expected to teach. Teachers are required to develop a program of learning that allows students to demonstrate all the content descriptions.

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For colleges wishing to deliver the VET qualification, there is flexibility for a teacher (provided the RTO has scope) to develop a program of learning aligned with the elements of the VET competencies and A/T content descriptions. The knowledge, skills and understandings within the competencies reflect the knowledge, skills and understandings of the BSSS course unit content descriptions.

Alternatively, a college may choose the A/T course without the VET qualification. In delivering the course teachers write a program of learning aligned with students' needs and interests, meeting the A/T content descriptions.

Units of Competency

Competence must be demonstrated over time and in the full range of ICT contexts. Teachers must use this unit document in conjunction with the Units of Competence from the **ICT20120 Certificate II Applied Digital Technologies** or **ICT30120 Certificate III in Information Technology**, which provide performance criteria, range statements and assessment contexts.

Teachers must address **all content** related to the competencies embedded in this unit. Reasonable adjustment may be made only to the mode of delivery, context and support provided according to individual student needs.

Competencies are attached to units and must be delivered in those units. However, ongoing assessment of competencies can occur while the student is enrolled as an ACT Senior Secondary student.

In order to be deemed competent to industry standard, assessment must provide authentic, valid, sufficient and current evidence as indicated in the relevant Training Package.

Certificate II in Applied Digital Technologies

The following **core** units must be delivered and assessed over the semester (if applicable):

Code	Competency Title
ICTICT214	Operate application software packages

Any **elective** competencies selected to meet packaging rules from the list below may also be delivered:

Code	Competency Title
ICTICT221	Identify and use specific industry standard technologies

Certificate III in Information Technology

The following **core** units must be delivered and assessed over the semester (if applicable):

Code	Competency Title
ICTSAS305	Provide ICT advice to clients

Any **elective** competencies selected to meet packaging rules from the list below may also be delivered:

Code	Competency Title
ICTICT312	Use advanced features of applications
ICTICT438	Select, configure and deploy software and hardware testing tools

It is essential to access www.training.gov.au for detailed up to date information relating to the above competencies.

Assessment

Refer to pages 10-12.

Data Research Project**Value: 1.0****Data Research Project a****Value 0.5****Data Research Project b****Value 0.5****Unit Description**

This unit enables students to undertake their own research project to develop and test hypotheses using real-world data sets. They further develop their data analysis skills, and explore patterns in data that yield interesting results. Students present conclusions drawn from their analysis, and communicate their findings through visualisations and arguments that inform and maximise impact.

Specific Unit Goals

This unit should enable students to:

A Course	T Course
• apply the processes of data acquisition, transformation, analysis, visualisation and presentation, considering privacy and security requirements • explore and decompose real-world problems with precision, taking into account contextual requirements, and apply multifaceted data analysis strategies to the selected problems • create innovative, interactive solutions through applying the techniques of data visualisation or algorithmic methods to share the results of the data research undertaken, incorporating safety, social contexts and ethical and legal responsibilities • evaluate and reflect upon the impacts of, and processes, techniques and strategies used to identify and research a problem, analyse available data, and communicate the results • plan and manage a project using agile and collaborative approaches, identifying and managing risks and considering safety and sustainability	• select and apply processes of data acquisition, transformation, analysis, visualisation and presentation, considering privacy and security requirements • evaluate and decompose real-world problems with precision, taking into account contextual requirements, and apply multifaceted data analysis strategies to the selected problems • create innovative, interactive solutions through applying the techniques of data visualisation or algorithmic methods to share the results of the data research undertaken, incorporating safety, social contexts and ethical and legal responsibilities • critically evaluate and reflect upon the impacts of, and processes, techniques and strategies used to identify and research a problem, analyse available data, and communicate the results • plan and manage a project using agile and collaborative approaches, identifying and managing risks and considering safety and sustainability

Content Descriptions

All knowledge, understanding and skills below must be delivered:

A Course	T Course
Design process	
- define a problem to assess its feasibility, scope and appropriateness to selected data sources and analysis approaches - apply a design process to identify and select appropriate techniques, approaches and strategies for solving defined problems - implement digital solutions using a range of data analysis techniques to test and/or validate predictions and hypotheses	- investigate and define a problem to assess its feasibility, scope and appropriateness to selected data sources and analysis approaches - apply a design process to identify and select appropriate techniques, approaches and strategies for solving defined problems - implement digital solutions using a range of data analysis techniques to test and/or validate predictions and hypotheses - critically analyse the implications and consequences of acting on conclusions made through analysis, considering interpretation bias, underlying assumptions, and data quality
Strategies, methodologies and procedures	
- apply data collection methods, considering storage requirements, security strategies and validation techniques - use structured data to model entities and relationships in a format appropriate for the problem domain - apply algorithms and analysis techniques to transform, interpret and interrogate data, considering distorting factors - implement relevant forms of data visualisation to effectively communicate findings, for example: graphs, plots, diagrams, animations	- evaluate data collection methods, considering storage requirements, security strategies and validation techniques - use structured data to model entities, processes and relationships in a range of formats appropriate for the problem domain - select and apply algorithms and analysis techniques to transform, interpret and interrogate data, considering distorting factors - conceptualise and implement relevant forms of data visualisation to effectively communicate findings, for example: graphs, plots, diagrams, animations
Theories, concepts and materials	
- apply knowledge about the structure, type, quality, nature and purpose of data through the design of the project - analyse sources and techniques used in the selection and acquisition of data, and how our own biases and opinions can influence our interpretation of results	- critically analyse how the structure, type, quality, nature and purpose of data inform the design of the project - evaluate sources and techniques used in the selection and acquisition of data, and how our own biases and opinions can influence our interpretation of results

A Course	T Course
• apply algorithms and techniques to identify trends and patterns in data and make predictions • apply selected techniques to organise data suited to the selected domain of data science	• select and implement algorithms and techniques to identify trends and patterns in data, make predictions, or apply generative techniques to create new artefacts • select and implement a range of techniques to organise data suited to the selected domain of data science
Contexts	
• analyse the historical and cultural influence of data-driven decision making and disruptive innovation on individual and social utility • understand the privacy, security and legal implications of the use of personal, group and population data in data science applications • analyse ethical and sustainable considerations in the design and practice of data science	• critically analyse the historical and cultural influence of data-driven decision making and disruptive innovation on individual and social utility • critically analyse the privacy, security and legal implications of the use of personal, group and population data in data science applications • critically analyse ethical and sustainable considerations in the design and practice of data science
Communication	
• communicate accurately with others using correct terms in an appropriate format, both orally and in writing • communicate ideas and insights in a range of appropriate mediums to a variety of audiences • describe how data analysis is used to solve problems, and justify the choices made throughout the design process • justify ideas coherently using appropriate evidence and accurate referencing	• communicate accurately with others using correct terms in an appropriate format, both orally and in writing • communicate ideas and insights in a range of appropriate mediums to a variety of audiences • explain how data analysis is used to solve problems, and justify the choices made throughout the design process • justify ideas coherently using appropriate evidence and accurate referencing
Reflection	
• reflect on the conclusions of their data analysis, the impact of those conclusions, and the learning gained through the process • reflect on own learning style and performance, including planning and time management, to develop strategies to improve own learning	• reflect on the conclusions of their data analysis, the impact of those conclusions, and the learning gained through the process • reflect on own learning style and performance, including planning and time management, to develop strategies to improve own learning

A guide to reading and implementing content descriptions

Content descriptions specify the knowledge, understanding and skills that students are expected to learn and that teachers are expected to teach. Teachers are required to develop a program of learning that allows students to demonstrate all the content descriptions.

A program of learning is what a college provides to implement the course for a subject meeting students' needs and interests. It is at the discretion of the teacher to emphasis some content descriptions over others. The teacher may teach additional (not listed) content if it meets the specific unit goals.

For colleges wishing to deliver the VET qualification, there is flexibility for a teacher (provided the RTO has scope) to develop a program of learning aligned with the elements of the VET competencies and A/T content descriptions. The knowledge, skills and understandings within the competencies reflect the knowledge, skills and understandings of the BSSS course unit content descriptions.

Alternatively, a college may choose the A/T course without the VET qualification. In delivering the course teachers write a program of learning aligned with students' needs and interests, meeting the A/T content descriptions.

Units of Competency

Competence must be demonstrated over time and in the full range of ICT contexts. Teachers must use this unit document in conjunction with the Units of Competence from the **ICT20120 Certificate II Applied Digital Technologies** or **ICT30120 Certificate III in Information Technology**, which provide performance criteria, range statements and assessment contexts.

Teachers must address **all content** related to the competencies embedded in this unit. Reasonable adjustment may be made only to the mode of delivery, context and support provided according to individual student needs.

Competencies are attached to units and must be delivered in those units. However, ongoing assessment of competencies can occur while the student is enrolled as an ACT Senior Secondary student.

In order to be deemed competent to industry standard, assessment must provide authentic, valid, sufficient and current evidence as indicated in the relevant Training Package.

Certificate II in Applied Digital Technologies

The following **core** units must be delivered and assessed over the semester (if applicable):

Code	Competency Title
BSBTEC202	Use digital technologies to communicate in a work environment
ICTICT215	Operate digital media technology packages

Any **elective** competencies selected to meet packaging rules from the list below may also be delivered:

Code	Competency Title
ICTICT219	Interact and resolve queries with ICT clients
ICTSAS212	Record the requirements of client support requests

Certificate III in Information Technology

The following **core** units must be delivered and assessed over the semester (if applicable):

Code	Competency Title
Nil required	

Any **elective** competencies selected to meet packaging rules from the list below may also be delivered:

Code	Competency Title
ICTICT215	Operate digital media technology package
ICTICT309	Create ICT user documentation

It is essential to access www.training.gov.au for detailed up to date information relating to the above competencies.

Assessment

Refer to pages 10-12.

Independent Study

Value: 1.0**Independent Study a****Value: 0.5****Independent Study b****Value: 0.5**

Prerequisites

Independent Study units are only available to individual students in Year 12. A student can only study a maximum of one Independent Study unit in each course. Students must have studied at least three standard 1.0 units from this course. An Independent Study unit requires the principal's written approval. Principal approval can also be sought by a student in Year 12 to enrol concurrently in an Independent Study unit and their third 1.0 unit in this course of study.

Unit Description

An Independent Study unit has an important place in senior secondary courses. It is a valuable pedagogical approach that empowers students to make decisions about their own learning. An Independent Study unit can be proposed by an individual student for their own independent study and negotiated with their teacher. The program of learning for an Independent Study unit must meet the unit goals and content descriptions as they appear in the course.

NOTE: There are no VET competencies attached to this unit. VET competencies may be assessed where relevant to the focus of the Unit.

Specific Unit Goals

This unit should enable students to:

A Course	T Course
- understand a particular area of data science - apply data science concepts and methodologies	- evaluate and understand a particular area of data science - select and implement data science concepts and methodologies

Content Descriptions

All knowledge, understanding and skills below must be delivered:

A Course	T Course
Design process	
- define the requirements of a problem, and select, acquire or generate the data necessary to solve it - apply a design process to identify and select the most appropriate solution to the chosen problem	- investigate and define the requirements of a problem, and select, acquire or generate the data necessary to solve it - apply a design process to identify and select the most appropriate solution to the chosen problem

A Course	T Course
implement digital solutions using artefacts generated from data analysis processes, to discover and tell stories derived from real-world data	- implement digital solutions using artefacts generated from data analysis processes, to discover and tell stories derived from real-world data - critically evaluate the implications and consequences of acting on conclusions made through analysis, considering interpretation bias, underlying assumptions, and data quality
Strategies, methodologies and procedures	
- explore and understand data collection methods, considering storage requirements, security strategies and validation techniques - use structured data to model entities, processes and relationships in a range of formats appropriate for the problem domain - apply algorithms and analysis techniques to transform, interpret and interrogate data, considering distorting factors - implement forms of data visualisation to effectively communicate findings, for example: graphs, plots, diagrams, animations	- evaluate data collection methods, considering storage requirements, security strategies and validation techniques - use structured data to model entities, processes and relationships in a range of formats appropriate for the problem domain - select, adapt and apply algorithms and analysis techniques to transform, interpret and interrogate data, considering distorting factors - conceptualise and implement relevant forms of data visualisation to effectively communicate findings, for example: graphs, plots, diagrams, animations
Theories, concepts and materials	
- understand how the structure, type, quality, nature and purpose of data inform its representation - apply algorithms and techniques to identify trends and patterns in data, make predictions, or apply generative techniques to create new artefacts - apply a range of techniques to organise data suited to the selected domain of data science	- critically analyse how the structure, type, quality, nature and purpose of data inform its representation - critically analyse the sources and techniques used in the acquisition of data, and how our own biases and opinions can influence our interpretation of results - select and implement algorithms and techniques to identify trends and patterns in data, make predictions, or apply generative techniques to create new artefacts - select and implement a range of techniques to organise data suited to the selected domain of data science

A Course	T Course
Contexts	
- analyse the historical and cultural influence of data-driven decision making and disruptive innovation on individual and social utility - understand the privacy, security and legal implications of the use of personal, group and population data in data science applications - analyse ethical and sustainable considerations in the design and practice of data science	- critically analyse the historical and cultural influence of data-driven decision making and disruptive innovation on individual and social utility - critically analyse the privacy, security and legal implications of the use of personal, group and population data in data science applications - critically analyse ethical and sustainable considerations in the design and practice of data science
Communication	
- communicate accurately with others using correct terms in an appropriate format, both orally and in writing - communicate ideas and insights in a range of appropriate mediums to a variety of audiences - describe how data analysis is used to solve problems, and justify the choices made throughout the design process - justify ideas coherently using appropriate evidence and accurate referencing	- communicate accurately with others using correct terms in an appropriate format, both orally and in writing - communicate ideas and insights in a range of appropriate mediums to a variety of audiences - explain how data analysis is used to solve problems, and justify the choices made throughout the design process - justify ideas coherently using appropriate evidence and accurate referencing
Reflection	
- reflect on the conclusions of their data analysis, the impact of those conclusions, and the learning gained through the process - reflect on own learning style and performance, including planning and time management, to develop strategies to improve own learning	- reflect on the conclusions of their data analysis, the impact of those conclusions, and the learning gained through the process - reflect on own learning style and performance, including planning and time management, to develop strategies to improve own learning

A guide to reading and implementing content descriptions

Content descriptions specify the knowledge, understanding and skills that students are expected to learn and that teachers are expected to teach. Teachers are required to develop a program of learning that allows students to demonstrate all the content descriptions.

A program of learning is what a college provides to implement the course for a subject meeting students' needs and interests. It is at the discretion of the teacher to emphasis some content descriptions over others. The teacher may teach additional (not listed) content if it meets the specific unit goals.

For colleges wishing to deliver the VET qualification, there is flexibility for a teacher (provided the RTO has scope) to develop a program of learning aligned with the elements of the VET competencies and A/T content descriptions. The knowledge, skills and understandings within the competencies reflect the knowledge, skills and understandings of the BSSS course unit content descriptions. Alternatively, a college may choose the A/T course without the VET qualification. In delivering the course teachers write a program of learning aligned with students' needs and interests, meeting the A/T content descriptions.

Appendix A – Implementation Guidelines

Available course patterns

A standard 1.0 value unit is delivered over at least 55 hours. To be awarded a course, students must complete at least the minimum units over the whole minor, major, major/minor or double major course.

Course	Number of standard units to meet course requirements
Minor	Minimum of 2 units
Major	Minimum of 3.5 units

Units in this course can be delivered in any order.

Prerequisites for the course or units within the course

For the Negotiated Study Unit (if applicable), students must have studied a minimum of TWO standard 1.0 units from this course.

Arrangements for students continuing study in this course

Students who studied the previous course may undertake any units in this course provided there is no duplication of content.

Duplication of Content Rules

Students cannot be given credit towards the requirements for a Senior Secondary Certificate for a unit that significantly duplicates content in a unit studied in another course. The responsibility for preventing undesirable overlap of content studied by a student rests with the principal and the teacher delivering the course. While it is acceptable for a student to be given the opportunity to demonstrate competence in VET qualifications over more than one semester, substantial overlap of content is not permitted. Students will only be given credit for covering the content once.

Relationship to other courses

This course shares common competencies with other BSSS accredited courses:

- Digital Technologies
- Digital Products
- Robotics and Mechatronics
- Networking and Security

New and/or updated Training Package

Training Packages are regularly updated through the mandatory continuous improvement cycle. This may result in updating of qualifications and a change in the composition of competencies within a qualification. Where qualifications from the new Training Package have been deemed to be equivalent, students may continue their study without interruption. Students will be granted direct credit for those competencies already achieved.

Where there are new competencies or updated competencies with significant change and these are deemed not equivalent, students may apply for Recognition of Prior Learning (RPL) for all or part of competencies.

Granting of RPL for competencies does not equate to points towards the Senior Secondary Certificate.

Recognition of Prior Learning (RPL)

RPL is an assessment process that assesses an individual's formal, non-formal and informal learning to determine the extent to which that individual has achieved the required learning outcomes, competence outcomes, or standards for entry to, and/or partial or total completion of, a VET qualification.

Recognition of competence through the RPL process should be granted to students through gathering supplementary evidence against elements, skills and knowledge from the Training Package as well as through established assessment criteria. RPL may be granted for individual Units of Competence where the evidence is sufficient to do so.

A student having been granted RPL for one or more Units of Competence will still be required to fulfill the time based component of units that contributes to points and A to E grading for the Senior Secondary Certificate.

To cater for this requirement, curriculum designers should design the course to be flexible enough to accommodate students who have gained some competencies through RPL.

Students may demonstrate the achievement of learning outcomes through challenge testing, interview or other means that the teacher deems reasonable. Full records of the RPL process and results must be stored by the college for perusal by the National VET Regulator upon request and should confirmation be required for VET certification. The college must be informed of the application of RPL before the start of the unit that includes the competency. For RPL to be awarded, the Units of Competency must be demonstrated in the Industry context.

Guidelines for Delivery

Program of Learning

A program of learning is what a school provides to implement the course for a subject. This meets the requirements for context, scope and sequence set out in the Board endorsed course. Students follow programs of learning in a college as part of their senior secondary studies. The detail, design and layout of a program of learning are a college decision.

The program of learning must be documented to show the planned learning activities and experiences that meet the needs of particular groups of students, taking into account their interests, prior knowledge, abilities and backgrounds. The program of learning is a record of the learning experiences that enable students to achieve the knowledge, understanding and skills of the content descriptions. There is no requirement to submit a program of learning to the OBSSS for approval. The Principal will need to sign off at the end of Year 12 that courses have been delivered as accredited.

Content Descriptions

Are all content descriptions of equal importance? No. It depends on the focus of study. Teachers can customise their program of learning to meet their own students' needs, adding additional content descriptions if desired or emphasising some over others. A teacher must balance student needs with their responsibility to teach all content descriptions. It is mandatory that teachers address all content descriptions and that students engage with all content descriptions.

Half standard 0.5 units

Half standard units appear on the course adoption form but are not explicitly documented in courses. It is at the discretion of the college principal to split a standard 1.0 unit into two half standard 0.5 units. Colleges are required to adopt the half standard 0.5 units. However, colleges are not required to submit explicit documentation outlining their half standard 0.5 units to the BSSS. Colleges must assess students using the half standard 0.5 assessment task weightings outlined in the framework. It is the responsibility of the college principal to ensure that all content is delivered in units approved by the Board.

Reasonable Adjustment

Units in this course are suitable for students requiring reasonable adjustment for delivery and assessment. However, standards of competency (outcomes) as dictated by National Training Packages **cannot be modified**. Students must demonstrate competence to the level required by industry in order to gain a Statement of Attainment or Vocational Certificate.

System Moderation

System moderation begins in schools whereby teachers cooperate to develop assessment, and grade and score student assessment according to the relevant curriculum.

Moderation Day is an essential component of the ACT senior secondary system which empowers school autonomy in curriculum and assessment. Moderation Day is a collaborative and professional event whereby schools undertake system quality assurance activities on behalf of their current and future students. Moderation Day fosters and enriches the development of quality assessment and validates student achievement. Continued best practice in teaching and learning is ensured through the formation of valid, constructive, and detailed feedback.

System Moderation:

- provides comparability of school-based assessment
- forms the basis for valid and reliable assessment in senior secondary schools
- involves the ACT Board of Senior Secondary Studies (BSSS) and schools in cooperation and partnership
- maintains the integrity of the ACT Senior Secondary Certificate.

The Moderation Model

Moderation within the ACT senior secondary system encompasses structured, consensus-based peer review of Unit Grades and quality of assessment for all BSSS courses twice per year. In addition to System Moderation, there is statistical moderation of course scores.

Moderation by Structured, Consensus-based Peer Moderation

Consensus-based peer moderation involves the review of student assessment against system wide criteria and standards and the validation of Unit Grades. This is done by matching student performance with the Framework Achievement Standards. In addition, feedback will be provided on the quality of the task.

Preparation for Structured, Consensus-based Peer Review

Schools retain originals or copies of student assessment evidence completed in the delivery of the unit and all unit documentation. Student assessment evidence must be sufficient to allow reviewing teachers to make an accurate judgment of grade standard. Schools will use ACS to present this information for System Moderation. Criteria for each Moderation Day will be communicated to schools in the proceeding calendar year.

Feedback from System Moderation

Feedback is provided to schools to affirm good practice and inform continuous improvement. This feedback is based on the BSSS Quality Assessment Guidelines and relevant course documents. It is expected that schools engage with feedback and address any longitudinal trends as outlined in the *BSSS Policy and Procedures Manual*.

Appendix B – Course Developers

Name	College
Bruce Fuda	Gungahlin College
Jackie MacDougall	Melba Copland Secondary School
Matthew Phillipps	UC Senior Secondary College, Lake Ginninderra

Appendix C – Common Curriculum Elements

Common curriculum elements assist in the development of high-quality assessment tasks by encouraging breadth and depth and discrimination in levels of achievement.

Organisers	Elements	Examples
create, compose and apply	apply	ideas and procedures in unfamiliar situations, content and processes in non-routine settings
	compose	oral, written and multimodal texts, music, visual images, responses to complex topics, new outcomes
	represent	images, symbols or signs
	create	creative thinking to identify areas for change, growth and innovation, recognise opportunities, experiment to achieve innovative solutions, construct objects, imagine alternatives
	manipulate	images, text, data, points of view
analyse, synthesise and evaluate	justify	arguments, points of view, phenomena, choices
	hypothesise	statement/theory that can be tested by data
	extrapolate	trends, cause/effect, impact of a decision
	predict	data, trends, inferences
	evaluate	text, images, points of view, solutions, phenomenon, graphics
	test	validity of assumptions, ideas, procedures, strategies
	argue	trends, cause/effect, strengths and weaknesses
	reflect	on strengths and weaknesses
	synthesise	data and knowledge, points of view from several sources
	analyse	text, images, graphs, data, points of view
	examine	data, visual images, arguments, points of view
	investigate	issues, problems
organise, sequence and explain	sequence	text, data, relationships, arguments, patterns
	visualise	trends, futures, patterns, cause and effect
	compare/contrast	data, visual images, arguments, points of view
	discuss	issues, data, relationships, choices/options
	interpret	symbols, text, images, graphs
	explain	explicit/implicit assumptions, bias, themes/arguments, cause/effect, strengths/weaknesses
	translate	data, visual images, arguments, points of view
	assess	probabilities, choices/options
	select	main points, words, ideas in text
identify, summarise and plan	reproduce	information, data, words, images, graphics
	respond	data, visual images, arguments, points of view
	relate	events, processes, situations
	demonstrate	probabilities, choices/options
	describe	data, visual images, arguments, points of view
	plan	strategies, ideas in text, arguments
	classify	information, data, words, images
	identify	spatial relationships, patterns, interrelationships
	summarise	main points, words, ideas in text, review, draft and edit

Appendix D – Glossary of Verbs

Verbs	Definition
Analyse	Consider in detail for the purpose of finding meaning or relationships, and identifying patterns, similarities and differences
Apply	Use, utilise or employ in a particular situation
Argue	Give reasons for or against something
Assess	Make a Judgement about the value of
Classify	Arrange into named categories in order to sort, group or identify
Compare	Estimate, measure or note how things are similar or dissimilar
Compose	The activity that occurs when students produce written, spoken, or visual texts
Contrast	Compare in such a way as to emphasise differences
Create	Bring into existence, to originate
Demonstrate	Give a practical exhibition an explanation
Describe	Give an account of characteristics or features
Discuss	Talk or write about a topic, taking into account different issues or ideas
Evaluate	Examine and judge the merit or significance of something
Examine	Determine the nature or condition of
Explain	Provide additional information that demonstrates understanding of reasoning and /or application
Extrapolate	Infer from what is known
Hypothesise	Put forward a supposition or conjecture to account for certain facts and used as a basis for further investigation by which it may be proved or disproved
Identify	Recognise and name
Interpret	Draw meaning from
Investigate	Planning, inquiry into and drawing conclusions about
Justify	Show how argument or conclusion is right or reasonable
Manipulate	Adapt or change
Plan	Strategize, develop a series of steps, processes
Predict	Suggest what might happen in the future or as a consequence of something
Reflect	The thought process by which students develop an understanding and appreciation of their own learning. This process draws on both cognitive and affective experience
Relate	Tell or report about happenings, events or circumstances
Represent	Use words, images, symbols or signs to convey meaning
Reproduce	Copy or make close imitation
Respond	React to a person or text
Select	Choose in preference to another or others
Sequence	Arrange in order
Summarise	Give a brief statement of the main points
Synthesise	Combine elements (information/ideas/components) into a coherent whole
Test	Examine qualities or abilities
Translate	Express in another language or form, or in simpler terms
Visualise	The ability to decode, interpret, create, question, challenge and evaluate texts that communicate with visual images as well as, or rather than, words

Appendix E – Glossary for ACT Senior Secondary Curriculum

Courses will detail what teachers are expected to teach and students are expected to learn for year 11 and 12. They will describe the knowledge, understanding and skills that students will be expected to develop for each learning area across the years of schooling.

Learning areas are broad areas of the curriculum, including English, mathematics, science, the arts, languages, health and physical education.

A **subject** is a discrete area of study that is part of a learning area. There may be one or more subjects in a single learning area.

Frameworks are system documents for Years 11 and 12 which provide the basis for the development and accreditation of any course within a designated learning area. In addition, frameworks provide a common basis for assessment, moderation and reporting of student outcomes in courses based on the framework.

The **course** sets out the requirements for the implementation of a subject. Key elements of a course include the rationale, goals, content descriptions, assessment, and achievement standards as designated by the framework.

BSSS courses will be organised into units. A unit is a distinct focus of study within a course. A standard 1.0 unit is delivered for a minimum of 55 hours generally over one semester.

Core units are foundational units that provide students with the breadth of the subject.

Additional units are avenues of learning that cannot be provided for within the four core 1.0 standard units by an adjustment to the program of learning.

A **negotiated study unit** makes provision for students, classes, groups or individuals to negotiate the program of learning based on the specific unit goals, content descriptions, assessment and achievement standards of the course.

An **elective** is a lens for demonstrating the content descriptions within a standard 1.0 or half standard 0.5 unit.

A **lens** is a particular focus or viewpoint within a broader study.

Content descriptions refer to the subject-based knowledge, understanding and skills to be taught and learned.

A **program of learning** is what a college develops to implement the course for a subject and to ensure that the content descriptions are taught and learned.

Achievement standards provide an indication of typical performance at five different levels (corresponding to grades A to E) following completion of study of senior secondary course content for units in a subject.

ACT senior secondary system **curriculum** comprises all BSSS approved courses of study.

Appendix F – Implementation of VET Qualifications

VET Qualifications

ICT20120 Certificate II in Applied Digital Technologies

For **ICT20120 Certificate II Applied Digital Technologies**, (Release 1) the following packaging rules apply:

Total number of units = 12

6 core units plus

6 elective units

The elective units consist of:

- at least 3 must be from Group A (*italicised*)
- of the remaining electives:
 - all may be from the electives listed below
 - up to 2 may be from elsewhere in this or any other currently endorsed training package qualification or accredited course at AQF Level 1, 2 or 3.

This course, with listed competencies, meets these requirements at time of development. Colleges are advised to check current training package requirements before delivery.

If the full requirements of a Certificate are not met, students will be awarded a Statement of Attainment listing Units of Competence achieved according to Standard 3 of the Standards for Registered Training Organisations (RTOs) 2015.

Competencies for Certificate II in Applied Digital Technologies

Code	Competency Title	Core/Elective
BSBSUS211	Participate in sustainable work practices	Core
BSBTEC202	Use digital technologies to communicate in a work environment	Core
BSBWHS211	Contribute to the health and safety of self and others	Core
ICTICT213	Use computer operating systems and hardware	Core
ICTICT214	Operate application software packages	Core
ICTICT215	Operate digital media technology packages	Core
ICTICT223	Install software applications	Elective A
ICTICT226	Operate simple database applications	Elective A
ICTICT219	Interact and resolve queries with ICT clients	Elective A
ICTICT221	Identify and use specific industry standard technologies	Elective A
ICTSAS211	Develop solutions for basic ICT malfunctions and problems	Elective A
ICTSAS212	Record the requirements of client support requests	Elective A
ICTSAS215	Protect and secure information assets	Elective A
ICTWEB306	Develop web presence using social media	Elective A

ICT30120 Certificate III in Information Technology

For **ICT30120 Certificate III in Information Technology**, (Release 2) the following packaging rules apply:

Total number of units = 12

6 core units plus

6 elective units

The elective units consist of:

- at least 4 units must be selected from the elective units listed in elective groups A -J as specified in the packaging rules
- up to 2 units may be selected from the remaining listed elective units or from this or any other currently endorsed training package qualification or accredited course at Australian Qualifications Framework (AQF) Level 2, 3 or 4.

This course, with listed competencies, meets these requirements at time of development.

Colleges are advised to check current training package requirements before delivery.

If the full requirements of a Certificate are not met, students will be awarded a Statement of Attainment listing Units of Competence achieved according to Standard 3 of the Standards for Registered Training Organisations (RTOs) 2015.

Competencies for Certificate III in Information Technology

Note: The following competencies for Certificate III in Information Technology have been aligned to the Data Science course from the training package.

Code	Competency Title	Core/Elective
BSBCRT311	Apply critical thinking skills in a team environment	Core
BSBXCS303	Securely manage personally identifiable information and workplace information	Core
BSBXTW301	Work in a team	Core
ICTICT313	Identify IP, ethics and privacy policies in ICT environments	Core
ICTPRG302	Apply introductory programming techniques	Core
ICTSAS305	Provide ICT advice to clients	Core
Group F – IT Work Ready Skills		
ICTICT215	Operate digital media technology package	Elective C
ICTICT216	Design and create basic organisational documents	Elective
ICTICT309	Create ICT user documentation	Elective
ICTICT312	Use advanced features of applications	Elective
ICTPMG301	Contribute as part of an IT project management team	Elective
Group H - Programming		
ICTICT438	Select, configure and deploy software and hardware testing tools	Elective
ICTPRG430	Apply introductory object-oriented language skills	Elective
ICTPRG435	Write scripts for software applications	Elective

Group I - Systems		
ICTICT214	Operate application software packages	Elective
Group J – Web Development		
ICTWEB304	Build simple web pages	Elective
ICTWEB431	Create and style simple markup language documents	Elective

Imported Competencies (allowed in Training Package packaging rules)

Code	Competency Title	Imported from
ICTDBS416	Create basic relational databases	Cert IV IT
ICTDAT402	Clean and verify data	Cert IV IT

VET Competencies Mapped to Course Units

Grouping of competencies within units may not be changed by individual colleges.

Competencies designated at the Certificate III level can only be delivered by schools that have scope to do so. Colleges must apply to have additional competencies at a higher level listed on their scope of registration.

Note: When selecting units, colleges must ensure that they follow packaging rules and meet the requirements for the Certificate level. In the event that full Certificate requirements are not met a Statement of Attainment will be issued.

All core competencies must be delivered in the relevant unit. The elective competencies delivered are dependent on the elective units chosen.

VET Implementation Summary

ICT20120 Certificate II in Applied Digital Technologies

BSSS Unit Title	Competencies
Data Representation & Analysis	BSBSUS211 Participate in sustainable work practices BSBWHS211 Contribute to the health and safety of self and others ICTWEB306 Develop web presence using social media ICTICT226 Operate simple database applications
Big Data Analysis & Techniques	ICTICT213 Use computer operating systems and hardware ICTICT223 Install software applications ICTSAS211 Develop solutions for basic ICT malfunctions and problems ICTSAS215 Protect and secure information assets
Machine Learning	ICTICT214 Operate application software packages ICTICT221 Identify and use specific industry standard technologies
Data Research Project	BSBTEC202 Use digital technologies to communicate in a work environment ICTICT215 Operate digital media technology packages ICTICT219 Interact and resolve queries with ICT clients ICTSAS212 Record the requirements of client support requests

ICT30120 Certificate III in Information Technology

BSSS Unit Title	Competencies
Data Representation & Analysis	BSBCRT311 Apply critical thinking skills in a team environment ICTPRG302 Apply introductory programming techniques ICTICT216 Design and create basic organisational documents ICTPMG301 Contribute as part of an IT project management team ICTICT214 Operate application software packages ICTDBS416 Create basic relational databases ICTDAT402 Clean and verify data

Big Data Analysis & Techniques	BSBXCS303	Securely manage personally identifiable information and workplace information
	BSBXTW301	Work in a team
	ICTICT313	Identify IP, ethics and privacy policies in ICT environments
	ICTPRG430	Apply introductory object-oriented language skills
	ICTPRG435	Write scripts for software applications
	ICTWEB304	Build simple web pages
	ICTWEB431	Create and style simple markup language documents
Machine Learning	ICTSAS305	Provide ICT advice to clients
	ICTICT312	Use advanced features of applications
	ICTICT438	Select, configure and deploy software and hardware testing tools
Data Research Project	ICTICT215	Operate digital media technology package
	ICTICT309	Create ICT user documentation

Competency Based Assessment

The assessment of competence must focus on the competency standards and the associated elements as identified in the Training Package. Assessors must develop assessment strategies that enable them to obtain sufficient evidence to deem students competent. Competence to industry standard requires a student to be able to demonstrate the relevant skills and knowledge in a variety of industry contexts on repeated occasions. Assessment must be designed to collect evidence against the four dimensions of competency.

- **Task skills** – undertaking specific workplace task(s)
- **Task management skills** – managing a number of different tasks to complete a whole work activity
- **Contingency management skills** – responding to problems and irregularities when undertaking a work activity, such as: breakdowns, changes in routine, unexpected or atypical results, difficult or dissatisfied clients
- **Job/role environment skills** – dealing with the responsibilities and expectations of the work environment when undertaking a work activity, such as: working with others, interacting with clients and suppliers, complying with standard operating procedures or observing enterprise policy and procedures.

The most appropriate method of assessing workplace competence is on-the-job in an industry setting under normal working conditions. This includes using industry standard tools, equipment and job aids and working with trade colleagues. Where this is not available, a simulated workplace environment that mirrors the industry setting will be used. The following general principles and strategies apply:

- assessment is competency based
- assessment is criterion-referenced.

Quality outcomes can only be assured through the assessment process. The strategy for assessment is based on an integration of the workplace competencies for the learning modules

into a holistic activity. The awarding of vocational qualifications is dependent on successful demonstration of the learning outcomes within the modules through the integrated competency assessment that meets the Training Package rules and requirements.

The integrated assessment activity will require the learner to:

- use the appropriate key competencies
- apply the skills and knowledge which underpin the process required to demonstrate competency in the workplace
- integrate the most critical aspects of the competencies for which workplace competency must be demonstrated
- provide evidence for grades and or scores for the Board course component of the assessment process.

Standards for Registered Training Organisations 2015

These Standards form part of the VET Quality Framework, a system which ensures the integrity of nationally recognised qualifications.

RTOs are required to comply with these Standards and with the:

- National Vocational Education and Training Regulator Act 2011
- VET Quality Framework.

The purpose of these Standards is to:

- set out the requirements that an organisation must meet in order to be an RTO
- ensure that training products delivered by RTOs meet the requirements of training packages or VET accredited courses, and have integrity for employment and further study
- ensure RTOs operate ethically with due consideration of learners' and enterprises' needs.

To access the standards, refer to:

<https://www.legislation.gov.au/Details/F2017C00663>

To access The Users' Guide to the Standards refer to:

<https://www.asqa.gov.au/standards>

Guidelines for Colleges Seeking Scope

Colleges must apply to have their scope of registration extended for each new qualification they seek to issue. There is no system-level process. Each college must demonstrate capacity to fulfil the requirements outlined in the Training Package. Applications for extension of scope are lodged through the Australian Skills Quality Authority (ASQA).

Assessment of Certificate III Units of Competence

Colleges delivering any Units of Competence from Certificate III (apart from those competencies allowed in training package rules) will need to have them listed on their scope **or** negotiate a Third Party Agreement with a scoped training partner. This document must be kept on record by the college as the RTO.

Appendix G – Course Adoption

Condition of Adoption

The course and units of this course are consistent with the philosophy and goals of the college and the adopting college has the human and physical resources to implement the course.

Adoption Process

Course adoption must be initiated electronically by an email to bssscertification@ed.act.edu.au by the principal or their nominated delegate.

The email will include the **Conditions of Adoption** statement above, and the table below adding the **College** name, and **A** and/or **T** and/or **M** and/or **V** to the **Classification/s** section of the table.

College:				
Course Title:	Data Science			
Classification/s:	A	T	V	
Framework:	The Technologies Framework 2018			
Dates of Course Accreditation:	From	2020	to	2028