UNSW SYDNEY

UNSW Engineering

Education Specification

1. Program Overview

Program Title: Master of Engineering

Award Title: Master of Engineering (Renewable Energy Engineering)

Engineering Discipline: Renewable Energy Engineering

The SOLAGS Master of Engineering in Renewable Energy (RE) is a two-year, full time degree. It is offered by SPREE as a specialisation of the UNSW 8621 Master of Engineering program. It is an AQF Level 9 qualification and provides graduates with specialist knowledge and skills for professional and/ or further learning. This document illustrates how the SOLAGS specialisation fosters the Engineers Australia (EA) Stage 1 Competencies for Professional Engineers in its students. In the following sections aims and specialisation learning outcomes (SLOs) are presented. This is followed by the curriculum mapping that relates the course learning outcomes of individual courses to SLOs, SLOs to EA Competencies, and finally CLOs of individual courses to EA Competencies.

The specific objective of the Renewable Energy program is to educate engineers for the needs of the renewable energy and related industries to support energy transition. Areas of study include renewable and distributed energy system design and operation, energy efficiency, and electricity industry integration and policy.

2. Career Alignment

Careers in renewable energy engineering are expanding rapidly as the energy transition accelerates, there is a strong demand for engineers who can design, integrate and operate renewable and distributed energy systems in a way that is sustainable, reliable, safe and grid compliant.

Graduates of this degree are prepared for roles across the renewable energy sector such as developers and asset owners, EPC, network service providers, energy retailers, consultancies and government. Typical career include renewable energy system engineer, gird integration engineer, DER engineer, asset performance and reliability engineer, energy market analyst, project development engineer, energy efficiency engineer, as well as opportunities in policy, finance, marketing, project management and research and development.

3. Specialisation Framework

Initial development of the SLOs occurred during the development of this specialisation. SLOs have been recently reviewed by a working group consisting of the Deputy Head of School (Education), Director of Learning and Teaching, Undergraduate Course Coordinator, and two academic representatives. The IAC has been consulted on the modifications to the SLOs and are satisfied that they are appropriate to address the needs of the renewable energy industry. All teaching academics have also been consulted and the modified SLOs were presented to the School Learning and Teaching Committee (L&T Comm) for further discussion and final endorsement.

On successful completion of this specialisation, graduates will be able to:

1. Demonstrate mastery of renewable energy specialist technical knowledge including quantifying the magnitude, variability and uncertainty of the resources underpinning renewable energy and energy systems.
2. Critically evaluate and apply current research to the solution of problems in a real world context in Renewable Energy engineering by considering technical, economic, social and environmental implications.
3. Apply advanced analytical and computational tools to analyse complex problems in renewable energy and solve by applying critical thinking and engaging with real world context.
4. Design and evaluate renewable energy systems using knowledge of the functionality and operating principles of systems components, and enabling technologies, and applying relevant standards.
5. Lead and manage renewable energy projects, individually or as part of a team, in a systematic and professional manner.
6. Demonstrate a high level of personal autonomy, perseverance, ethical conduct and professional accountability when working as an individual and within diverse multi-cultural and multi-disciplinary team environments.
7. Communicate professionally and effectively within and outside of renewable energy engineering and effectively incorporate feedback.

4. Continuous Improvement

The SPREE Program Committee monitors the programs and courses. The Committee meets once per month. The committee gathers feedback from the stakeholders including industry, Course Convenors, School and Faculty committees, students and professional bodies. In addition, the School conducts routine course reviews and comprehensive course and program reviews as discussed in Section 5.2. Course convenors also propose revisions based on course review, student feedback and/ or industry requirements. Revision and/or new course/program proposals are presented to the SPREE Learning and Teaching Committee (LTC) for further discussion and endorsement. The approved proposals are presented to the Faculty Academic Committee.

5. Review Process

UNSW's Academic Offering Review and Monitoring Procedure outlines a structured approach to maintaining the quality and relevance of academic programs and courses. It includes both program-level and course-level review processes, with defined responsibilities and timelines.

Program Monitoring is conducted annually for all programs and specialisations. A comprehensive program review must occur at least once every five years for accredited programs, and every seven years for others. These reviews include a self-evaluation report (SER), review panel, review event, and a formal response with an implementation plan. Oversight is provided by the Academic Board and University Academic Quality Committee (UAQC), with input from Faculty Education Committees and Deans.

Course Review within UNSW Engineering is managed through a two-tiered process: Routine Course Review and Comprehensive Course Review. Routine reviews are conducted at the end of each term by Schools, using data such as enrolment, assessment outcomes, academic integrity issues, WAM differences, and student feedback (myExperience). Courses flagged through this process are added to the Comprehensive Course Review roster.

Comprehensive Course Reviews are detailed evaluations led by the Course Convenor in collaboration with a Faculty Educational Developer, Nexus Fellow, or Senior Academic. These reviews assess course design, pedagogy, alignment with learning outcomes, and feedback mechanisms. Outcomes are documented in a Course Development Plan and an Evaluation Report following the next course delivery. Schools must review at least 10% of their courses annually.

Stakeholder involvement spans multiple levels, including the Academic Board, UAQC, Faculty and School committees, Course Convenors, and external contributors such as students and professional bodies.

Frequency of updates includes termly course reviews, annual program monitoring, and five-yearly comprehensive reviews for accredited programs.

6. Curriculum Mapping

Curriculum mapping was undertaken following the methodology established by the Faculty. The mapping was conducted as a two-step process. The assessments in an individual course were mapped with the CLOs, CLOs were mapped with SLOs and SLOs were mapped with relevant Engineers Australian Stage 1 Competency Standards for Professional Engineers (PLOs). Both core and elective courses in the specialisation were considered for the mapping. These mapping are shown in Tables 1 and 2.

Mapping of the assessments to CLOs and CLOs to SLOs were done in consultation with the course convenors, and the mapping of SLOs to PLO was performed in consultation with the program leader.

Curriculum mapping shows that the specialisation provides good coverage of all the Engineers Australia Stage 1 Competencies for Professional Engineers. It is particularly strong in in-depth technical knowledge, application of engineering methods, engineering design, and creative, innovative and pro-active demeanour. The SPREE IAC is satisfied that the SLOs and the mapping of competencies appropriately address the needs of the renewable energy industry. Although “Professional and personal attributes” competencies are embedded in the specialisation, some elements of this such as ethics could be better distributed across the specialisation which is an aim of the on-going program review.

Table 1. Mapping of the specialisation learning outcomes to the Engineers Australia Stage 1 Competencies.

SLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13	PLO14	PLO15	PLO16
1. Demonstrate mastery of renewable energy specialist technical knowledge including quantifying the magnitude, variability and uncertainty of the resources underpinning renewable energy and energy systems.	x	x	x													
2. Critically evaluate and apply current research to the solution of problems in a real world context in Renewable Energy engineering by considering technical, economic, social and environmental implications.				x		x										
3. Apply advanced analytical and computational tools to analyse complex problems in renewable energy and solve by applying critical thinking and engaging with real world context.				x	x	x	x	x								
4. Design and evaluate renewable energy systems using knowledge of the functionality and operating principles of systems components, and enabling technologies, and applying relevant standards.				x	x	x	x	x	x							
5. Lead and manage renewable energy projects, individually or as part of a team, in a systematic and professional manner.										x						
6. Demonstrate a high level of personal autonomy, perseverance, ethical conduct and professional accountability when working as an individual and within diverse multi-cultural and multi-disciplinary team environments.											x		x		x	x
7. Communicate professionally and effectively within and outside of renewable energy engineering and effectively incorporate feedback.												x		x		

Table 2. Mapping of courses to the specialisation learning outcomes

CLO	1. Demonstrate mastery of renewable energy specialist technical knowledge including quantifying the magnitude, variability and uncertainty of the resources underpinning renewable energy and energy systems.	2. Critically evaluate and apply current research to the solution of problems in a real world context in Renewable Energy engineering by considering technical, economic, social and environmental implications.	3. Apply advanced analytical and computational tools to analyse complex problems in renewable energy and solve by applying critical thinking and engaging with real world context.	4. Design and evaluate renewable energy systems using knowledge of the functionality and operating principles of systems components, and enabling technologies, and applying relevant standards.	5. Lead and manage renewable energy projects, individually or as part of a team, in a systematic and professional manner.	6. Demonstrate a high level of personal autonomy, perseverance, ethical conduct and professional accountability when working as an individual and within diverse multi-cultural and multi-disciplinary team environments.	7. Communicate professionally and effectively within and outside of renewable energy engineering and effectively incorporate feedback.
Disciplinary Core Courses List 1							
SOLA4012 Photovoltaic Systems Design	Proficient	Introduced	Proficient	Proficient	Proficient	Proficient	Proficient
SOLA5051 Life Cycle Assessment	Developed	Proficient	Proficient	Developed	Developed	Developed	Proficient
SOLA5053 Wind Energy Converters	Proficient	Introduced	Proficient	Proficient	Developed	Developed	Proficient
SOLA9001 Photovoltaics	Developed		Introduced	Proficient	Introduced	Introduced	Developed
Disciplinary Core Courses List 2							
ELEC4612 Power System Analysis	Developed	Developed	Developed	Developed			
ELEC9711 Power Electronics for Renewable and Distributed Generation	Proficient	Developed	Proficient	Proficient			
ELEC9714 Electricity Industry Planning and Economics	Developed	Proficient	Developed	Proficient		Developed	Developed
ELEC9715 Electricity Industry Operation and Control	Developed	Proficient	Developed	Proficient		Developed	Developed
GSOE9017 Managing Energy Efficiency	Developed		Developed		Introduced	Developed	Developed
GSOE9111 Energy Storage	Developed	Proficient	Developed				
MECH9720 Solar Thermal Energy Design	Developed	Developed	Developed	Developed			Proficient
PTRL5119 Geothermal Engineering							
SOLA5050 Renewable Energy Industry and Policy	Developed	Proficient	Proficient			Developed	Developed
SOLA5052 Bioenergy and Renewable Fuels	Developed	Developed	Proficient	Developed			
SOLA9103 Renewable Energy System Modelling and Analysis	Proficient	Developed	Proficient	Developed	Developed	Developed	Proficient
SOLA9104 Hybrid Renewable Energy Systems	Proficient	Developed	Developed	Proficient	Developed		Developed

SOLA9105 Renewable Energy System Design	Proficient	Introduced	Proficient	Proficient			
SOLA9451 Masters Project A	Developed	Developed	Developed	Developed	Developed	Developed	Developed
SOLA9452 Masters Project B	Proficient	Developed	Proficient	Proficient	Proficient	Proficient	Proficient
SOLA9453 Masters Project C	Proficient	Proficient	Proficient	Proficient	Proficient	Proficient	Proficient
Technical and Management Electives							
GSOE9445 Entrepreneurial Engineering					Proficient	Developed	Developed
GSOE9510 Ethics and Leadership in Engineering					Developed	Developed	Developed
GSOE9820 Engineering Project Management					Proficient	Proficient	Developed
GSOE9830 Economic Decision Analysis in Engineering		Developed	Developed		Proficient		

7. Assessments

At SPREE, we use a mix of assessment type to balance assurance of learning and authenticity. Our assessment design is guided by three simple principles: we want students to show what they know (technical competence and understandings), show what they can do (apply, design, analyse, investigate, communicate... all in a context close to a professional context) and improve as they go (through formative assessment, staged tasks and timely feedback). This philosophy leads us to combine invigilated assessments where appropriate (to provide robust evidence of individual attainment) with practical and project-based assessments (to develop higher-order capabilities such as problem framing, iteration, experimentation, modelling, design and teamwork). Assessment choices are made to align with the course learning outcomes and the development of the student within the program. This ensure that the student has a coherent progression through the program with competencies being scaffolded. The School has reviewed the alignment of assessment types across the specialisation, with fewer than 30% of courses retaining a final exam, and many replacing it with problem- or project-based assessment. In courses involving design and report writing, assessment is often staged so students receive feedback as the course progresses. Presentations, posters and oral exams are also used to build communication skills and support academic integrity. Overall, this assessment design prioritises authenticity while ensuring students develop AI literacy and self-regulation as part of professional practice (i.e., preparing them for the world "out there").

In team-based assessments, individual team members are peer-assessed. We are also increasingly implementing viva-style oral examination in team-based assessment as well as in project-based assessments. Viva-style components also support assessment integrity in an environment where generative AI can otherwise obscure individual contribution and disciplinary reasoning.

SPREE's approach to use of generative AI and assessment integrity

The School has implemented many processes to ensure that academic integrity is maintained:

- All exam papers are reviewed by another academic. New questions are written for each exam.
- Online exams use as much randomisation as practically possible. This includes use of question banks and use of STACK questions which allows randomised questions, were developed for numerical questions. In most courses open ended questions are used in exams to assess students' comprehension. Exams also start at a set time so that student need to focus on their exams which reduces collusion.
- Viva-style oral exams are used in several courses and are often linked to preceding take-home tasks, helping to ensure take-home tasks are used primarily for learning rather than being treated as end-point assessment or completed using generative AI.
- Assignments are submitted in electronic format and are submitted through TurnItIn, which detects plagiarism, collusion and use of AI.
- Thesis literature review and final thesis have two markers to ensure consistency. If there is a mark difference of greater than 10, a third marker is used.
- Several courses (stage-gate courses in-terms of competency development at the program level) have hurdles where student much achieve certain performance level to pass the course.

In addition, the School is shifting from "policing" AI to redesigning tasks so that AI use is explicit and supports learning rather than completion. In particular, we (i) design tasks so the assessable product is clearly tied to disciplinary process (drafting, iteration, justification, and reflection), (ii) use vivas/oral checks and staged submissions to validate authorship, reasoning, and individual contribution, and (iii) make AI use transparent and pedagogically purposeful, for example, through in-house course-context chatbots that promote "AI for learning", such as the Scout bot used in SOLA9001.

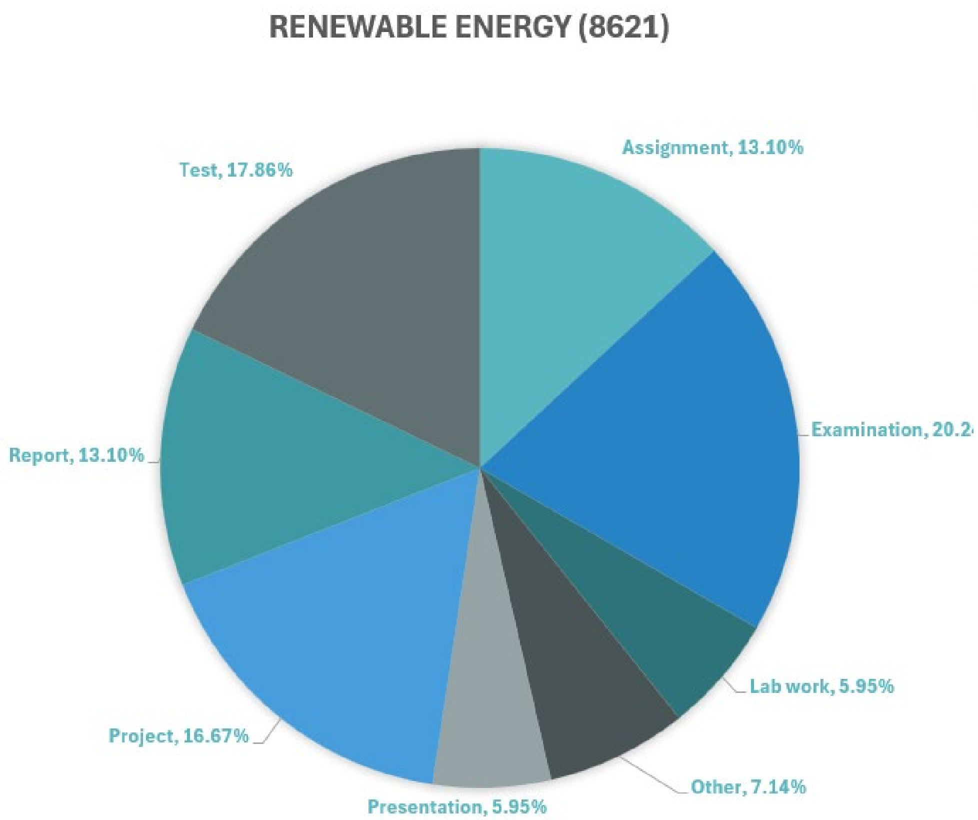

Figure 1. Percentage of assessment types used within the specialisation.

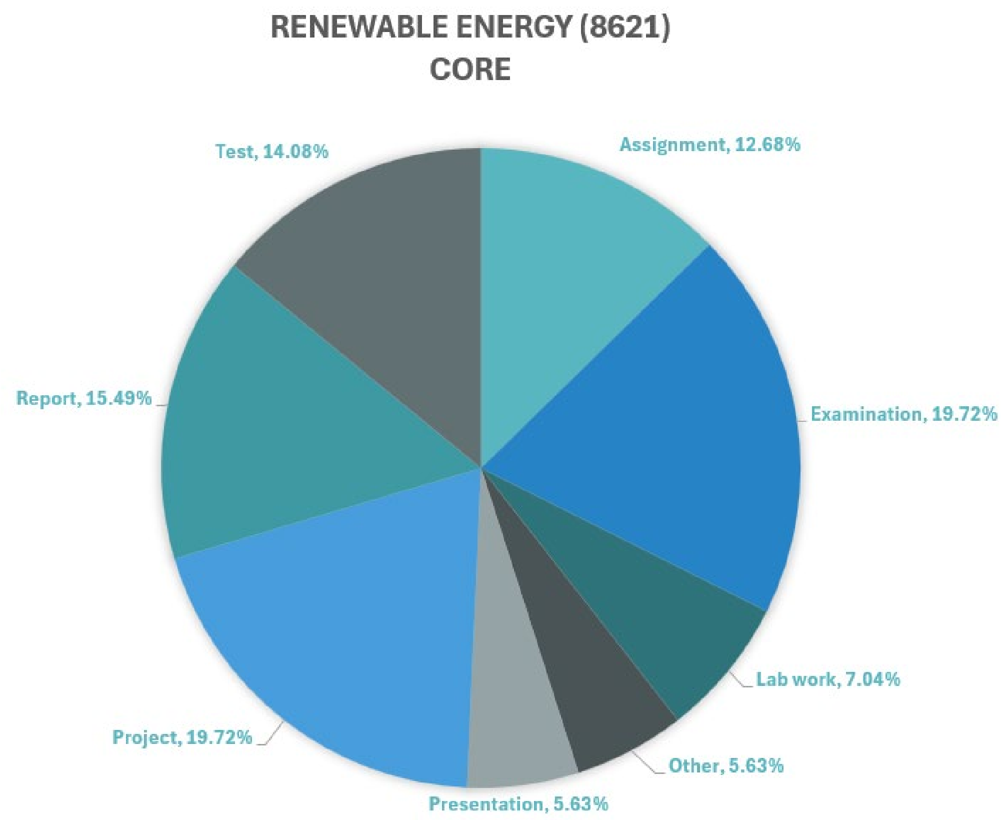

Figure 2. Percentage of assessment types used within the core of the specialisation.

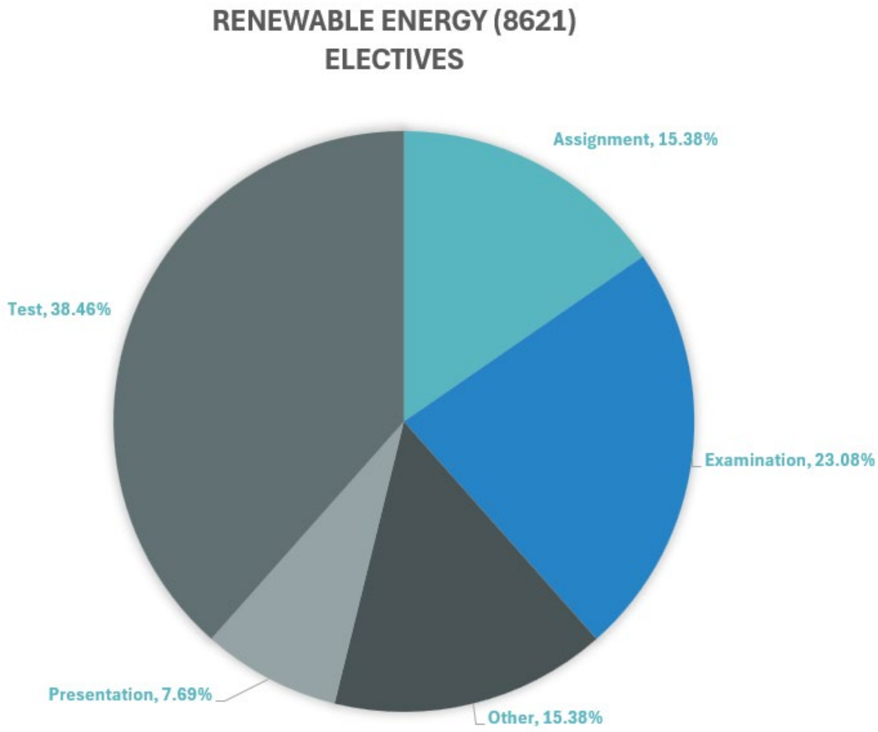

Figure 3. Percentage of assessment types used within the electives of the specialisation.

8. Specialisation Progression Plan

Students can track their progression through the “myPlan” checker tool.

myPlan | Current Students - UNSW Sydney

A progression checklist and/or study plan is also available for students for the single degree and the double degree offerings.

Progression checksheets & study plans | Engineering - UNSW Sydney