1. What is this course about?

1.1 Description
Thermofluids deals with the relations between heat and other forms of energy and how it relates to the mechanics of fluids. Engineers require an understanding of thermofluids and their applications to using machines to do work. In this course, you will learn and apply basic concepts including an introduction to systems, first law of thermodynamics, relationship between pressure and flow, momentum analysis, piping system analysis, open channel flows, mechanisms of heat transfer, and fundamental pump performance.

1.2 Field trips, WIL placements or activities required by professional accreditation

<table>
<thead>
<tr>
<th>Activity</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>Nil</td>
</tr>
</tbody>
</table>

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?

<table>
<thead>
<tr>
<th>Specific Learning Outcomes</th>
<th>Assessment tasks</th>
<th>Graduate Qualities or Professional Standards mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>On successful completion of this course, you should be able to:</td>
<td>You will be assessed on the learning outcomes in task/s:</td>
<td>Completing these tasks successfully will contribute to:</td>
</tr>
<tr>
<td>Explain and investigate the first law of thermodynamics for both closed and open systems and apply to solve problems.</td>
<td>Task 1, Task 2</td>
<td>Knowledgeable</td>
</tr>
</tbody>
</table>
### Specific Learning Outcomes
On successful completion of this course, you should be able to:

<table>
<thead>
<tr>
<th>Assessment tasks</th>
<th>Graduate Qualities or Professional Standards mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 1, Task 3</td>
<td>Knowledgeable</td>
</tr>
<tr>
<td>Task 1, Task 2, Task 3</td>
<td>Empowered</td>
</tr>
<tr>
<td>Task 1, Task 3</td>
<td>Knowledgeable</td>
</tr>
<tr>
<td>Task 1, Task 3</td>
<td>Empowered</td>
</tr>
<tr>
<td>Task 1, Task 3</td>
<td>Creative and critical thinkers</td>
</tr>
<tr>
<td>Task 1, Task 2, Task 3</td>
<td>Empowered</td>
</tr>
<tr>
<td>Task 1, Task 3</td>
<td>Knowledgeable</td>
</tr>
<tr>
<td>Task 1, Task 2, Task 3</td>
<td>Empowered</td>
</tr>
</tbody>
</table>

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**  
This course is only available to students enrolled in the SC411 program

5.2 **Pre-requisites**  
MTH102 or MTH103

5.3 **Co-requisites**  
Nil

5.4 **Anti-requisites**  
ENG204 or MEC2101 (USQ course)

5.5 **Specific assumed prior knowledge and skills (where applicable)**  
Students are assumed to have foundational skills in mathematics and physical sciences.

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 **Details of early feedback on progress**  
The summative assessment for this course includes weekly quizzes submitted via Blackboard. The results of these quizzes will provide you with an ongoing feedback on your performance in each module. Additional feedback will be provided during regular contact sessions via worked examples and formative peer-assisted problem-solving activities.
6.3 Assessment tasks

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Assessment Product</th>
<th>Individual or Group</th>
<th>Weighting %</th>
<th>What is the duration / length?</th>
<th>When should I submit?</th>
<th>Where should I submit it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Quiz/zes</td>
<td>Individual</td>
<td>40%</td>
<td>Short answer / multi-choice / mathematical working</td>
<td>Weeks 1 - 13</td>
<td>Quiz (Online Test)</td>
</tr>
<tr>
<td>2</td>
<td>Practical / Laboratory Skills</td>
<td>Individual</td>
<td>20%</td>
<td>Pre-work quiz questions and individual laboratory reports</td>
<td>Sessions run weeks 2 – 13. Students attend a total of 2 laboratory sessions.</td>
<td>In Class</td>
</tr>
<tr>
<td>3</td>
<td>Examination</td>
<td>Individual</td>
<td>40%</td>
<td>2 hours</td>
<td>Exam period</td>
<td>Exam Venue</td>
</tr>
</tbody>
</table>

Assessment 1: Online activities

**Goal:**
This assessment will develop your problem-solving skills in thermodynamics, fluid mechanics, and heat transfer. It will allow you to demonstrate your understanding of the fundamental laws and principles of the discipline.

**Product:** Quiz/zes

**Format:** Weekly quizzes will be distributed via Blackboard which will require students to respond with a mixture of short answer, multiple-choice, and mathematical working. This is an individual task.

**Criteria:**
You will be assessed on:
- Accuracy of the explanation and/or numerical result
- Application of the fundamental laws and principles to solve problems
- Identification and verification of the system being analysed using sketches and modelling
- Communication of results

**Engineers Australia competencies:**
1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.
2.1. Application of established engineering methods to complex engineering problem solving.
3.2 Effective oral and written communication in professional and lay domains

Assessment Task 2: Laboratory reports

**Goal:** The goal of this task is to investigate fundamental principles of thermodynamics, fluid mechanics and heat transfer through experimental applications and by reporting on the results.

**Product:** Practical/Laboratory Skills

**Format:** You will attend 2 laboratory sessions over the semester. You will attend one session between weeks 3 – 7 and one session between weeks 8 – 12. Prior to each session, you will complete a series of pre-lab questions on Blackboard. During the session, you will conduct an experiment and complete a report. The experimental work will be conducted in a group format, however the pre-lab questions and the reports are to be
submitted individually by all students. A template will be provided for the report submission. This report will be submitted at the end of the session.

Criteria:
You will be assessed on:

- Accuracy of the explanation and/or numerical result
- Application of the fundamental laws and principles to the experimental conditions
- Identification and verification of the system being analysed using sketches and modelling
- Communication of results

Engineers Australia competencies:
1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.
2.2 Fluent application of engineering techniques, tools and resources.
3.5 Orderly management of self, and professional conduct.

Assessment Task 3: Examination

Goal:
The goal of this task is to evaluate your knowledge of the foundational concepts in thermodynamics, fluid mechanics and heat transfer, and to demonstrate the use of standard methods to analyse problems within the discipline.

Product:
Examination

Format:
This examination will occur during the central examination period. You will respond to questions using short answer and mathematical working. All teaching modules covered during the semester may be assessed in this examination.

Criteria:
You will be assessed on:

- Accuracy of the explanation and/or numerical result
- Application of the fundamental laws and principles to solve problems
- Identification and verification of the system being analysed using sketches and modelling

Engineers Australia competencies:
1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.
1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline.
2.2 Fluent application of engineering techniques, tools and resources.

7. Directed study hours

The directed study hours listed here are a portion of the workload for this course. A 12 unit course will have total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Directed study hours may vary by location. Student workload is calculated at 12.5 learning hours per one unit.

This course will be delivered via technology-enabled learning and teaching. All lectures will remain in this mode for Semester 2 2020. When government guidelines allow, students that elected on-campus study via the class selection process will be advised when on campus tutorials and practical sessions will resume.

<table>
<thead>
<tr>
<th>Location</th>
<th>Directed study hours for location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sippy Downs</td>
<td>Lectures – 2 hours/week</td>
</tr>
<tr>
<td></td>
<td>Tutorials – 2 hours/week</td>
</tr>
<tr>
<td></td>
<td>Laboratory – 2 x 3 hour sessions during the semester</td>
</tr>
<tr>
<td>Moreton Bay</td>
<td>Lectures – 2 hours/week</td>
</tr>
</tbody>
</table>


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) or course reader**

Please note that you need to have regular access to the resource(s) listed below as they are required:

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Title</th>
<th>Publisher</th>
</tr>
</thead>
</table>

8.2 **Specific requirements**

All students will be required to wear closed footwear for laboratory sessions. Students who do not have the appropriate footwear will not be permitted to enter the laboratory space.

9. **How are risks managed in this course?**

Risk assessments have been performed for all laboratory classes and a low level of health and safety risk exists. Some risk concerns may include equipment, instruments, and tools, as well as manual handling items within the laboratory.

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 on 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

10.5 Wellbeing Services

Student Wellbeing Support Staff are available to assist on a wide range of personal, academic, social and psychological matters to foster positive mental health and wellbeing for your success. Student Wellbeing is comprised of professionally qualified staff in counselling, health and disability Services.

Ability Advisers ensure equal access to all aspects of university life. If your studies are affected by a disability, mental health issue, learning disorder, injury or illness, or you are a primary carer for someone with a disability, AccessAbility Services can provide assistance, advocacy and reasonable academic adjustments.

To book an appointment with either service go to Student Hub, email studentwellbeing@usc.edu.au or accessibility@usc.edu.au or call 07 5430 1226

10.6 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
10.7  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 Moreton Bay - Service Centre, Building A – Ground Floor, 1 Moreton Bay Parade, Petrie
- **USC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **USC Caboolture** - Student Central, Level 1 Building J,Cnr Manley and Tallon Street, Caboolture

Tel: +61 7 5430 2890
Email: studentcentral@usc.edu.au
### Appendix 1  Course content

<table>
<thead>
<tr>
<th>Module #</th>
<th>What key concepts/content will I learn?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic concepts in thermodynamics and fluid mechanics</td>
</tr>
<tr>
<td>2</td>
<td>Energy and the first law</td>
</tr>
<tr>
<td>3</td>
<td>Properties of pure substances</td>
</tr>
<tr>
<td>4</td>
<td>Energy analysis of closed systems</td>
</tr>
<tr>
<td>5</td>
<td>Energy analysis of open systems</td>
</tr>
<tr>
<td>6</td>
<td>Fluid statics</td>
</tr>
<tr>
<td>7</td>
<td>Bernoulli and energy equations</td>
</tr>
<tr>
<td>8</td>
<td>Momentum analysis of flow systems</td>
</tr>
<tr>
<td>9</td>
<td>Internal flow and piping system analysis</td>
</tr>
<tr>
<td>10</td>
<td>External flows</td>
</tr>
<tr>
<td>11</td>
<td>Open channel flows</td>
</tr>
<tr>
<td>12</td>
<td>Basic concepts of heat transfer</td>
</tr>
<tr>
<td>13</td>
<td>Introduction to pump performance curves</td>
</tr>
</tbody>
</table>