

## Course Outline

**Code: ENS281**

### **Title: Introduction to Sustainable Energy Systems**

<b>Faculty:</b>	Science, Health, Education and Engineering
<b>School:</b>	Science & Engineering
<b>Teaching Session:</b>	Semester 1
<b>Year:</b>	2019
<b>Course Coordinator:</b>	Dr Damon Kent Email: dkent@usc.edu.au
<b>Course Moderator:</b>	Dr Neil Tindale

Please go to the USC website for up to date information on the teaching sessions and campuses where this course is usually offered.

#### **1. What is this course about?**

##### **1.1 Description**

This course provides you with an introduction to energy systems so that you may understand the physical processes that govern energy conversion into forms used by society. It provides a basis with which you may form considered arguments relating to the long term suitability of various energy technologies. The balance between theory and practice provides a solid foundation for further studies in sustainable development and renewable energy.

##### **1.2 Course topics**

Topics include:

Energy sources - demand and supply

Sun - Earth interactions, Global circulation, Weather, Radiant energy, Photovoltaics

Wave energy - Earth-moon system, tides

Heat engines - Geothermal energy, Fuels and Greenhouse gases

Fuel cells, Environmental impacts

#### **2. What level is this course?**

200 level Developing - Applying broad and/or deep knowledge and skills to new contexts. May require pre-requisites and introductory level knowledge/skills. Normally undertaken in the 2nd or 3rd year of an undergraduate program

#### **3. What is the unit value of this course?**

12 units

#### 4. How does this course contribute to my learning?

<b>Specific Learning Outcomes</b> On successful completion of this course, you should be able to:	<b>Assessment tasks</b> You will be assessed on the learning outcomes in task/s:	<b>Graduate Qualities or Professional Standards mapping</b> Completing these tasks successfully will contribute to you becoming:
Effectively communicate concepts and techniques relevant to sustainable energy systems, using written English and mathematical notations.	1: Mid-semester Exam 2: Practical Exercises 3: Final Exam	Empowered Knowledgeable
Demonstrate effective oral and written communication to explain the theory, underpinning sustainable energy systems to professional and lay audiences.	1: Mid-semester Exam 2: Practical Exercises 3: Final Exam	Creative and Critical Thinkers Empowered Knowledgeable Sustainability Focussed
Apply comprehensive theory based understanding of the principles of energy conversion to the solution of practical problems.	1: Mid-semester Exam 2: Practical Exercises 3: Final Exam	Creative and Critical Thinkers Empowered Knowledgeable Sustainability Focussed
Demonstrate in-depth knowledge of the function and operation of energy conversion devices.	1: Mid-semester Exam 2: Practical Exercises 3: Final Exam	Creative and Critical Thinkers Empowered Engaged Knowledgeable Sustainability Focussed
Effectively work in a team to collect, analyse, evaluate and report on data obtained from experimental investigations.	2: Practical Exercises	Empowered Ethical Knowledgeable
Discern the scientific principles relevant to energy conversion and creatively apply these to develop innovative solutions to problems in sustainable energy.	1: Mid-semester Exam 2: Practical Exercises 3: Final Exam	Creative and Critical Thinkers Knowledgeable Sustainability Focussed

#### 5. Am I eligible to enrol in this course?

Refer to the [USC Glossary of terms](#) for definitions of “pre-requisites, co-requisites and anti-requisites”.

##### 5.1 Enrolment restrictions

Nil

##### 5.2 Pre-requisites

Nil

##### 5.3 Co-requisites

Nil

##### 5.4 Anti-requisites

Nil

##### 5.5 Specific assumed prior knowledge and skills (where applicable)

Good English comprehension and writing skills; Ability to carry out algebraic manipulation of formulae and perform numerical calculations.

## 6. How am I going to be assessed?

### 6.1 Grading scale

Standard – High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL)

### 6.2 Assessment tasks

Task No.	Assessment Tasks	Individual or Group	Weighting	What is the duration/length?	When should I submit?	Where should I submit it?
1	Mid Semester Exam	Individual	20%	60 minutes	Tutorial class in week 7	Hardcopy to invigilator of exam
2	Six Practical Reports	Individual	5% each, total 30 %	As necessary	In class at the completion of the practical exercise	To tutor / lecturer (hardcopy)
3	Final Exam	Individual	50 %	2 Hours	Central Examination Period	Hardcopy to invigilator of exam
			100%			

#### Assessment Task 1: Mid-Semester Exam

<b>Goal:</b>	The mid-semester examination gives you an opportunity to demonstrate your knowledge, understanding and skills associated with the learning outcomes in weeks 1 - 6 of this course.	
<b>Product:</b>	Mid-semester exam	
<b>Format:</b>	Individual Mixed practical and theoretical written questions During tutorial class in week 7	
<b>Criteria:</b>	Students will be assessed on their ability to: <ul style="list-style-type: none"> <li>recall and communicate the theoretical and practical components of the course materials covered in both the lectures, tutorials and practical exercises from weeks 1-6</li> <li>apply the relevant theory to particular examples</li> <li>produce correct solutions to particular problems</li> </ul>	
<b>Generic skill assessed</b>		<b>Skill assessment level</b>
Problem solving		Developing
Communication		Developing

#### Assessment Task 2: Practical Class Reports

<b>Goal:</b>	You will perform several experiments related to the content of the course in order to enhance your knowledge and understanding of the theory.
<b>Product:</b>	Practical Report
<b>Format:</b>	Hardcopy (paper) submission to the course coordinator. Standard FoSHEE assignment coversheet, signed by the student. Specifications for the report format will be provided on Blackboard.
<b>Criteria:</b>	In general, students will be assessed on their ability to: <ul style="list-style-type: none"> <li>Gather and analyse data accurately and write a short summary describing the outcome(s) of the experiment and any conclusions that may be drawn from the results</li> <li>Present your work in a clear and professional manner (layout, language, spelling, general presentation)</li> <li>Work collaboratively in a team.</li> </ul>

## Course Outline: ENS281 Introduction to Sustainable Energy Systems

Generic skill assessed	Skill assessment level
Problem solving	Developing
Communication	Developing
Applying technologies	Developing

**Assessment Task 3: End of Semester Exam**

<b>Goal:</b>	The end of semester examination gives you an opportunity to demonstrate your knowledge, understanding and skills associated with all the learning outcomes of this course.	
<b>Product:</b>	Final Exam	
<b>Format:</b>	Individual. Mixed practical and theoretical written questions. During Central Examination Period.	
<b>Criteria:</b>	Students will be assessed on their ability to: <ul style="list-style-type: none"> <li>recall and communicate the theoretical and practical components of the course materials covered in both the lectures, tutorials and practical exercises from weeks 1-13</li> <li>apply the relevant theory to particular examples</li> <li>produce correct solutions to particular problems</li> </ul>	
Generic skill assessed	Skill assessment level	
Problem solving	Developing	
Communication	Developing	

**7. What are the course activities?****7.1 Directed study hours**

1 x 2-hour lecture per week

1 x 2-hour tutorial per week

1 x 3-hour practical per fortnight

**7.2 Teaching semester/session(s) offered**

Sippy Downs: Semester 1

**7.3 Course content**

Teaching Week / Module	What key concepts/content will I learn?	What activities will I engage in to learn the concepts/content?	
		Directed Study Activities	Independent Study Activities
1	Overview and examples of Energy Sources, Global circulation and weather. Basic principles of fluid mechanics; Bernoulli's principle, power in flow.	Lectures and Tutorials,	Readings, online research. Practice with tutorial questions
2	Wind Energy: Aerofoils, propellers and turbines, Power extraction from fluids. Wind and Hydroelectric power generation.	Lectures and Tutorials,	Readings, online research. Practice with tutorial questions
	Wind Energy	Practical 1	Report writing
3	Wave energy: Global wave activity, extraction of energy from wave motion.	Lectures and Tutorials,	Readings, online research. Practice with tutorial questions

## Course Outline: ENS281 Introduction to Sustainable Energy Systems

4	Tidal Energy: Earth - moon system, tides, geographic tidal variation, energy availability and extraction,	Lectures and Tutorials,	Readings, online research. Practice with tutorial questions
	Hydro power and electricity generation.	Practical 2	Report writing
5	Heat Transfer and Insulation, thermal conductivity, R-values, Conduction, Convection and Radiation.	Lectures and Tutorials,	Readings, online research. Practice with tutorial questions
6	Heat, basic principle of heat engines, thermal efficiency, use and conversion of heat, Geothermal energy	Lectures and Tutorials,	Readings, online research. Practice with tutorial questions
	Insulation and Heat Transfer	Practical 3	Report writing
7	Solar Radiation. Geometry of the Earth and Sun, extraterrestrial solar radiation.		
	Mid-semester Exam		
8	Effects of the Earth's atmosphere, terrestrial radiation, solar radiation profiles and availability.	Lectures and Tutorials,	Readings, online research. Practice with tutorial questions
	Solar Collectors.	Practical 4	Report writing
9	Physical systems: Solar thermal systems, radiant energy, optics of collectors, energy conversion.	Lectures and Tutorials,	Readings, online research. Practice with tutorial questions
10	Physical systems. Photovoltaics: Semiconductors, solar cell construction, power from solar cells, performance characteristics, arrays of cells, concentrators.	Lectures and Tutorials,	Readings, online research. Practice with tutorial questions
	Photovoltaics: Electricity from light.	Practical 5	Report writing
11	Chemical Sources of Energy: Fossil fuels. Types of fossil fuels, calorific yield, energy conversion. Combustion; Greenhouse gas emissions. Hydrogen, Fuel cells and batteries. Pollution.	Lectures and Tutorials,	Readings, online research. Practice with tutorial questions
12	Biomass and Biofuels: biofuel classification, biomass production, direct combustion, pyrolysis, ethanol and methane production, alcoholic fermentation, anaerobic digestion, biodiesel, wastes and residues.	Lectures and Tutorials,	Readings, online research. Practice with tutorial questions
	Power from Fuel cells and other storage devices.	Practical 6	Report writing
13	Course revision and review.	Lectures and Tutorials,	Readings, online research. Practice with tutorial questions

**NOTE:** The above schedule is a guide to Course topics. While every endeavour will be made to keep to the schedule, the timing and treatment of material may vary, without notice, in order to accommodate student needs, availability of staff, resources, events of significance and extreme weather events.

## **8. What resources do I need to undertake this course?**

Please note that course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Blackboard site. Please log in as soon as possible.

### **8.1 Prescribed text(s)**

Nil

### **8.2 Specific requirements**

Scientific calculator, or a more advanced calculator if you prefer

## **9. Risk management**

Health and safety risks for this course have been assessed as low. You will be required to complete a laboratory induction prior to commencement of the practical component.

It is your responsibility as a student to review course material, search online, discuss with lecturers and peers, and understand the health and safety risks associated with your specific course of study. It is also your responsibility to familiarise yourself with the University's general health and safety principles by reviewing the [online Health Safety and Wellbeing training module for students](#), and following the instructions of the University staff.

## **10. What administrative information is relevant to this course?**

### **10.1 Assessment: Academic Integrity**

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Blackboard, are electronically checked through SafeAssign. This software allows for text comparisons to be made between your submitted assessment item and all other work that SafeAssign has access to.

### **10.2 Assessment: Additional requirements**

#### **Eligibility for Supplementary Assessment**

Your eligibility for supplementary assessment in a course is dependent of the following conditions applying:

- a) The final mark is in the percentage range 47% to 49.4%
- b) The course is graded using the Standard Grading scale
- c) You have not failed an assessment task in the course due to academic misconduct

### 10.3 Assessment: Submission penalties

Late submission of assessment tasks will be penalised at the following maximum rate:

- 5% (of the assessment task's identified value) per day for the first two days from the date identified as the due date for the assessment task.
- 10% (of the assessment task's identified value) for the third day
- 20% (of the assessment task's identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task.
- A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task.

Weekdays and weekends are included in the calculation of days late.

To request an extension, you must contact your Course Coordinator and supply the required documentation to negotiate an outcome.

### 10.4 Study help

In the first instance, you should contact your tutor, then the Course Coordinator. Additional assistance is provided to all students through Academic Skills Advisers. To book an appointment or find a drop-in session go to [Student Hub](#).

Contact Student Central for further assistance: +61 7 5430 2890 or [studentcentral@usc.edu.au](mailto:studentcentral@usc.edu.au)

### 10.5 Links to relevant University policy and procedures

For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Administration of Central Examinations
- Deferred Examinations
- Student Academic Misconduct
- Students with a Disability

Visit the USC website:

<http://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching>

### 10.6 General Enquiries

In person:

- **USC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **USC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **USC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **USC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay

Tel: +61 7 5430 2890

Email: [studentcentral@usc.edu.au](mailto:studentcentral@usc.edu.au)