UNSW Course Outline

SOLA5056 Sustainable Energy for Developing Countries - 2024

Published on the 11 Sep 2024

General Course Information

Course Code : SOLA5056
Year : 2024
Term : Term 3
Teaching Period : T3
Is a multi-term course? : No
Faculty : Faculty of Engineering
Academic Unit : School of Photovoltaic and Renewable Engineering
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Postgraduate, Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

Energy services are critical for health and livelihoods, while enabling productive activities and economic prosperity. However, more than a billion people around the world in rural areas and urban slums do not have access to these services and infrastructure. Many projects and

programs in rural areas of developing countries, fragile states, communities in disaster recovery and other disadvantaged communities aim to improve access to modern energy services. A range of renewable energy technologies, from small and appliance-integrated to utility-scale, are available to deliver these services cost-effectively. However, delivery of these interventions presents a range of technical, economic, social and institutional challenges. The aims of this course are to:

- Introduce students to many of the technical and nontechnical issues related to the delivery of accessible, affordable and appropriate energy services and infrastructure in developing countries and other disadvantaged communities.
- Develop and apply skills and approaches for assessing, designing and specifying sustainable rural energy projects. The course guides students in collection of data, technical characteristics of system components, building appropriate technical and economic models, and project planning.
- There is an emphasis on understanding context, appropriate design and technology selection, implementation models and capacity building for sustainable projects.

Course Aims

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- There is an emphasis on understanding context, appropriate design and technology selection, implementation models and capacity building for sustainable projects.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Interpret a brief, present proposals for feedback and assessment in a range of written, oral and visual formats.
CLO2 : Describe the technical characteristics of, and design, size and specify renewable energy systems commonly deployed in developing country contexts.
CLO3 : Apply a range of multi-disciplinary methodologies, frameworks and best practices to scope, design and implement sustainable solutions to complex real-world humanitarian engineering problems.
CLO4 : Assess the performance and sustainability of these energy systems by modelling the technical and economic outcomes.
CLO5 : Creatively integrate multi-disciplinary considerations into the design process and work in interdisciplinary teams.

Course Learning Outcomes	Assessment Item
CLO1 : Interpret a brief, present proposals for feedback and assessment in a range of written, oral and visual formats.	• Preliminary Proposal • Project Final Submission (Individual) • Project Final Submission (Group)
CLO2 : Describe the technical characteristics of, and design, size and specify renewable energy systems commonly deployed in developing country contexts.	• Research Journal • Project Final Submission (Individual) • Project Final Submission (Group)
CLO3 : Apply a range of multi-disciplinary methodologies, frameworks and best practices to scope, design and implement sustainable solutions to complex real-world humanitarian engineering problems.	• Preliminary Proposal • Project Final Submission (Individual) • Project Final Submission (Group)
CLO4 : Assess the performance and sustainability of these energy systems by modelling the technical and economic outcomes.	• Research Journal • Project Final Submission (Individual) • Project Final Submission (Group)
CLO5 : Creatively integrate multi-disciplinary considerations into the design process and work in interdisciplinary teams.	• Research Journal • Preliminary Proposal • Project Final Submission (Individual) • Project Final Submission (Group)

Learning and Teaching Technologies

Moodle - Learning Management System | Microsoft Teams

Other Professional Outcomes

https://www.unsw.edu.au/engineering/student-life/student-resources/program-design

Additional Course Information

You should aim to spend about 10-13 hours per week on this course. The additional time outside of class should be spent:

- Research, design or analysis for your major assignment, including working on your research journal
- In person or online collaboration with your team
- Preparing for class, including preparation for workshops or to seek feeback from teaching staff
- Preparing to present your work in oral and written formats
- Reviewing the lecture material and any further reading

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Research Journal Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: Week 2: 16 September - 22 September, Week 3: 23 September - 29 September, Week 7: 21 October - 27 October, Week 8: 28 October - 03 November, Week 9: 04 November - 10 November
Preliminary Proposal Assessment Format: Group	10%	Due Date: Week 5: 07 October - 13 October
Project Final Submission (Individual) Assessment Format: Individual	50%	Due Date: 15/11/2024 11:59 PM
Project Final Submission (Group) Assessment Format: Group	20%	Due Date: 15/11/2024 11:59 PM

Assessment Details

Research Journal

Assessment Overview

6 entries

Course Learning Outcomes

- CLO2 : Describe the technical characteristics of, and design, size and specify renewable energy systems commonly deployed in developing country contexts.
- CLO4 : Assess the performance and sustainability of these energy systems by modelling the technical and economic outcomes.
- CLO5 : Creatively integrate multi-disciplinary considerations into the design process and work in interdisciplinary teams.

Detailed Assessment Description

You are expected to make 5 journal posts throughout the semester, each of around 500-1000 words, which will be posted in a OneNote on the SOLA5056 Microsoft Team. The purpose of the journal is to scaffold and support the progress of your ideas and analysis towards the final project proposal. Journal topics include:

- Reviewing best practices from industry reports and academic studies and reflecting on these studies and their relevance to your own work.
- Preparing first drafts of your data analysis, design and technoeconomic modelling.

You will be able to see the journal entries of your team, helping you to benefit from each other's

thinking and align your work throughout the semester.

Assessment Length

5 x 500-1000 words

Assessment information

Due Wednesday midnight in weeks 2,3,7,8 and 9.

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

Assistance with Attribution

This assessment requires you to write/create a first iteration of your submission yourself. You are then permitted to use generative AI tools, software or services to improve your submission in the ways set out below.

Any output of generative AI tools, software or services that is used within your assessment must be attributed with full referencing.

If outputs of generative AI tools, software or services form part of your submission and are not appropriately attributed, your Convenor will determine whether the omission is significant. If so, you may be asked to explain your submission. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

For more information on Generative AI and permitted use please see here.

You are permitted to use generative AI tools, software or services to generate initial ideas, structures, or outlines. However, you must edit and develop those ideas to such a significant extent that what is submitted is your own work and directly relevant to your own project. You should keep copies of your iterations to show your Course Authority if there is any uncertainty about the originality of your work.

Preliminary Proposal

Assessment Overview

Online presentation and summary

Course Learning Outcomes

- CLO1 : Interpret a brief, present proposals for feedback and assessment in a range of

written, oral and visual formats.
- CLO3 : Apply a range of multi-disciplinary methodologies, frameworks and best practices to scope, design and implement sustainable solutions to complex real-world humanitarian engineering problems.
- CLO5 : Creatively integrate multi-disciplinary considerations into the design process and work in interdisciplinary teams.

<u>Detailed Assessment Description</u>

The preliminary proposal is a group presentation to talk the client through your understanding of the brief, context, and options. This includes:

- Demontsrated understanding of the context of your target community
- Identification of the problem(s) and your project goals
- Introducing options to the client.
    - o These options will form the basis for you to develop for your final proposal. i.e. the individual project ideas you are developing.
    - o Demonstrating how these options are appropriate to the client brief and the broader context, and can therefore be sustainable.
    - o Presenting a preliminary understanding of the solution – loads, components, sizing.
    - o Identification of challenges and potential solutions (ways of overcoming them).

<u>Assessment Length</u>

Presentation 15-20 mins

<u>Assignment submission Turnitin type</u>

This is not a Turnitin assignment

<u>Generative AI Permission Level</u>

Planning/Design Assistance

You are permitted to use generative AI tools, software or services to generate initial ideas, structures, or outlines. However, you must develop or edit those ideas to such a significant extent that what is submitted is your own work, i.e., what is generated by the tool, software or service should not be a part of your final submission. You should keep copies of your iterations to show your Course Authority if there is any uncertainty about the originality of your work.

If your Convenor has concerns that your answer contains passages of AI-generated text or media that have not been sufficiently modified you may be asked to explain your work, but we recognise that you are permitted to use AI generated text and media as a starting point and some traces may remain. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

For more information on Generative AI and permitted use please see [here](#).

Reading from notes (using either phone or laptop) during Preliminary Proposal presentations is prohibited. You must communicate your proposal in your own words and will be required to answer questions about the proposal. Reading extensively from points on slides will be penalised as a poor form of communication.

Project Final Submission (Individual)

<u>Assessment Overview</u>

Final Report (10,000 words) with follow up questions

<u>Course Learning Outcomes</u>

- CLO1 : Interpret a brief, present proposals for feedback and assessment in a range of written, oral and visual formats.
- CLO2 : Describe the technical characteristics of, and design, size and specify renewable energy systems commonly deployed in developing country contexts.
- CLO3 : Apply a range of multi-disciplinary methodologies, frameworks and best practices to scope, design and implement sustainable solutions to complex real-world humanitarian engineering problems.
- CLO4 : Assess the performance and sustainability of these energy systems by modelling the technical and economic outcomes.
- CLO5 : Creatively integrate multi-disciplinary considerations into the design process and work in interdisciplinary teams.

<u>Detailed Assessment Description</u>

This is a real life project for people in remote communities in Fiji and Vanuatu. The assignment takes the form of a request for proposals, typical in the development industry.

The objective is to design and specify a project that improves access to energy services to improve lives, livelihoods and climate resilience for one of the target villages.

The project aims to introduce students to many of the technical and non-technical issues related to the delivery of sustainable energy services in developing countries. Students will develop and apply skills and approaches for assessing, designing and specifying sustainable energy projects. In most projects, this involves applying students' pre-existing engineering knowledge and skills, and using standard approaches and tools to design reasonably simple systems. While the technology solutions may be quite straightforward, students must apply rigorous engineering approaches to their design (quantitative analysis and modelling); and there is an emphasis on understanding context (appropriate design and technology selection, implementation models

and capacity building), which is the basis for successful and sustainable projects.

The project should:

- Be designed as a pilot or 'market test', so must include design of an appropriate implementation model to ensure sustainability and the potential to scale up the successful pilot to other areas.
- Sustainable solutions must be aligned with community needs and priorities and use technologies that are appropriate to the context.

This project is to be completed in teams of 4 students. Each team member must select an energy service focus area, which will be the basis for individual assessment. The individual focus areas within the team will likely overlap and must be brought together and presented as a coherent group proposal, requiring strong collaboration and good communication. For the final submission (worth 70% of final course marks), 20 of the marks will be allocated for the overall team proposal, and 50 of the marks for individual contribution.

The individual work includes:

- Engineering design and calculations for an energy system to meet the energy services identified.
- Including specification of efficient and affordable energy end-use equipment and appliances as appropriate.
- Life cycle economic analysis of the system.
- Develoment a technically feasible, financially viable and sustainable project design through understanding of the project context and exploration of project risks and sensitivities.

Assessment Length

Group report around 10,000-15,000 words, plus appropriate drawings, diagrams, graphs etc.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Generative AI Permission Level

Planning/Design Assistance

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If your Convenor has concerns that your answer contains passages of AI-generated text or media

that have not been sufficiently modified you may be asked to explain your work, but we recognise that you are permitted to use AI generated text and media as a starting point and some traces may remain. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

For more information on Generative AI and permitted use please see here.

You are permitted to use generative AI tools, software or services to generate initial ideas, structures, or outlines. However, AI will be of limited value since you must develop ideas relevant to your own project, that directly respond to the specific project context (community), and the objectives of your group.

Project Final Submission (Group)

<u>Assessment Overview</u>

Final Report (10,000 words) with follow up questions

<u>Course Learning Outcomes</u>

- CLO1 : Interpret a brief, present proposals for feedback and assessment in a range of written, oral and visual formats.
- CLO2 : Describe the technical characteristics of, and design, size and specify renewable energy systems commonly deployed in developing country contexts.
- CLO3 : Apply a range of multi-disciplinary methodologies, frameworks and best practices to scope, design and implement sustainable solutions to complex real-world humanitarian engineering problems.
- CLO4 : Assess the performance and sustainability of these energy systems by modelling the technical and economic outcomes.
- CLO5 : Creatively integrate multi-disciplinary considerations into the design process and work in interdisciplinary teams.

<u>Detailed Assessment Description</u>

Refer to description of Project Final Submission (Individual).

The Group assessment requires a plan for the introduction and long term operation and management of the proposed new technologies, which will meet the needs and goals of the community and be sustainable over the long term, including:

- Project prioritisation (recommendations for the client) and proposed implementation model (management structure and/or business model) based on a clear understanding of the project context and community needs
- Budget, timeline, materials and skills/training requirements, capacity building, operation and

maintenance, monitoring and evaluation.

<u>Assessment Length</u>

Group report around 10,000-15,000 words, plus appropriate drawings, diagrams, graphs etc.

<u>Assignment submission Turnitin type</u>

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

<u>Generative AI Permission Level</u>

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For more information on Generative AI and permitted use please see [here](#).

Refer to Project Final Submission (Individual)

General Assessment Information

Assessment focusses on the major project, which takes the form of a request for proposals, as used in the development industry. In addition to the final submission, intermediate deliverables include a preliminary proposal and a research journal used to scaffold progress.

Details of assessment criteria and expectations for the project will be provided separately on Moodle e.g. in the project brief. Students will work in teams on the project, with individual assessment for the individual contribution, and a group mark component. The preliminary project proposal is an intermediate assessment for the project and will be assessed as a group, with peer assessment used to allocate marks on the basis of contribution.

An assessable research journal will be created by each student to record and collate work each

week throughout the semester, which will encourage and provide structure for consistent progress and provide a way to share and collaborate with peers working on the same part of the project.

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Grading Basis

Standard

Course Schedule

Attendance Requirements

You must attend all workshop classes and scheduled group project consultations in person. If you need to be absent for any reason, you must notify the course convenor in advance and negotiate with your group to join via an online call during class and contribute to group work offline as needed. These classes will not be recorded.

Lectures held 9-10 may be viewed online asynchronously, but it is highly recommended that you attend these in real time, since you will be able to ask specific questions of the lecturer and engage in discussions that will support your project.

In summary:

- *9-10 Lecture - we recommend attendance in person*
- *11-2 Workshop - attend in person and take notes*
  - *The lectures during this timeslot will not be recorded*
  - *Team meetings and project support from teaching staff requires in person attendance*

General Schedule Information

All classes are held on Thursdays

Journal submissions are due on Wednesdays (midnight)

Week 1

9:00-10:00: Course and Project Introduction

11.00-12.30: Project Introduction & Form teams

12:30-2.00: Lecture - Energy, Sustainable livelihoods technology options

Work on Research Journal 1: Development studies concepts

Week 2

9:00-10:00: Lecture - Rural energy project design

11.00-1.00: Human centred design workshop - empathising

1.00-2.00: Lecture - Clean Water

Submit Research Journal 1

Work on Research Journal 2: Energy Access Precedents

Week 3

9:00-10:00: Lecture - Energy System Sizing

11.00-1.00: Human centred design workshop - ideation

1:00-2:00: Lecture - Food Water Energy Nexus

Submit Research Journal 2

Work on Preliminary Proposal

Week 4

9:00-10:00: Lecture - Bioenergy and clean cooking

11:00-2:00: Proposal Prep - Project consultations in groups

Work on Preliminary Proposal

Week 5

Present Preliminary Proposal

Week 6

(Flexibility Week)

Work on Research Journal 3: Load and Resource profiles

Week 7

9:00-10:00: Economics & Implementation Models; Prelim Proposal Feedback

11.00-2.00: Design workshop - 'stress testing'

Submit Research Journal 3

Work on Research Journal 4: System sizing, equipment selection and costing

Week 8

9:00-10:00: Project planning and capacity building

11:00-2:00: Preparing Final submissions - Project consultations in groups

Submit Research Journal 4

Work on Research Journal 5: Capacity Building or Implementation case study

Week 9

9:00-10:00: Case study

11:00-2:00: Project consultations in groups

Submit Research Journal 5

Work on Final Proposal

Week 10

Work on Final Proposal

Final Submission Due

Course Resources

Prescribed Resources

Moodle and Microsoft Teams will be used to disseminate teaching materials, share resources and host discussion forums.

There is no textbook for this course. However, announcements, readings and other resources related to lectures and the major project will be made available via Moodle and Microsoft Teams.

Course Evaluation and Development

In this course, recent improvements resulting from student feedback include using the research journal to break down the major assignment into smaller parts, and providing more detailed information about the format of the presentations.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Anna Bruce				In class and via Teams during working hours	No	Yes
Demonstrator	Edoardo Santagata				In class and via Teams during working hours	No	No
	Samhan Samhan				In class and via Teams during working hours	No	No
	Ruby Brown				In class and via Teams during working hours	No	No

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary

assessment, please see the information on UNSW's Special Consideration page.

II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: https://www.unsw.edu.au/engineering/student-life/student-resources/program-design.

Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic

integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly

indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific Information

[Engineering Student Support Services](#) – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

[Engineering Industrial Training](#) – Industrial training questions

[UNSW Study Abroad](#) – study abroad student enquiries (for inbound students)

[UNSW Exchange](#) – student exchange enquiries (for inbound students)

[UNSW Future Students](#) – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

School-specific Information

SPREE Student Information Hub

Students are welcome to visit the [SPREE Student Information Hub](#) for information such as sample study plans, course outlines, thesis project, industrial training etc.

School Contact Information

For course-related matters, please contact course convenor directly via emails. Please email spreeteaching@unsw.edu.au for any other matters.