CRS1400353 Associate Degree in Civil and Structural Engineering (Design Drafting) – Curriculum Map

The Associate Degree in Civil and Structural Engineering (Design Drafting) provides graduates with the practical ability and theoretical understanding necessary to enter employment at a paraprofessional engineer level and/or to articulate into relevant undergraduate engineering degree courses.

The qualification was developed to respond to the workforce development needs of the civil and structural consulting industry in South Australia. The program gives students a firm foundation in both theoretical study and practical skills.

Graduate Attributes

The graduate of this course will have developed the following knowledge and skills:

1. KNOWLEDGE AND SKILL BASE

1.1 Descriptive, formula-based understanding of the underpinning science and engineering fundamentals applicable to civil and structural engineering.

1.2 Procedural-level understanding of the mathematics, and information technology concepts which underpin civil and structural engineering.

1.3 Practical knowledge and skills in civil and structural engineering.

1.4 Awareness of current research and emerging technologies in civil and structural engineering.

1.5 Knowledge and understanding of contemporary workplace practices in civil and structural engineering.

2. ENGINEERING APPLICATION ABILITY

2.1 Application of problem-solving techniques to conceptualise a solution to a civil and structural engineering problem.

2.2 Application of analysis techniques to assess that designs and finished products follow specifications, regulations and contract details.

2.3 Application of established technical and practical methods to collect information, perform calculations and use computers to interpret designs, detailed drawings and documentation.

2.4 Application of design and analysis techniques to assist civil and structural engineers to produce specifications, designs and engineering calculations.

2.5 Application of project management techniques to actively participate and contribute in the management of engineering projects.

2.6 Application of established technical and practical methods to produce detailed drawings and documentation for civil, structural and building services.

3. PROFESSIONAL AND PERSONAL ATTRIBUTES

3.1 Effective participation in team activities and be able to evaluate his/her contribution

3.2 Effective communication with the engineering team and the broader community.

3.3 Understanding of and commitment to professional and ethical responsibilities.

3.4 Creative, innovative and pro-active demeanour.

3.5 Professional use and management of information.

3.6 Orderly management of self and professional conduct.

Note: The Graduate Attributes reflect and are mapped against the Engineers Australia's Stage 1 Competency Standard for Engineering Associate.

The course structure consists of 15 core subjects and 2 electives taught over 4 semesters of study.

First Year			**Credit Points**
First Semester	Construction Practice	BLDPRAC401	4.5
	Mathematics 1	ENGMATH401	4.5
	Computing for Engineering	ENGCOMP502	4.5
	Civil/Structural Basic Drawing	BLDDRFT501	4.5
Second Semester	Engineering Mechanics	ENGMECH601	4.5
	Mathematics 2	ENGMATH501	4.5
	Construction Geotechnics	ENGGEO601	4.5
	Water Infrastructure	ENGWTR601	4.5
Second Year			
First Semester	Structural Analysis	ENGSTA601	4.5
	Civil Drafting	BLDDRFT602	4.5
	Structural Design Drafting	BLDDRFT603	4.5
	Elective		
Second Semester	Building Services Drafting	BLDDRFT601	4.5
	Project Management	ENGPMGT601	4.5
	Infrastructure Engineering Project	ENGPROJ603	4.5
	Elective		
	Exposure to Engineering Practice	ENGEXP601	0
Electives	Site Management 1	BLDMGT501	4.5
	Environmental Engineering	ENGENV601	4.5
	Water and Wastewater Treatment	ENGWTR501	4.5
	Mathematics 3	ENGMATH601	4.5
	Computer Science 1	ENGCOMP501	4.5
	Advanced BIM (Building Information Management)	ENGBIM601	4.5
		Total Credit Points	**72**

Year 1								
Subject Title	**CONSTRUCTION PRACTICE**	**MATHEMATICS 1**	**COMPUTING FOR ENGINEERING**	**CIVIL/STRUCTURAL BASIC DRAWING**	**ENGINEERING MECHANICS**	**MATHEMATICS 2**	**CONSTRUCTION GEOTECHNICS**	**WATER INFRASTRUCTURE**
Subject Code	BLDPRAC401	ENGMATH401	ENGCOMP502	BLDDRFT501	ENGMECH601	ENGMATH501	ENGGEO601	ENGWTR601
Credit Points	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
EFTSL	0.1248	0.1248	0.1248	0.1248	0.1248	0.1248	0.1248	0.1248
Topics	Worksite OHS Construction materials Concreting Framing timber & steel Domestic plumbing Electrical techniques Surveying techniques Heating, ventilation and airconditioning (HVAC) & refrigeration (R) *Introduction to Team Skills*	Numerical computation: Fundamental operations with algebraic expressions Algebraic fractions Indices and radicals Transposition Special products Factorisation Trigonometry Complex numbers Trigonometric identities Linear function Systems of linear equations Quadratic function and quadratic equations Trigonometric functions Exponential and logarithmic functions	Microsoft Office Database fundamentals Introduction to programming *Advanced presentation skills*	Symbols, standards and terminology related to the drawing of the following Hand-drafting techniques Using design software to produce civil and structural drawings, including	Units Vectors Forces Systems of forces and moments Structures in equilibrium Centroids and centres of mass Moments of inertia Beams and columns Properties of materials Fundamentals of dynamics Kinematics Kinetics Kinematics of rigid bodies	Linear Algebra: • Introduction to Matlab • Matrices and linear equations • Vector spaces • Determinants Calculus: • Limits • Derivatives • Integration • Functions • Techniques • Numerical integration	Characteristics of rocks Characteristics of soils Improvement of soil properties Soil stress and strength criteria Site investigation techniques Footing and soil retaining structures and their application Design of shallow footings Design of retaining structures Footing and soil retaining structures and their application Design of shallow footings Design of retaining structures	Properties of fluids Pressures in stationary fluids and buoyancy forces Head loss in pipes and fittings Pump selection Pipe networks Open channel flow Hydrology and stormwater design
Learning Outcomes	1. Interpret plans for construction trades. 2. Apply WHS requirements for construction practices. 3. Use plans and equipment to perform measurements for construction practices. 4. Apply building codes and standards to construction practice. 5. Indicate licensing requirements for specific construction trades. 6. Demonstrate basic construction skills. 7. Select appropriate building and construction materials.	1. Solve engineering problems involving arithmetic, simple algebra and trigonometry. 2. Use mathematical reasoning and a generalized problem-solving process. 3. Use appropriate technology to solve mathematical problems, and judge the reasonableness of the results. 4. Communicate mathematical reasoning and ideas using appropriate language and representations, such as symbols, equations, tables, and graphs.	1. Use Microsoft Office Excel to manipulate and display report data. 2. Use Microsoft Office Word to create work documents following the industry standard. 3. Use Microsoft Office PowerPoint to prepare professional presentations. 4. Create and modify simple database applications. 5. Design, write, test and debug simple programs written in high-level programming languages. 6. Read and interpret code.	1. Apply knowledge of relevant codes, standards and symbols to interpret basic civil and structural diagrams and drawings 2. Prepare basic civil and structural drawings and diagrams in accordance with given system requirements and relevant standards 3. Use current design software to produce basic civil and structural drawings and diagrams 4. Demonstrate awareness of copyright, IP issues and emerging technologies in relation to drawing 5. Use file management and version control techniques.	1. Perform conversions of units. 2. Solve forces and systems of forces in 2-D. 3. Solve for distributed forces along a beam using relations between shear force and bending moment diagrams. 4. Interpret stress and strain data to solve structural problems. 5. Explain fundamental concepts of engineering statics and dynamics. 6. Solve problems of kinematic systems. 7. Solve problems using Work-Energy & Impulse-Momentum theorems.	1. Solve engineering problems involving key concepts of linear algebra and differential and integral calculus. 2. Use mathematical reasoning and a generalized problem solving process. 3. Use appropriate technology to solve mathematical problems, and judge the reasonableness of the results. 4. Communicate mathematical reasoning and ideas using appropriate language and representations, such as symbols, equations, tables, and graphs.	1. Classify soil and rock types and discuss their characteristics. 2. Assess suitability of soils for engineering applications. 3. Recommend footing type and design using current industry standards and practice. 4. Design simple retaining structures using current industry standards and practice. 5. Evaluate suitable methods and equipment for soil stabilisation and excavation. 6. Interpret geotechnical reports and bore logs.	1. Discuss static and dynamic fluid properties. 2. Calculate static fluid pressures and buoyancy forces. 3. Calculate flows and losses through a closed pipe network. 4. Determine pump requirements for a given system head. 5. Design pipe network infrastructure. 6. Apply knowledge of construction methods and requirements for pipeline projects. 7. Evaluate rainfall, runoff and drainage requirements for engineering projects.
Ave Weekly Contact	6 hours	6 hours	4 hours	5 hours	5 hours	6 hours	6 hours	6 hours
Ave Weekly Independent Study	2 hours	2 hours	4 hours	3 hours	3 hours	2 hours	2 hours	2 hours
Total Hours (Semester)	144 Hours (18 Weeks)	144 Hours (18 Weeks)	144 Hours (18 Weeks)	144 Hours (18 Weeks)	144 Hours (18 Weeks)	144 Hours (18 Weeks)	144 Hours (18 Weeks)	144 Hours (18 Weeks)
Assessment Tasks	WHS and Sustainability assessment – non graded Practical component – non graded Construction project – non graded	Assignments 15% Test 1 20% Test 2 20% Final exam 45%	Practical component 25% Assignment 30% Project 20% Test 25%	Practical component 30% Project 35% Assignment 10% Practical exam 25%	Quizzes 15% Mid semester exam 25% Assignment 20% Final Exam 40%	Assignment 25% Mid-semester test 30% Final exam 45%	Practical component 15% Assignment 1 10% Assignment 2 15% Project 35% Final exam 25%	Practical component 10% Assignment 1 10% Assignment 2 15% Project 30% Final exam 35%

Co-/Pre-requisites	nil	nil	nil	nil	Pre-requisite: Mathematics 1 Co-requisite: Mathematics 2	Pre-requisite: Mathematics 1	Pre-requisite: Mathematics 1 Co-requisite: Engineering Mechanics	Pre-requisite: Mathematics 1 Co-requisite: Engineering Mechanics

Year 2							
Subject Title	**STRUCTURAL ANALYSIS**	**CIVIL DRAFTING**	**STRUCTURAL DESIGN DRAFTING**	**BUILDING SERVICES DRAFTING**	**PROJECT MANAGEMENT**	**INFRASTRUCTURE ENGINEERING PROJECT**	**EXPOSURE TO ENGINEERING PRACTICE**
Subject Code	ENGSTA601	BLDDRFT602	BLDDRFT603	BLDDRFT601	ENGPMGT601	ENGPROJ603	ENGEXP601
Credit Points	4.5	4.5	4.5	4.5	4.5	4.5	0
EFTSL	0.1248	0.1248	0.1248	0.1248	0.1248	0.1248	0.0032
Topics	er learning outcomes	Survey data plots Alignment design Techniques and standards for drafting Earthwork drafting Using design software to produce civil drafting drawings *Ethics and your profession: Engineers Australia Code of Ethics*	Reinforced concrete Structural steel Using design software to produce structural drafting drawings	Heating, ventilation and airconditioning (HVAC) Hydraulics and fire Power and lighting Using design software to produce civil drafting drawings	Overview of project management Project life-cycle Requirements engineering Risk management and contingencies Scheduling techniques Preliminary design Engineering documentation Quality management Financial management Performance assessment Communication management Physical Resource management Intellectual property Team leadership Ethical considerations	Per learning outcomes	Students are required to complete a portfolio of activities related to Exposure to Engineering Practice. These activities will take place outside normal class time.
Learning Outcomes	1. Apply relevant design actions and combinations to structural analysis. 2. Calculate the design capacity of steel members. 3. Design simple steel connections. 4. Analyse and design single and doubly reinforced concrete beams. 5. Evaluate reinforcement requirements for concrete beams and slabs. 6. Analyse short and slender concrete columns for various configurations.	1. Apply knowledge of relevant codes, standards and symbols to interpret civil diagrams and drawings 2. Prepare civil drawings and diagrams in accordance with given system requirements and relevant standards 3. Use current design software to produce civil drawings and diagrams 4. Demonstrate awareness of copyright and IP issues in relation to drawing 5. Use file management and version control techniques	1. Apply knowledge of relevant codes, standards and symbols to interpret structural diagrams and drawings. 2. Prepare structural drawings and diagrams in accordance with given system requirements and relevant standards. 3. Use current design software to produce structural drawings and diagrams. 4. Demonstrate awareness of copyright and IP issues in relation to drawing. 5. Use file management and version control techniques.	1. Apply knowledge of relevant codes, standards and symbols to interpret building services diagrams and drawings. 2. Prepare building services drawings and diagrams in accordance with given system requirements and relevant standards. 3. Use current design software to produce building services drawings and diagrams. 4. Demonstrate awareness of copyright and IP issues in relation to drawing. 5. Use file management and version control techniques.	1. Define fundamental project management concepts 2. Define fundamental system integration concepts 3. Apply project management concepts to the management of small to medium scale projects 4. Apply system integration concepts to the design and implementation of small to medium scale projects 5. Produce an engineering project master plan for a small electronics project. The master plan must follow a standard engineering format. 6. Write reports in commonly used engineering format	1. Apply management techniques to plan a medium-sized infrastructure project. 2. Apply technical and practical methods to prepare project documentation. 3. Present project outcomes.	1. Develop an appreciation of the relationship between academic preparation and career expectations. 2. Develop an appreciation of the scope and size of the electronics and biomedical industry in South Australia. 3. Appreciate the responsibilities, roles and work methods of practicing engineering associates in industry. 4. Develop an appreciation of the structure and operation of a company. 5. Appreciate the importance of evaluating their own knowledge and skills capabilities and identifying ongoing professional development and learning needs.
Ave Weekly Contact	6 hours	5 hours	5 hours	5 hours	5 hours	1 hours	3 hours over the whole course
Ave Weekly Independent Study	2 hours	3 hours	3 hours	3 hours	3 hours	7 hours	93 hours over the whole course
Total Hours (Semester)	144 Hours (18 Weeks)	144 Hours (18 Weeks)	144 Hours (18 Weeks)	144 Hours (18 Weeks)	144 Hours (18 Weeks)	144 Hours (18 Weeks)	96 hours over the whole course
Assessment Tasks	Assignment 10% Test 1 30% Project 30% Test 2 30%	Practical component 35% Project 40% Final exam 25%	Practical component 25% Project 40% Final exam 35%	Practical component 30% Project 40% Final exam 30%	Tutorials 20% Initial project master plan 35% Final exam 35% Assignment 10%	Project master plan 25% Project documentation 50% Project presentation 25%	Portfolio of activities 100% Compulsory
Co-/Pre-requisites	Pre-requisites: Mathematics 1 AND Engineering Mechanics AND Civil/Structural Basic Drawing	Pre-requisite: Civil/Structural Basic Drawing	Pre-requisite: Civil/Structural Basic Drawing	Pre-requisites: Civil/Structural Basic Drafting OR Electrical Drawing	Students must have gained a minimum of 54 credit points in this course.	Students must have successfully gained a min. of 54 credit points.	nil

						This is the capstone subject of the qualification. Co-requisites: Project Management OR Site Management 2	

Electives						
Subject Title	**SITE MANAGEMENT 1**	**ENVIRONMENTAL ENGINEERING**	**WATER AND WASTEWATER TREATMENT**	**MATHEMATICS 3**	**COMPUTER SCIENCE 1**	**ADVANCED BIM (BUILDING INFORMATION MODELLING)**
Subject Code	BLDMGT501	ENGENV601	ENGWTR501	ENGMATH601	ENGCOMP501	ENGBIM601
Credit Points	4.5	4.5	4.5	4.5	4.5	4.5
EFTSL	0.1248	0.1248	0.1248	0.1248	0.1248	0.1248
Topics	Site planning Site communications Site administration Work method statements Project quality Project risk management Safety Supervisors *Team Roles – participating in a team*	Environmental systems Rivers and groundwater Fundamentals of chemical transport in the environment Water sensitive urban design Environmental impact (historical) Environmental risk assessment and management Environmental legislation Climate change	Water chemistry Applying water industry legislation codes and standards Water and wastewater infrastructure Design of water and wastewater treatment plants	Linear Algebra Topics: • Eigenvalues and eigenvectors • Vector spaces Rn • Linear Transformation • Series • Linear Algebra applications Calculus Topics: • Applllication of differentiation • Application of integration • Differential equations • Caluclus of more than one variable • Taylor series	Fundamental programming structures and syntax Introduction to algorithms and data structuresa Introduction to object-oriented programming: Using IDEs to write, test and debug code *Team Communication Skills: Listening and Giving Feedback* *Presentation skills*	Components (Revit Families) Project Workflows Interpretation & Collaboration Software (Navisworks)
Learning Outcomes	1. Apply site planning and set-out techniques in accordance with standards and regulations. 2. Use effective communication methods for site requirements. 3. Use site administration methods for site management. 4. Inspect and document project quality according to contractual requirements. 5. Conduct project risk management in accordance with Australian Standards. 6. Apply principles of site WHS management.	1. Recognise the importance and complexity of environmental systems and the effects that urbanisation, industrial, agricultural, and other engineering projects. 2. Describe environmental factors of river systems such as flows, erosion control, water quality and ecological parameters. 3. Discuss environmental rehabilitation measures associated with the impacts of mining, landfill, and waterway engineering projects. 4. Report on environmental risk and risk management for engineering projects. 5. Explain legislative requirements for environmental protection, native title, significant sites, and the legislative obligations to stakeholders for engineering projects and indicate the approvals process. 6. Discuss how engineering technology in sustainable design and create renewable energy infrastructure.	1. Recognise the importance and complexity of water and wastewater quality and their effects on health and environment. 2. Describe water and wastewater treatment infrastructure components and their function. 3. Interpret biological and chemical data and processes for water and wastewater treatment. 4. Explain legislative requirements applicable to water and wastewater treatment. 5. Apply principles of design to water and wastewater treatment infrastructure.	1. Solve engineering problems involving advanced concepts of linear algebra and differential and integral calculus. 2. Use mathematical reasoning and a generalized problem solving process. 3. Use appropriate technology to solve mathematical problems, and judge the reasonableness of the results. 4. Communicate mathematical reasoning and ideas using appropriate language and representations, such as symbols, equations, tables, and graphs.	1. Define basic computer science theoretical concepts. 2. Design, write, test and debug simple programs written in high-level programming languages. 3. Read and interpret code. 4. Use the language and terminology of object-oriented programming. 5. Summarise and report the algorithm and the coding solution.	1. Create standard components, symbols and office standards as they apply to Civil, Structural and Building Services engineering disciplines. 2. Use technology to streamline and automate Civil, Structural and Building Services engineering drawing production tasks. 3. Use advanced technology to conceptualise and provide Civil, Structural and Building Services engineering design options and solutions. 4. Use file management and version control techniques.
Ave Weekly Contact	5 hours	5 hours	5 hours	6 hours	6 hours	6 hours
Ave Weekly Independent Study	3 hours	3 hours	3 hours	2 hours	2 hours	2 hours
Total Hours (Semester)	144 Hours (144 Weeks)	144 Hours (144 Weeks)	144 Hours (144 Weeks)	144 Hours (144 Weeks)	144 Hours (144 Weeks)	144 Hours (18 Weeks)
Assessment Tasks	Tutorials 20% Project 1 35% Assignment 2 20% Project 2 25%	Assignment 1 10% Project 1 20% Assignment 2 15% Project 2 20% Final exam 35%	Practical component 10% Assignment 15% Project 40% Final exam 35%	Assignment 25% Mid-semester test 30% Final exam 45%	Test 1 15% Practical exam 15% Practical component 15% Project – Code review 20% Final exam 35%	Practical component 40% Project 35% Final exam 25%
Co-/Pre-requisites	Pre-requisite: Construction Practice	Co-requisites: Mathematics 1 AND Computing for Engineering	Pre-requisites: Mathematics 1 AND Computing for Engineering	Pre-requisite: Mathematics 2	nil	Pre-requisite: Civil/Structural Basic Drafting