

**MECH3695: Heat Transfer**

Callaghan

Semester 1 - 2024



**OVERVIEW**

**Course Description** Students learn the fundamental principles of heat transfer and how they can use them to solve engineering problems, in particular in heat exchanger applications. The course, which nicely blends physical and mathematical concepts, provides an excellent support to the students for expanding/developing the analytical skills built on previous knowledge of mathematics and physics.

On completion, students will demonstrate sufficient skills to enable them for their future careers, and the potential for future self-directed study in this area.

**Academic Progress Requirements** Nil

**Assumed Knowledge** ENGG2300 Engineering Fluid Mechanics (previously MECH2710).

**Contact Hours**  
**Callaghan Laboratory**  
Face to Face On Campus  
1 hour(s) per term  
Students will select a laboratory session at the beginning of the semester in consultation with the course coordinator.  
**Lecture**  
Face to Face On Campus  
3 hour(s) per week(s) for 13 week(s) starting Week 1  
**Online Activity**  
Online  
1 hour(s) per week(s) for 13 week(s) starting Week 1  
**Tutorial**  
Face to Face On Campus  
2 hour(s) per week(s) for 13 week(s) starting Week 1

**Unit Weighting Workload** 10  
Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

**COURSE OUTLINE**

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# CONTACTS

**Course Coordinator**     **Callaghan**  
Dr Thi Bang Tuyen Nguyen  
Thibangtuyen.Nguyen@newcastle.edu.au  
(02) 4921 8879  
Consultation: 9.00am-1.00pm and 2.00pm-5.00pm (Monday to Friday) by appointment.

**Teaching Staff**             Other teaching staff will be advised on the course Canvas site.

**School Office**             **School of Engineering**  
EAG02  
EA Building  
Callaghan  
SENG-ADMIN@newcastle.edu.au  
+61 2 4921 5798  
9.00am-5.00pm (Monday to Friday)

# SYLLABUS

**Course Content**             The course covers various topics including:

1. Introduction to heat transfer
2. Heat exchangers
3. 1D Steady state conduction
4. 2D Steady state conduction (numerical analysis using Matlab)
5. Transient heat transfer using Matlab
6. Convection (External and internal)
7. Radiation

**Course Learning Outcomes**     **On successful completion of this course, students will be able to:**

1. Describe, explain and identify various heat transfer mechanisms.
2. Apply the principles of heat transfer for analysing processes in an engineering context.
3. Solve engineering heat transfer problems related to heat exchangers.
4. Perform routine experiments relating to heat transfer and communicate experimental results through written reports.

**Course Materials**

# ASSESSMENTS

This course has 5 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Assignment 1	Week 4	Individual	20%	1, 2, 3
2	Assignment 2	Week 6	Individual	10%	1, 2, 3
3	Laboratory Report	2 weeks after allocated lab work	Group	15%	1, 2, 3, 4
4	Mid-Semester Quiz	Week 8	Individual	25%	1, 2, 3
5	End-semester non-formal quiz	Week 13	Individual	30%	1, 2, 3

## Late Submissions

The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

## Assessment 1 - Assignment 1

<b>Assessment Type</b>	Written Assignment
<b>Purpose</b>	To provide the students with the opportunity to show that they have understood the concepts learned in class and acquired the skills to solve problems in applying these concepts.
<b>Description</b>	Face-to-face assessment. Solving a set of problems.
<b>Weighting</b>	20%
<b>Length</b>	90
<b>Due Date</b>	Week 4
<b>Submission Method</b>	In Class
<b>Assessment Criteria</b>	Open booked type. Students will perform the assessment face-to-face in class using Canvas. Computer and/or iPad is required. Submission will be done on Canvas in class. Other details will be advised on Canvas.
<b>Return Method</b>	Online
<b>Feedback Provided</b>	Online - .
<b>Opportunity to Reattempt</b>	Students WILL NOT be given the opportunity to reattempt this assessment.

## Assessment 2 - Assignment 2

<b>Assessment Type</b>	Quiz
<b>Purpose</b>	To provide the students with the opportunity to show that they have understood the concepts learned in class and acquired the skills to solve problems in applying these concepts.
<b>Description</b>	Online assessment. Solving a set of problems
<b>Weighting</b>	10%
<b>Length</b>	30
<b>Due Date</b>	Week 6
<b>Submission Method</b>	Online
<b>Assessment Criteria</b>	Students will perform the assessment at home on Canvas.
<b>Return Method</b>	Online
<b>Feedback Provided</b>	Online - .
<b>Opportunity to Reattempt</b>	Students WILL NOT be given the opportunity to reattempt this assessment.

## Assessment 3 - Laboratory Report

<b>Assessment Type</b>	Report
<b>Purpose</b>	The purpose of group and laboratory activity is to enable peer-to-peer learning; develop oral communication skills and the ability to record data, synthesize an opinion and convey this clearly in a well presented and articulate manner in a written report.
<b>Description</b>	Face-to-face for experiment. Online for report submission. Laboratory experiment and group report
<b>Weighting</b>	15%

<b>Length</b>	60 minutes
<b>Due Date</b>	2 weeks after allocated lab work
<b>Submission Method</b>	Online
<b>Assessment Criteria</b>	A group of 4 students (except adverse circumstances) to carry out a laboratory experiment and to prepare a joint written report. Submission via Canvas. 1 hour for each group. Experiments on Heat Exchanger in EC110. EC Lab induction is required prior to entering the lab.
<b>Return Method</b>	Online
<b>Feedback Provided</b>	Online - .
<b>Opportunity to Reattempt</b>	Students WILL NOT be given the opportunity to reattempt this assessment.

## Assessment 4 - Mid-Semester Quiz

<b>Assessment Type</b>	Quiz
<b>Purpose</b>	To provide the students with the opportunity to show that they have understood the concepts learned in class and acquired the skills to solve problems in applying these concepts.
<b>Description</b>	Face-to-face assessment. Solving a set of problems
<b>Weighting</b>	25%
<b>Length</b>	90 minutes
<b>Due Date</b>	Week 8
<b>Submission Method</b>	In Class
<b>Assessment Criteria</b>	Open booked type. Students will perform the assessment face-to-face in class using Canvas. Computer and/or iPad is required. Submission will be done on Canvas in class. Other details will be advised on Canvas.
<b>Return Method</b>	Online
<b>Feedback Provided</b>	Online - .
<b>Opportunity to Reattempt</b>	Students WILL NOT be given the opportunity to reattempt this assessment.

## Assessment 5 - End-semester non-formal quiz

<b>Assessment Type</b>	Quiz
<b>Purpose</b>	To provide the students with the opportunity to show that they have understood the concepts learned in class and acquired the skills to solve problems in applying these concepts.
<b>Description</b>	Face-to-face assessment. Solving a set of problems
<b>Weighting</b>	30%
<b>Length</b>	90 minutes
<b>Due Date</b>	Week 13
<b>Submission Method</b>	In Class
<b>Assessment Criteria</b>	Open booked type. Students will perform the assessment face-to-face in class using Canvas. Computer and/or iPad is required. Submission will be done on Canvas in class. Other details will be advised on Canvas.
<b>Return Method</b>	Online
<b>Feedback Provided</b>	Online - .
<b>Opportunity to Reattempt</b>	Students WILL NOT be given the opportunity to reattempt this assessment.

# ADDITIONAL INFORMATION

## Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.

65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

\*Skills are those identified for the purposes of assessment task(s).

**Communication Methods**

Communication methods used in this course include:

**Course Evaluation**

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

**Oral Interviews (Vivas)**

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the [Oral Examination \(viva\) Procedure](#). In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the [Student Conduct Rule](#).

**Academic Misconduct**

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to <https://policies.newcastle.edu.au/document/view-current.php?id=35>.

**Adverse Circumstances**

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3. you are requesting a change of placement; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at:

<https://policies.newcastle.edu.au/document/view-current.php?id=236>

**Important Policy Information**

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at <https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures> that support a safe and respectful environment at the University.

## Graduate Profile Statements

This course builds students' capacity in the following University of Newcastle Bachelor of Engineering Graduate Profile Statements (based on 2011 Engineers Australia revised Stage 1 Competency Standards for Professional Engineers):

UON Att.	University of Newcastle Bachelor of Engineering Graduate Profile Statements/ Engineers Australia Stage 1 competency statements	Taught	Practised	Assessed	Skill Level (1-4)
	<b>Professional Attributes</b>				
11	3.1. Ethical conduct and professional accountability		X		
12	3.2. Effective oral and written communication in professional and lay domains.		X		
13	3.3. Creative, innovative and pro-active demeanour.		X		
14	3.4. Professional use and management of information.		X		
15	3.5. Orderly management of self, and professional conduct.		X		
16	3.6. Effective team membership and team leadership.		X		
	<b>Engineering Ability</b>				
7	2.1. Application of established engineering methods to complex engineering problem solving.	X	X	X	3
8	2.2. Fluent application of engineering techniques, tools and resources.	X	X	X	3
9	2.3. Application of systematic engineering synthesis and design processes.	X	X		3
10	2.4. Application of systematic approaches to the conduct and management of engineering projects.				
	<b>Knowledge Base</b>				
1	1.1. Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.	X	X	X	3
2	1.2. Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.	X	X	X	3
3	1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.	X	X	X	3
4	1.4. Discernment of knowledge development and research directions within the engineering discipline.	X	X		3
5	1.5. Knowledge of contextual factors impacting the engineering discipline.				
6	1.6. Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the specific discipline.				

*This course outline was approved 23/02/2024 by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.*

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