School of Chemical Sciences and Engineering

CEIC2002 Chemical Engineering Fundamentals 2

SESSION 2, 2009

Contents

Course Staff

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General course information

Outline and aims

The aim of this course is to develop your understanding of the various modes of heat transfer and mass transfer phenomena. Problem-solving skills that you have acquired in first year courses are extended with numerical problems that involve: developing and applying methods for the estimation of rates of heat/mass transfer, temperature distributions and concentration profiles; implementing appropriate assumptions to simplify solutions; and critically evaluating different calculation methods.

Requisite knowledge and relationships to other courses

The topics of heat and mass transfer complement other areas such as material and energy balances (CEIC2000), as well as fluid flow (CEIC2001). All of these courses can be considered as core chemical engineering topics. They relate to the application of scientific knowledge to practical situations typically found in the chemical industry. They are also important for plant and equipment design (CEIC3004).

Target students and career prospects

The course is targeted at second year chemical engineering and industrial chemistry students. Course content is also relevant to Mechanical, Civil and Petroleum Engineering. Heat and mass transfer theory is widely used in the design of processes and equipment in the chemical industry.

Course Details

6 UOC with 4 hr/week of contact hours. The course is offered in Session 2 only.

Student Learning Outcomes

At successful completion of this course you should be able to:

- understand fundamental concepts in heat and mass transfer
- apply various methods for estimating rates of heat/mass transfer involving solid, liquid and gaseous phases
- identify physical property data needed in solving these problems

CEIC2002 also provides you with the opportunity to develop the following UNSW graduate attributes:

- the capacity for analytical and critical thinking and for creative problem-solving
- the ability to engage in independent and reflective learning
- information literacy - the skills to appropriately locate, evaluate and use relevant information

Assessment

Item	Marks	Due Date	Rationale and Assessment Criteria
Quizzes 1,2,3	30	Weeks 3,5,7	To assess understanding of **heat transfer** topics covered in weeks 1-6 and to provide feedback. Closed-book tests of equal value and approx. 40 min duration each.
Quizzes 4,5,6	30	Weeks 10,11,13	To assess understanding of **mass transfer** topics covered in weeks 7-12 and to provide feedback. Closed-book tests of equal value and approx. 40 min duration each.
Final Exam	40	Exam period	Summative assessment of the **whole course**. Formal exam because it has high reliability. Assessed on the basis of technical accuracy of calculations, speed of calculation and clarity of presentation and being able to exercise good engineering judgement. Closed-book exam of 2 hr duration.
	100	Total marks for the course	

Course Schedule

Lecture: Friday 11-1pm, Electrical Engineering, G24

Tutorial: Tuesday 11-1pm. You will be allocated to a tutorial group. Quizzes will be held every second week starting in Week 3 (see table below).

Week[+]	**Tutorial** **Tuesday 11 – 1pm**	**Lecture** **Friday 11 - 1pm**
1	No tute	Conduction
2	HT1, HT2	Conduction
3	11-12pm: Quiz 1 12-1pm: HT3, HT4	Convection
4	HT5, HT6	Convection
5	11-12pm: Quiz 2 12-1pm: HT7, HT8	Condensation and boiling
6	HT9	Heat exchangers
7	11-12pm: Quiz 3 12-1pm: HT10	No lecture
Mid-semester break		
8	No tute	MT1 Molar & Mass Flux MT2 Fick's Law MT3 Diffusion Coefficients
9	MT1, MT2, MT3	MT4 Diffusive Transfer MT5 Mass Transfer Coefficients
10	11-12pm: Quiz 4 (MT1, MT2, MT3) 12-1pm: MT4, MT5	MT6 Gas/Liquid Equilibrium MT7 Gas/Liquid Equilibrium
11	11-12pm Quiz 5 (MT4 & MT5) 12-1 pm:MT6 MT7	MT8 Mass Transfer Correlations MT9 Mass Transfer Correlations
12	MT8, MT9	MT10 Adsorption
13	11-12pm: Quiz 6 (MT6 – MT9) 12-1pm: MT10	Review & Exam Preparation

[+] Lectures in weeks 1-6 (heat transfer) given by A/Prof F. Lucien. Lectures in weeks 8-13 (mass transfer) given by A/Prof. G. Leslie.

Resources for Students

The recommended text books are:

1. J.P. Holman, Heat Transfer, McGraw-Hill (6th or higher edition preferred).
2. J.M. Coulson & J.F. Richardson with J.R. Backhurst and J.H. Harker, Chemical Engineering Volume 1: Fluid Flow, Heat Transfer and Mass Transfer, Butterworth Heinemann.

Students are expected to consult the textbooks for more detailed explanations of the various topics. Additional materials will be handed out in class and placed on Vista. You should check Vista at least twice a week.

Teaching Strategies

Analogies between heat and mass transfer will be made to highlight fundamental concepts. A heavy emphasis will be placed on solving numerical problems to reinforce the theory covered in the lectures. Tutorial workbooks have been prepared for this purpose. Each tutorial in the workbook consists of a series of numerical problems with varying degrees of difficulty. Worked solutions are included in the workbook, as well as summaries of the lecture content, allowing you to use it as a self-paced learning module. Regular quizzes will be conducted to assess your understanding of the topics and to provide you with feedback on your progress.

The rationale behind the approach to learning and teaching

Please refer to the Guidelines on Learning that Inform Teaching at UNSW. The Guidelines are available at:

www.guidelinesonlearning.unsw.edu.au/

Academic Honesty and Plagiarism

What is Plagiarism?
Plagiarism is the presentation of the thoughts or work of another as one's own.* Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.

Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:

www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students 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 items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle
† Adapted with kind permission from the University of Melbourne.

Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including the Course and Teaching Evaluation and Improvement (CATEI) Process. This feedback is used for course improvement in future years.

Other Matters

School policy on administrative matters relating to undergraduate students, including matters relating to examination procedures, and what to do in the event of illness or misadventure, may be found on the School's website at:

http://www.chse.unsw.edu.au/current/ug_school_policy.html

Information on UNSW Occupational Health and Safety policies and expectations may be found at:

http://www.riskman.unsw.edu.au/ohs/ohs.shtml

Students who have a disability that requires some adjustment in their learning and teaching environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of the course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (9385 4734). Information for students with disabilities is available at:

http://www.equity.unsw.edu.au/disabil.html

Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional examination and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

Change Log

Changes will not ordinarily be made to Course Outlines once published, especially so for assessment structure. Sometimes, however, it may be necessary to adjust the course schedule. Such changes should be documented here.

Document version	Changes made since previous version
2009.1	Release version