

ENG400 Heat Transfer

School: School of Science, Technology and Engineering

2026 | Semester 1

UniSC Sunshine Coast

**BLENDED
LEARNING**

Most of your course is on campus but you may be able to do some components of this course online.

Please go to unisc.edu.au 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

Heat transfer is an important part of many diverse areas of engineering. This course covers the fundamental physical processes of heat transfer, including the application of techniques to engineering problem solving. It extends upon the concepts and principles learned in fluid mechanics and thermodynamics courses. The course content will cover the three modes of heat transfer ' conduction, convection, and radiation ' and their application to the industry.

1.2. How will this course be delivered?

| ACTIVITY | HOURS | BEGINNING WEEK | FREQUENCY |
|----------------------------|-------|----------------|-----------|
| BLENDED LEARNING | | | |
| Lecture | 1hr | Week 1 | 13 times |
| Tutorial/Workshop 1 | 3hrs | Week 1 | 13 times |
| Laboratory 1 | 3hrs | Not applicable | 2 times |

1.3. Course Topics

1. Basic concepts in heat transfer
2. Heat conduction
3. Numerical analysis of heat conduction
4. External forced convection
5. Internal forced convection
6. Natural convection
7. Heat exchangers
8. Radiation heat transfer

2. What level is this course?

400 Level (Graduate)

Demonstrating coherence and breadth or depth of knowledge and skills. Independent application of knowledge and skills in unfamiliar contexts. Meeting professional requirements and AQF descriptors for the degree. May require pre-requisites where discipline specific introductory or developing knowledge or skills is necessary. Normally undertaken in the third or fourth full-time study 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?

| COURSE LEARNING OUTCOMES | | GRADUATE QUALITIES |
|---|---|--|
| On successful completion of this course, you should be able to... | | Completing these tasks successfully will contribute to you becoming... |
| 1 | Explain and investigate the laws and principles of thermodynamics and heat transfer and use to solve problems. | Knowledgeable |
| 2 | Investigate and apply the principles of heat transfer (conduction, convection, radiation) to complex systems. | Knowledgeable Empowered |
| 3 | Solve heat transfer problems by appraising information, determining applicable concepts, and providing and verify a solution. | Creative and critical thinker Empowered |
| 4 | Communicate results through reports, sketching, and modelling | Knowledgeable Creative and critical thinker |

5. Am I eligible to enrol in this course?

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

5.1. Pre-requisites

(ENG204 or MEC2102 USQ equivalent) or PHY201) and (ENG300 or MEC3102 USQ equivalent) and enrolled in Program SC411

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

Not applicable

5.4. Specific assumed prior knowledge and skills (where applicable)

Students are assumed to have foundational skills in thermodynamics and fluid mechanics.

5.5. Microcredential Information

Not applicable

6. How am I going to be assessed?

6.1. Grading Scale

Standard Grading (GRD)

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

6.2. Details of early feedback on progress

Early feedback will be provided through the regular discussion of worked examples in class, as well as the summative quiz held in week 3 of semester.

6.3. Assessment tasks

| DELIVERY MODE | TASK NO. | ASSESSMENT PRODUCT | INDIVIDUAL OR GROUP | WEIGHTING % | WHAT IS THE DURATION / LENGTH? | WHEN SHOULD I SUBMIT? | WHERE SHOULD I SUBMIT IT? |
|---------------|----------|-------------------------------|---------------------|-------------|---------------------------------|-----------------------|--|
| All | 1 | Practical / Laboratory Skills | Individual | 20% | Short answer questions | Refer to Format | In Class |
| All | 2 | Quiz/zes | Individual | 40% | Short answer/numerical workings | Refer to Format | In Class |
| All | 3 | Report | Individual | 40% | 10 pages | Refer to Format | Online Assignment Submission with plagiarism check |

All - Assessment Task 1: Laboratory reports

| | | | |
|------------------------------|---|---|----------------------------------|
| GOAL: | The goal of this task is to explain heat transfer principles through experimental applications and reporting on the results . | | |
| PRODUCT: | Practical / Laboratory Skills | | |
| AUTHORSHIP STATEMENT: | | | |
| FORMAT: | Submit: Two labs during weeks 3 - 12. You will attend 2 laboratory sessions over the semester. You will attend 1 session between weeks 3-7 and 1 session between weeks 8-12. Prior to each session, you will complete a series of pre-lab questions online. During the session, you will conduct an experiment and complete a report. This report will be submitted at the end of the session. 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 | | |
| CRITERIA: | No. | | Learning Outcome assessed |
| | 1 | Accuracy of the explanation and/or numerical result | |
| | 2 | Investigation and application of heat transfer concepts | |
| | 3 | Identification and verification of the system being analysed using sketches and modelling | |
| | 4 | Communication of results | |
| | 5 | Assessment criteria are mapped to the course learning outcomes. | 1 2 3 4 |
| GENERIC SKILLS: | | | |

All - Assessment Task 2: Quizzes

| GOAL: | The quizzes are designed to evaluate your knowledge of heat transfer concepts and to demonstrate the use of standard methods to analyse heat transfer problems | | | | | | | | |
|------------------------------|--|-----|---------------------------|---|---|---|---|---|---|
| PRODUCT: | Quiz/zes | | | | | | | | |
| AUTHORSHIP STATEMENT: | | | | | | | | | |
| FORMAT: | Submit: Weeks 3, 6, 9, 12. These quizzes will occur in Weeks 3,6,9, and 12 during the lecture session. You will respond to questions using short answer. The quizzes will cover all content taught prior to that week. | | | | | | | | |
| CRITERIA: | <table border="1"><thead><tr><th>No.</th><th>Learning Outcome assessed</th></tr></thead><tbody><tr><td>1</td><td>Accuracy of the explanation and/or numerical result</td></tr><tr><td>2</td><td>Investigation and application of heat transfer concepts</td></tr><tr><td>3</td><td>Identification and verification of the system being analysed using sketches and modelling</td></tr></tbody></table> | No. | Learning Outcome assessed | 1 | Accuracy of the explanation and/or numerical result | 2 | Investigation and application of heat transfer concepts | 3 | Identification and verification of the system being analysed using sketches and modelling |
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| 2 | Investigation and application of heat transfer concepts | | | | | | | | |
| 3 | Identification and verification of the system being analysed using sketches and modelling | | | | | | | | |
| GENERIC SKILLS: | | | | | | | | | |

All - Assessment Task 3: Project

| GOAL: | The goal of this task is to apply fundamental heat transfer concepts to analyse the heating for a given situation. | | | | | | | | | | |
|------------------------------|--|-----|---------------------------|---|---|---|---|---|---|---|--------------------------|
| PRODUCT: | Report | | | | | | | | | | |
| AUTHORSHIP STATEMENT: | | | | | | | | | | | |
| FORMAT: | The report will be submitted electronically in Week 15 and will be approximately 10 pages long (3000 word equivalent). You will be required to develop models and solve a number of heat transfer problems within the provided context. This will involve conducting research to determine material properties and identifying other necessary information. | | | | | | | | | | |
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| 3 | Identification and verification of the system being analysed using sketches and modelling | | | | | | | | | | |
| 4 | Communication of results | | | | | | | | | | |
| GENERIC SKILLS: | | | | | | | | | | | |

7. Directed study hours

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. Student workload is calculated at 12.5 learning hours per one unit.

7.1. Schedule

| PERIOD AND TOPIC | ACTIVITIES |
|---|--|
| 1 Basic concepts of heat transfer | Lecture Workshop Online module in Blackboard |
| 2 Heat conduction | Lecture Workshop Online module in Blackboard |
| 3 Heat conduction (steady, fin approximation) | Lecture Workshop Laboratory Online module in Blackboard |
| 4 Heat conduction (transient) | Lecture Workshop Laboratory Online module in Blackboard |
| 5 Numerical analysis of heat conduction | Lecture Workshop Laboratory Online module in Blackboard |
| 6 Convection (forced external) | Lecture Workshop Laboratory Online module in Blackboard |
| 7 Convection (forced internal) | Lecture Workshop Laboratory Online module in Blackboard |
| 8 Convection (natural) | Lecture Workshop Laboratory Online module in Blackboard |
| 9 Heat exchangers | Lecture Workshop Laboratory Online module in Blackboard |
| 10 Thermal radiation | Lecture Workshop Laboratory Online module in Blackboard |
| 11 Radiation heat exchange | Lecture Workshop Laboratory Online module in Blackboard |
| 12 Radiation heat exchange | Lecture Workshop Laboratory Online module in Blackboard |
| 13 Course review | Lecture Workshop Online module in Blackboard |

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

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

8.1. Prescribed text(s) or course reader

You need regular access to the resource(s) below. Many texts are available as ebooks through the [Library](#) at no additional cost.

| REQUIRED? | AUTHOR | YEAR | TITLE | EDITION | PUBLISHER |
|-----------|-----------------------------|------|---|---------------------------|-------------|
| Required | Y.A. Cengel and A.J. Ghajar | 2015 | Heat and Mass Transfer: Fundamentals and Applications | (5th Edition in SI units) | McGraw Hill |

8.2. Specific requirements

Laboratory work will be undertaken in areas requiring students to wear closed footwear.

9. How are risks managed in this course?

Risk assessments have been performed for all studio and 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 to review course material, search online, discuss with lecturers and peers and understand the risks associated with your specific course of study and to familiarise yourself with the University's general health and safety principles by reviewing the [online induction training 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 Canvas, are electronically checked through Turnitin. This software allows for text comparisons to be made between your submitted assessment item and all other work to which Turnitin has access.

10.2. Assessment: Additional Requirements

Eligibility for Supplementary Assessment Your eligibility for supplementary assessment in a course is dependent of the following conditions applying: The final mark is in the percentage range 47% to 49.4% The course is graded using the Standard Grading scale You have not failed an assessment task in the course due to academic misconduct

10.3. Assessment: Submission penalties

Late submission of assessment tasks may 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 to negotiate an outcome.

10.4. 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
- Central Examinations
- Deferred Examinations
- Student Conduct
- Students with a Disability

For more information, visit <https://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching>

10.5. Student Charter

UniSC is committed to excellence in teaching, research and engagement in an environment that is inclusive, inspiring, safe and respectful. The [Student Charter](#) sets out what students can expect from the University, and what in turn is expected of students, to achieve these outcomes.

10.6. General Enquiries

In person:

- **UniSC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **UniSC Moreton Bay** - Service Centre, Ground Floor, Foundation Building, Gympie Road, Petrie
- **UniSC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **UniSC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **UniSC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **UniSC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

Tel: +61 7 5430 2890

Email: studentcentral@usc.edu.au