CRS1400352 Associate Degree in Electrical Engineering – Curriculum Map

The Associate Degree in Electrical Engineering 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 electrical engineering industry in South Australia.

The program gives students a firm foundation in both theoretical study and practical skills. Students are encouraged to experiment and explore ideas through project-based learning activities, thus developing graduate employability attributes essential to Australia's technology-based industries.

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 electrical engineering.

1.2 Procedural-level understanding of the mathematics and information technology concepts that underpin electrical engineering.

1.3 Practical knowledge and skills in electrical engineering.

1.4 Awareness of current research and emerging technologies in electrical engineering.

1.5 Knowledge and understanding of contemporary workplace practices in electrical engineering.

2. ENGINEERING APPLICATION ABILITY

2.1 Application of problem-solving techniques to conceptualise a solution to an electrical engineering problem.

2.2 Application of design and analysis techniques to assist with the design and layout of electrical circuitry and equipment, such as power generation and distribution, and industrial, commercial and residential applications.

2.3 Application of established technical and practical methods to assess the adherence of designs and finished products to specifications, regulations and contract details.

2.4 Application of established technical and practical methods to assist with commissioning of electrical equipment, and in supervising operations and maintenance.

2.5 Application of project management techniques to participate actively in the management of medium-sized projects.

2.6 Application of established technical and practical methods to collect information, perform calculations and use computers to produce designs, detailed drawings and documentation of electrical installations and circuitry.

3. PROFESSIONAL AND PERSONAL ATTRIBUTES

3.1 Effective participation in team activities and the ability 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 proactive 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 14 core subjects and 3 electives taught over 4 semesters of study.

First Year			**Credit Points**
First Semester	Electrical Engineering Practice	ENGPRAC402	4.5
	Mathematics 1	ENGMATH401	4.5
	Computing for Engineering	ENGCOMP502	4.5
	Basic Electrical Circuits	ENGCIRC501	4.5
Second Semester	Introduction to Electrical Energy Equipment	ENGELEC501	4.5
	Mathematics 2	ENGMATH501	4.5
	Engineering Science	ENGSCI601	4.5
	Electronic Circuits	ENGCIRC601	4.5
Second Year			
First Semester	Electrical Machines	ENGELEC601	4.5
	Electrical Drawing	ENGELDR501	4.5
	Mechatronics	ENGMECH602	4.5
	Elective		4.5
Second Semester	Project Management	ENGPMGT601	4.5
	Electrical Engineering Project	ENGPROJ602	4.5
	Elective		4.5
	Elective		4.5
	Exposure to Engineering Practice	ENGEXP601	0
Electives	Computer Science 2	ENGCOMP601	4.5
	Digital Electronics	ENGDEL501	4.5
	Mathematics 3	ENGMATH601	4.5
	Microcontroller Programming	ENGMPR601	4.5
	Programmable Controllers	ENGPCON601	4.5
	Building Services Drafting	BLDDRFT601	4.5
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Year 1								
Subject Title	**ELECTRICAL ENGINEERING PRACTICE**	**MATHEMATICS 1**	**COMPUTING FOR ENGINEERING**	**BASIC ELECTRICAL CIRCUITS**	**INTRODUCTION TO ELECTRICAL ENERGY EQUIPMENT**	**MATHEMATICS 2**	**ENGINEERING SCIENCE**	**ELECTRONIC CIRCUITS**
Subject Code	ENGPRAC402	ENGMATH401	ENGCOMP502	ENGCIRC501	ENGELEC501	ENGMATH501	ENGSCI601	ENGCIRC601
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	Workplace Health and Safety (WHS) and workplace practices Fabrication Sustainability *Introduction to Team Skills*	Numerical computation Numerical fractions Fundamental operations with algebraic expressions Algebraic fractions Indices and radicals Transposition Special products Factorisation Trigonometry Complex numbers Trigonometrici Linear function Systems of linear equations Quadratic function and quadratic equations Trigonometric functions Exponential and logarithmic function *Writing a scientific report*	Microsoft Office Database fundamentals Programming *Advanced presentation skills*	Electrical circuits concepts DC circuits Test and measurement techniques for DC circuits AC circuits Test and measurement techniques for AC circuits Design considerations Basic amplifier theory Introduction to op amps *Technical report writing*	Introduction to power systems and electric power generation Transmission and distribution Electrical equipment for power generation and distribution Introduction to electrical machines Linear Motors, servomotors, permanent magnet motors, variable reluctance motors and stepper motors Motor Control Power Cables and accessories Design of wiring systems Cable Selection Electrical safety and hazards	Linear Algebra: • Introduction to Matlab • Matrices and linear equations • Vector spaces • Determinants Calculus: • Limits • Derivatives • Integration • Functions • Techniques • Numerical integration	Calculus Statics and dynamics Electricity and magnetism Thermodynamics Semiconductors Technical report writing	Introduction to semiconductors Diode Power Supplies Bipolar Junction Transistor (BJT) Field Effect Transistors Mesh and nodal analysis *Advanced presentation skills*
Learning Outcomes	1. Apply WHS regulations in the electrical industry. 2. Identify and analyse hazards and risks related to WHS in the workplace. 3. Safely use electrical assembly tools. 4. Perform basic mechanical measurements, including marking-out and reading mechanical and electrical diagrams. 5. Use hand and power tools to construct, repair and facilitate the installation of electrical components. 6. Select and install appropriate fixings for electrical equipment. 7. Apply sustainability standards in the electrical industry.	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. Define fundamental electrical theoretical concepts as applied in basic electronic circuits and amplifiers. 2. Explain the operation of a basic electronic circuit. 3. Calculate the parameters of a basic electronic circuit and amplifier using circuit analysis techniques. 4. Use computer simulation for basic analysis of electronic circuits. 5. Prototype basic electronic circuits and amplifiers based on a given schematic diagram. 6. Correctly measure basic electronic circuit and amplifier parameters using appropriate equipment. 7. Summarise and report the measured parameter values in commonly used engineering format.	1. Identify safety aspects of power generation and distribution. 2. Analyse and describe the principles and application of electrical energy conversion. 3. Demonstrate understanding and knowledge of the principles of power generation, transmission, distribution and protection. 4. Perform basic selection of electric machines to be used for specified functions. 5. Perform basic power system calculations involving power and energy requirements, voltage drops, power factor correction and fault currents. 6. Design a cabling system to relevant Australian Standards.	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. Describe calculus techniques related to key concepts of basic physics. 2. Describe units and definitions commonly used in basic physics. 3. Solve scientific problems involving key concepts of basic physics. 4. Communicate mathematical and scientific reasoning and ideas using appropriate scientific language and representations	1. Define fundamental electrical theoretical concepts as applied in semiconductor electronic circuits. 2. Explain the operation of a basic semiconductor electronic circuit. 3. Calculate the parameters of a basic semiconductor electronic circuit using circuit analysis techniques. 4. Use computer simulation for basic analysis of semiconductor electronic circuits. 5. Prototype basic semiconductor electronic circuits based on a given schematic diagram. 6. Correctly measure basic semiconductor electronic circuit parameters using appropriate equipment. 7. Summarise and report the measured parameter values in commonly used engineering format. 8. Design of basic semiconductor electronic circuits.
Ave Weekly Contact	6 hours	6 hours	4 hours	5 hours	5 hours	6 hours	5 hours	5 hours
Ave Weekly Independent Study	2 hours	2 hours	4 hours	3 hours	3 hours	2 hours	3 hours	3 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	Practical component 60% WHS and sustainability investigation 20% Final exam 20%	Assignment 15% Test 1 20% Test 2 20% Final exam 45%	Practical component 25% Assignment 30% Project 20% Test 25%	Test 1 10% Test 2 10% Practical component 20% Project 25% Final exam 35%	Test 1 10% Assignment 20% Practical component 20% Project 15% Final exam 35%	Assignment 25% Mid-semester test 30% Final exam 45%	Test 1 15% Test 2 15% Final exam 50% Assignment 20%	Test 1 10% Test 2 10% Practical component 20% Research presentation 5% Project 20% Final exam 35%
Co/Pre-requisites	nil	nil	nil	Co-requisite: Mathematics 1	Pre-requisite: Basic Electrical Circuits AND Electrical Engineering Practice	Pre-requisite: Mathematics 1	Pre-requisite: Mathematics 1	Pre-requisite: Basic Electrical Circuits

Year 2						
Subject Title	**ELECTRICAL MACHINES**	**ELECTRICAL DRAWING**	**MECHATRONICS**	**PROJECT MANAGEMENT**	**ELECTRICAL ENGINEERING PROJECT**	**EXPOSURE TO ENGINEERING PRACTICE**
Subject Code	ENGELEC601	ENGELDR501	ENGMECH602	ENGPMGT601	ENGPROJ602	ENGEXP601
Credit Points	4.5	4.5	4.5	4.5	4.5	0
EFTSL	0.1248	0.1248	0.1248	0.1248	0.1248	0.0032
Topics	Electromagnetism Direct current machines Transformers Polyphase induction motors Single-phase motors Synchronous motors Alternating current generators Motor Drives Electrical machine maintenance	Symbols, standards and terminology related to the drawing of the following: • Electronic components • Electrical layouts • Schedules • Cable runs • Riser diagrams Electrical drawing formats Using design software to produce electrical drawings Ethics and your profession.	Overview of mechatronics Sensors and transducers Automation and control Actuators Software and data acquisition *Team Roles: participating in a team.*	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.	Will involve a series of lecture on various topics, including: Creativity and Innovation Ethics and the profession.	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. Appraise electrical machine equipment and be able to make selections from theoretical considerations. 2. Analyse and describe aspects of the construction, principle of operation, applications, methods of speed control and methods of direction reversal of dc and ac machines. 3. Analyse and describe the construction, application and operation of single phase and three phase transformers. 4. Fault-find and maintain electric machines and their control. 5. Evaluate motor control techniques and be able to make selections.	1. Apply knowledge of relevant codes, standards and symbols to interpret electrical diagrams and drawings. 2. Prepare electrical drawings and diagrams in accordance with given system requirements and relevant standards. 3. Use current design software to produce electrical 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 theoretical mechatronics concepts. 2. Outline the operation of the fundamental elements of automation and control. 3. Describe the basic function of software and data acquisition in a mechatronic system. 4. Apply knowledge of control, sensors and actuators to control a mechatronic system. 5. Design and prototype mechatronic solutions to a given specification.	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 to medium engineering 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 electrical project. 2. Apply engineering design skills to the development of a product. 3. Apply technical and practical methods to prepare project documentation. 4. 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. 1. Appreciate the importance of evaluating their own knowledge and skills capabilities and identifying ongoing professional development and learning needs.
Ave Weekly Contact	5 hours	5 hours	6 hours	5 hours	1 hour	3 hours over the whole course
Ave Weekly Independent Study	3 hours	3 hours	2 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)	96 hours over the whole course
Assessment Tasks	Test 1 20% Practical component 20% Project 20% Final exam 40%	Practical component 35% Project 40% Final exam 25%	Test 1 10% Test 2 10% Practical component 20% Project 25% Final exam 35%	Assignment 1 20% Initial project master plan 35% Final exam 35% Assignment 2 10%	Initial project master plan 5% Product (design solution) 50% Project final documentation set 25% Project presentation 20%	Portfolio of activities 100% Compulsory
Co-/Pre-requisites	Pre-requisites: Mathematics 1 AND Basic Electrical Circuits AND Introduction to Electrical Energy Equipment Co-requisite: Electrical Drawing	Pre-requisites:Introduction to Electrical Energy Equipment AND Basic Electrical Circuits	Pre-requisites: Electronic Circuits AND Computing for Engineering OR Electronic Circuits AND Computer Science 1	Pre-requisite: Students must have successfully gained a minimum of 54 credit points in this course.	Pre-requisite: Students must have gained a 54 credit points minimum, including: Introduction to Electrical Energy Equipment AND Electrical Drawing. Co-requisite: Project Management	nil

Electives						
Subject Title	**COMPUTER SCIENCE 2**	**DIGITAL ELECTRONICS**	**MATHEMATICS 3**	**MICROCONTROLLER PROGRAMMING**	**PROGRAMMABLE CONTROLLERS**	**BUILDING SERVICES DRAFTING**
Subject Code	ENGCOMP601	ENGDEL501	ENGMATH601	ENGMPR601	ENGCON601	BLDDRFT601
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	Revision of basic object-oriented programming concepts Designing with classes Exception handling Inheritance Polymorphism Graphical user interfaces (GUIs) Fundamental linked data structures and associated computing algorithms Using Team Communication Skills: Listening and Giving Feedback.	Introduction to digital electronics Digital electronic circuits concepts Combinational logic Sequential logic (types, timing, applications, troubleshooting) Integrated circuit families MSI logic circuits (types, applications, troubleshooting) Microcontrollers	Linear Algebra Topics: • Eigenvalues and eigenvectors • Vector spaces Rn • Linear Transformation • Series • Linear Algebra applications Calculus Topics: • Appllication of differentiation • Application of integration • Differential equations • Caluclus of more than one variable • Taylor series	C Programming for microcontrollers Using I/O Ports Interrupts Programmable timers A/D conversions Networking of embedded systems *Teamwork skills: Team Organisation and Leadership.*	Intro to programmable controllers System configuration Basic circuit Programming – digital Basic circuit programming - analog Basic Circuit Programming – word control Structured programming PID control Basic fault finding Installation methods	Heating, ventilation and airconditioning (HVAC) Hydraulics and fire Power and lighting Using design software to produce civil drafting drawings.
Learning Outcomes	1. Define more advanced computer science theoretical concepts. 2. Design, write, test and debug programs of moderate complexity written in high-level programming language. 3. Implement algorithms based on common algorithmic strategies. 4. Use the language and terminology of object-oriented programming and data abstraction. 5. Summarise and report the algorithm and the coding solution.	1. Define electronics theoretical concepts as applied to digital electronic circuits and microcontrollers. 2. Explain the operation of digital electronic circuits comprising logic gates, combinational logic, flip-flops and related devices, counters and registers and MSI logic circuits. 3. Analyse the performance of digital electronic circuits and subsystems. 4. Use computer simulation for basic analysis of digital electronic circuits. 5. Prototype basic digital electronic circuits based on a given schematic diagram. 6. Correctly measure basic digital electronic circuit parameters using appropriate equipment. 7. Summarise and report the measured parameter values in commonly used engineering format. 8. Design of basic digital electronic circuits. 9. Design, write test and debug assembly language programs for microcontrollers.	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 theoretical concepts related to the hardware features and the programming of microcontrollers. 2. Design, write, test and debug programs written for microcontroller-based systems. 3. Interface microcontrollers to I/O devices and successfully integrate the hardware with the software. 4. Use the terminology of microcontroller programming. 5. Summarise and report the algorithm, the I/O interface and the coding solution.	1. Analyze and describe the principles and application of programmable controllers. 2. Design, program and test control systems using programmable controllers. 3. Select Programmable Controllers to be used in electrical control systems. 4. Install and configure a programmable controller system to Australian Standard AS3000. 5. Identify safety aspects of programmable controllers.	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.
Ave Weekly Contact	6 hours	6 hours	6 hours	4.5 hours	6 hours	5 hours
Ave Weekly Independent Study	2 hours	2 hours	2 hours	3.5 hours	2 hours	3 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)
Assessment Tasks	Test 1 20% Practical component 20% Project – Code review 25% Final exam 35%	Test 1 10% Test 2 10% Practical component 15% Project 25% Final exam 40%	Assignment 25% Mid-semester test 30% Final exam 45%	Test 1 20% Practical component 20% Project 25% Final exam 35%	Practical component 20% Project 1 10% Project 2 20% Final exam 50%	Practical component 30% Project 40% Final exam 30%
Co-/Pre-requisites	Pre-requisite: Computer Science 1 OR Computing for Engineering	Co-requisite: Basic Electrical Circuits	Pre-requisite: Mathematics 2	Pre-requisites: Computer Science 1 OR Digital Electronics	Pre-requisites: Electronic Circuits AND Computing for Engineering OR Electronic Circuits AND Computer Science 1	Pre-requisite: Civil/Structural Basic Drawing OR Electrical Drawing