CHEMICAL ENGINEERING

Information Manual Level Two 2009

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WELCOME

I congratulate continuing students on your success in examinations last year and extend a warm welcome into Level II. A special welcome is extended to any new Australian or international students transferring directly into Level II from another program at the University of Adelaide or from elsewhere. You have completed a successful transition from secondary school to university and this experience will enable you to achieve bigger and better things in the year ahead. You will feel a sense of satisfaction with having successfully completed the first step in building the foundations for a successful career as a professional engineer. The versatility of Chemical Engineering graduates is well known and this versatility is even further enhanced by the options available for students to undertake specialisation streams within the degree program and a range of double degree programs. The School is committed to excellence in all its activities with special emphasis on student care. Now that you will be taking more courses run by the School you will inevitably have more contact with Chemical Engineering staff. You will find all academic, professional and technical staff to be approachable, friendly and willing to provide assistance when required. Please do not hesitate to contact the 2009 Level II Course Advisers, Dr Peter Ashman (Chemical Engineering) or Dr. Jingxiu Bi (Pharmaceutical Engineering) in the first instance should you require further information or assistance. In my role as Acting Head of School, I am always willing to meet with students, either individually or collectively to discuss any issues you may wish to raise. I try to make myself known to students whenever the opportunity arises. If we have not already met then I do hope that this will occur at some time during the year. I will be teaching CHEM ENG 2000 Chemical Engineering Thermodynamics in semester 2 so if you are enrolled in this course I will get to know you better. I offer my best wishes for a successful and enjoyable academic year.

Dr Peter Ashman
Acting Head of School

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GENERAL STUDENT INFORMATION

For further information about the Chemical Engineering School, Engineering North Building, please contact the appropriate person listed below:

Position	Staff Member	Room No.
Acting Acting Head of School	Dr Peter Ashman	N119
Undergraduate Course Advisor	A/Prof Brian O'Neill (Chem)	N114
Student Advisor Undergraduate Level I	Dr Peter Ashman (Chem) Dr Jingxiu Bi (Pharma)	N119 N212
Student Advisor Undergraduate Level 2	Dr Zeyad Alwahabi (Chem) Dr Jingxiu Bi (Pharma)	N113b N212
Student Advisor Undergraduate Level 3	Dr Ken Davey Dr Hu Zhang (Pharma)	N211 N208
Student Advisor Undergraduate Level 4	Dr David Lewis	N212b
Postgraduate Coordinator	Dr David Lewis	N212b
Employment/Industry Liaison	Dr Peter Ashman	N119
Business Manager	Mrs Dianne Parish	N118
School Office Staff	Mrs Mary Barrow Mrs Elaine Minerds Mrs Sue Earle	N120
Workshop Technical Officers	Mr Jason Peak Mr Jeff Hiorns Michael Jung	Engineering Workshop
Computing Engineer	Mr Sanh Tran	N206a
School Safety Officer	Mr Andrew Wright	N115
School Health and Safety Representative	Mrs Elaine Minerds	N120
First Aid Officers	Mrs Mary Barrow Mrs Dianne Parish	N120 N118
Laser Laboratory Coordinator	Dr Zeyad Alwahabi	N212b
Laboratory Coordinator	Mr Andrew Wright	N115
Equal Opportunity	Mrs Mary Barrow Mrs Dianne Parish	N120 N118

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Assessment Procedures, 2009

The following gives the proposed method of assessment and weighting factors for 2009. Minor changes may occur throughout the year. Students will be informed of these.

NOTES:

1. C.B. = Closed book
   O.B. = Open book

2. There shall be four classifications of pass at an annual examination in any course for the degree as follows: Pass with High Distinction, Pass with Distinction, Pass with Credit, Pass.

   There shall also be a classification of Conceded Pass. A candidate may present for the degree courses for which a Conceded Pass grade has been awarded within he following limits:
   - no course may be presented at the conceded pass level with a unit value greater than 3 units.
   - for any single Bachelor of Engineering program no more that 10% of the courses presented may be at the conceded pass level with a limit of 9 units in total.
   - for all double/combined programs no more than 10% of the courses presented may be at the conceded pass level with a limit of 12 units in total. All rules pertaining to the presentation of conceded passes within the individual programs must also be complied with.
   - articulating students and students with credit transfer may present 10% of their units undertaken at Adelaide at the conceded pass level and this number will be rounded up to a multiple of 3 and will not exceed 9 units in total.

3. Supplementary examinations are held two weeks after the main examination periods:

   Mid-year (Semester 1) 20 - 24 July 2009
   End of year (Semester 2) 14 - 18 December 2009

   Supplementary examinations are available on academic, medical and compassionate grounds. The decision to grant a supplementary examination is the responsibility of the academic staff.
   Please note: It is strongly recommended that students sit for their exams wherever possible because there is no guarantee that a supplementary will be granted.

   Academic Grounds
   For courses taught by Engineering Schools, supplementary examinations on academic grounds are normally offered to students obtaining a mark of 40-49 (provided they meet all other requirements of the course) and to students in their final year of study who have completed all the requirements for the degree with the exception of up to four units. Precise details on assessment in each course should be provided by Schools at the beginning of lectures.

   Students do not apply for academic supplementary examinations. The maximum final grade that can be awarded for a course in which students have an Academic Supplementary is 50 Pass, except where a higher division pass (55 P1) is required to proceed to the next level of the course.

   Medical Grounds
   Applications must be lodged within five (5) working days of the illness.

   It will be to your advantage to see a doctor on the day of the illness, so an accurate assessment of your condition can be made. Retrospective certificates are not accepted.

   The category of "unfit to sit an examination" is reserved for major illness that prevents attendance at the examinations. As a general rule, minor ailments, such as colds and mild respiratory infections, are not considered sufficient grounds for being certified unfit to sit an exam.
   There is no restriction on the maximum grade awarded for a Medical Supplementary.

   Compassionate Grounds
   Supplementary examinations may be awarded where special circumstances beyond the student's control significantly affect their preparation for, or performance in, an exam. Applications must be lodged within five

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(5) working days of the special circumstances. There is no restriction on the maximum grade awarded for a Compassionate Supplementary.

Students who are awarded a supplementary examination on medical or compassionate grounds will not be able to count the better of the primary and supplementary exams. Sitting a supplementary exam will constitute acceptance of the offer of the supplementary exam and only the supplementary exam result will be recorded (whether it is higher or lower than the first result).

Students granted a Medical or Compassionate Supplementary Examination and also eligible for an Academic Supplementary Examination

For courses taught by Schools in the Faculty of Engineering, Computer & Mathematical Sciences, students granted a medical/compassionate supplementary examination and who are also eligible for an academic supplementary examination should consider their options and before sitting the examination, advise the ECMS Faculty Student Office (ecms_office@adelaide.edu.au) whether they wish to accept the medical/compassionate supplementary examination or whether they wish to take the academic supplementary examination. If no notification is received it will be assumed that the student wishes to take the academic supplementary examination and thus allow the possibility of retaining the primary examination mark.

4. Tutorials and class exercises held during the year may count towards the mark in any subject for each component. This value will be specified by the lecturer in charge at the commencement of the course.

5. In subjects consisting of a number of components, a minimum mark of 40 must be obtained. This requirement applies to the following subject: CHEM ENG 3003A/B Chem Eng Projects III; CHEM ENG 4025 Chemical Engineering Projects IV, CHEM ENG 4027 Chemical Engineering Research Project (N), CHEM ENG 4026 Chemical Engineering Research Project (H).CHEM ENG 4002A/B Chemical Engineering Research Elective II and CHEM ENG 4020A/B Chemical Engineering Research Elective. A fail will be recorded if the student does not submit satisfactory project work in **ALL** components as specified by the examiner or supervisor.

6. **Exemptions and Status** - In some cases students may be granted status in whole subjects because of related studies taken previously. Exemptions from part of a subject previously attempted may be granted in some cases. You **must apply** for exemption or status; it does not happen automatically. Applications should be submitted to the **School Office** on the appropriate form **no later than** the end of Week 1 (6 March 2009).

7. **Chemical Engineering Honours:** To be eligible for the award of honours a student **should be** enrolled for the complete Fourth Year with the exception of up to 4 Units (composed of electives and/or CHEM ENG 4018 Ind. Econ. Man). In exceptional circumstances this requirement may be varied by the Head of the School. Honours will be awarded for meritorious performance throughout the course. To obtain the final honours mark a weighted average for each year will be evaluated based upon the subject weights shown in a calendar (eg a 2-point subject will contribute 2/24 = 8.33%) and the mark achieved by a student at their **first attempt** (with the exception of subjects where a medical supplementary was awarded). Results from any repeating subjects are **NOT** counted towards honours marks. Weights for the individual years are: Year 2 = 20%, Year 3 = 30%; Year 4 = 50%. Class I Honours requires 75%, Class IIA 70% and Class IIB 65%. Candidates will normally be required to average at least 75% in their final year for the award of Class I Honours.

   There is a selection process to choose candidates who will be permitted to undertake the honours stream in the fourth year of the BE. Those selected for honours may enrol in a specially designated level IV honours course. This course varies from program to program and details are given in the enrolment sheets for each program. The normal minimum requirement for selection for the honours stream is a weighted average of 60% over levels 2 and 3 of the BE, where the relative weighting of the levels is 2:3 respectively.

8. Students may apply **in writing** to have supervised access to their **examination scripts** within **three (3) weeks** of the publication of the provisional examination results.

9. Students who believe they have reasonable grounds for expecting a higher mark may request, **in writing** to the Acting Head of School within **three (3) weeks** of the publication of the results, for a piece of work to be reassessed

   Review of Academic Progress: Engineering implements a review of academic progress policy in accordance with University guidelines. This policy states that students who, in any one year of university study, fail 1/3 or more of their year's enrolment will be subject to review. The review in this case involves a formal letter and an interview with a Course Adviser in the School. The outcome could include referral to academic or counselling services and restriction of the student's enrolment, such that the student is not permitted to enrol

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in an overload in the following year. Further failures will result further restrictions and students failing 1/3 or more of their enrolment in each of three consecutive years will have their progress reviewed by the Academic Review Committee. The outcome of this review could include a recommendation for preclusion, compulsory deferment for one semester or one year, or a further restricted enrolment.

11. **University Policy on Plagiarism**: Details are available on the CLPD website at: http://www.adelaide.edu.au/clpd/plagiarism/students

Acting Acting Head of School
January 2009

Calculator Policy

1. **No restrictions** will be placed on the **type/brand** of calculator that may be used by students in an examination where the use of calculators is permitted.
2. Students are expected to own **either** a **graphing** calculator (similar to those used in Year 12 mathematics) or a calculator with a **solve function** (i.e. can iterate & solve non-linear equations). This is particularly useful in the later years of the course.
3. There will be **no restrictions** placed on calculator usage in **an open-book** examination or **an open-book** section of an examination.
4. Students are permitted to use a calculator in **all closed-book** examinations or **all closed-book sections** of an examination unless a **specific direction** is included on the examination cover sheet prohibiting the use of calculators
5. The use of calculators **may be prohibited in a defined part (or all) of a closed-book examination**. In this case, a separate answer book for this section **must be handed-in** before the portion of the paper in which a calculator may be used is commenced.

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School Policy and Procedures for Handling Student Complaints and Feedback

The following outlines the necessary steps to make a complaint, offer suggestions or comments, or express concerns about any issue deemed relevant to the School:

1. Bring the matter to the attention of the appropriate member of staff (academic, professional or technical) concerned.
2. If the matter is not resolved by following step 1, it should be discussed with the Year Level Advisor.
3. If the matter remains unresolved after following steps 1 and 2, it should be brought to the attention of the Acting Head of School. If the member of staff concerned in step 1 is the Acting Head of School then the appropriate person in step 3 is the Executive Dean.
4. Steps 1 and/or 2 may be by-passed if the student so desires.
5. If the student wishes to make anonymous complaints, suggestions or comments, a locked Suggestions Box is available on the wall outside the School Office (Room N120, North Engineering Building).

CHEMICAL ENGINEERING SUBJECTS - ASSESSMENT PROCEDURES (2009)

LEVEL II **Subject**	**Part**	**Paper No**	**Type**	**Duration (h)**	**Semester**	**Weight**
CHEM ENG 2010 INTRO TO PROCESS SIMULATION					1	(3.0 Units)
	1. Examination	1	{C.B.	1		70%
			{O.B.	2		
	2. Assignments and test					30%
CHEM ENG 2011 CHEMICAL ENGINEERING THERMODYNAMICS					2	(3 Units)
This is not applicable for students	1. Examination	1	{C.B.	1		80%
Doing Food Wine and Biomolecular			{O.B.	2		
stream	2. Tutorials and Tests					20%
CHEM ENG 2012 PRINCIPLES OF PHARMACEUTICAL ENGINEERING					1	(3.0 Units)
	1. Examination	1	{C.B.	1		80%
			{O.B.	2		
	2. Tutorials					20%
CHEM ENG 2013 PROCESS MODELLING AND COMPUTATIONS					1	(3.0 Units)
	1. Examination	1	{C.B.	1	2	80%
			{O.B.	2		
	2. Tutorials					20%
CHEM ENG 2014: PROCESS ENGINEERING IIA					1	(3.0 Units)
	1.					50%
	2. Presentation					50%
CHEM ENG 2015 PRINCIPLES OF BIOTECHNOLOGY II					2	(3.0 Units)
	1. Design Project Report					85%
	2. Class assignments					15%
CHEM ENG 2016: PROFESSIONAL PRACTICE II					2	(3.0 Units)
	1. Examination	1	{C.B.	1		80%
			{O.B.	2		
	2. Tutorials					20%
CHEM ENG 2018 PROCESS ENGINEERING IIB					2	(3.0 Units)
	1. Examination	1	{C.B.	1		80%
			{O.B.	2		
	2. Tutorials					20%

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The assessment procedures for Level II service subjects are available on MyUni.

Practical Experience

It is a student's responsibility to organise their own work experience and a booklet listing names of companies who have provided practical work experience to students in the past is available at the School Office. Engineers Australia also provides a booklet to their Student members listing a number of Chemical Engineering companies.

A total of **twelve weeks practical experience** (of which a minimum of 6 weeks should be under the supervision of a professional engineer) is required and this should be undertaken during the university vacations and be normally completed before beginning the work of Level IV of the course. It is desirable that at least half of the total number of weeks specified above be spent in an approved chemical factory or research establishment on plant operation or industrial research or development. The Faculty may grant either partial or total exemption from these requirements to a candidate who produces satisfactory evidence of practical experience obtained before their first enrolment in the Faculty; and in special cases, the Faculty may grant dispensation from the requirements. Credit will not normally be given for periods of less than three consecutive weeks. A candidate should seek a variety of practical experience appropriate to the candidate's academic level. Before beginning a period of practical experience, a candidate may ensure that it will be satisfactory to the Faculty by consulting the Acting Head of School.

Upon completion of each period of practical experience (and no later than the following 31 March) each candidate is required to submit to the Faculty Office, on the prescribed form, a statement of practical experience gained, certified by the employer for approval by the Faculty of Engineering.

To help you find work experience, we have produced a booklet which contains names, addresses and phone numbers of companies you may contact for work experience. This is available from the School of Chemical Engineering Office N120.

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STUDENT PLACEMENT PROGRAM AGREEMENT

Students who undertake **unpaid** work experience or a community placement program in connection with their course or approved research work will only be covered by the University's insurance program if the work is undertaken with the knowledge and consent of the University. To obtain and document this consent the student must complete a **Student Placement Program Agreement** before any work placement can take place. (This form (a total of three pages, may be found starting on the next page.)

The most important thing to remember is that if a student begins **unpaid** work placement place without the approval of the Acting Head of School and the completion of the Student Placement Program Agreement the University of Adelaide insurance program is **not** available to the student.

STUDENT PLACEMENT PROGRAM AGREEMENT

Part A - Student Details

Family Name ____________________ Given Names ____________________

Student ID # ____________________ Student Phone # ____________________

Degree/Program enrolled ____

____

Faculty ______________________________ Campus ________________

Emergency contact

Name ______________________________ Relationship ________________

Phone # Work: ________________ Home: ________________________

Mobile # ______________________________

School Contact

Name ______________________________ Phone # ____________________

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As a student on work placement, I agree

1. To attend the workplace to which I have been assigned at the agreed times and days stated below.
2. To notify both my workplace supervisor (named below) and the School Contact above if I am unable to attend for reasons of ill health or any other reason.
3. To present myself in an appropriately dressed fashion ensuring I am wearing any protective clothing which may be required by the Host Organisation.
4. Obey all lawful directions of the workplace to which I have been assigned.
5. To work to my full capacity, with due regard for my legal responsibilities in the workplace.
6. To comply with all Occupational Health & Safety requirements required by the host organisation.
7. To inform the host workplace supervisor and the School administration office of any accident or injury in which I am injured or in which I have injured another party.
8. In the event of an emergency I will contact the School administration office.

Student's Signature:______________________________Date:______________

Part B – Host Organisation

Name: ______________________________ Phone # ________________

Street address: ____

____

____

Contact Person: ______________________________ Phone # ________________

Email Address ______________________________ Fax# ________________

Location of placement ____

____

____

Supervisor Name ___________________________ Phone # ____________

Date of placement: (From) ___________________________ (To) ___________

Hours of work: (Start) __________________________ (Finish) ___________

Description of task to be performed ____________________________________

____

____

____

____

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Special Conditions (Clothing, safety equipment, parking)

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Part C – Conditions

We agree to accept the named student on work placement and to plan an appropriate program for their placement.

All reasonable precautions will be taken in the workplace to ensure the occupational health safety and welfare of the student in a non-discriminatory and harassment free working environment. The School administration office will be notified by our organisation in the case of a student's illness, injury or unexplained absence. The student will not receive any form of reward or stipend for work performed during and placement and will not be used to replace paid workers or be used during any form of industrial dispute. The student is not to be required to undertake any task prohibited by the University, Legislation or insurance requirements.

It is understood by all parties that the University, the host organization or the student may without notice cancel the work placement.

The host organization agrees that they have Occupational Health & Safety procedures in place and the student will receive a safety and workplace induction that will prepare them to safely undertake the tasks and duties of the work placement.

Part D – Insurance

The University maintains a Public Liability insurance policy that will indemnify the host organisation for any negligence act, error or omissions by the student during the period of the work placement. A Certificate of Insurances for Public Liability is enclosed with this Placement Agreement Form.

The host organization agrees to indemnity the University and the student for any injury, loss or damage to student or to University property being used by agreement with the host organisation, resulting from any negligent act or omission by its employees, agents or contractors.

The host organisation agrees to provide 'proof of insurance' for the period of the work placement to the School administration office. The student is not to commence the work placement until the proof of insurance has been sighted.

Host Organisation Authorising Officer Name: ______________________________

Signature ______________________________ Date ______________

Part E - Authorisation

I grant permission for the above named student to undertake a work placement with the above named host organisation in accordance with the conditions and guidelines above:

Acting Head of School

Signature ______________________________ Date ______________

Distribution

1. School administration office
2. Host organisation
3. Student

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Adelaide University Undergraduate Scholarships

A list of potential scholarships is available on the web at the following URL:

http://www.adelaide.edu.au/scholarships/undergrad/

Chemical Engineering Undergraduate Prizes

Each year students who achieve a weighted average of over 80% for that year will receive a Dean’s Merit Award.

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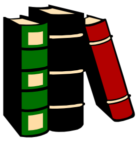
Course Notes and Syllabus

Level II - Requirements for B.E. (Chem.) and Combined Degrees.



The Bachelor of Engineering degree (including all combined degrees) may be awarded in the Pass or Honours grade. The award of the Honours grade shall be made for meritorious performance in the course with greatest weight given to performance in the later years.

The Honours grade may be awarded in one of the following classifications: First Class, Second Class Division A, Second Class Division B. (There is no Third Class for the Bachelor of Engineering degree).

To qualify for the degree a candidate shall regularly attend lectures and do written, laboratory, and other practical work (where such is required), and pass examinations in the subjects prescribed in the Specific Course Rules for one of the specialisations listed above.

Before being admitted to the degree a candidate shall also submit satisfactory evidence of completion of a period of practical experience in work approved by the Faculty of Engineering as appropriate to the course which the candidate has followed.

Candidates are required to complete satisfactorily subjects to the value of 24 Units at each of Levels I, II, III and IV.

Course Notes and Syllabus Requirements for B.E. (Chem.) and Combined Degrees.

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The degree course with Honours in BE (Chem.) shall occupy four years of full-time study. Details of BE courses can be found at the following site.

http://www.ecms.adelaide.edu.au/enrol/guides/

B.E. Chem (Energy and Environment)
B.E. Chem (Process and Product Engineering)
B.E. Chem (Food, Wine and Bio-molecular)
B.E. in Sustainable Energy Engineering (Chemical)
B.E. in Pharmaceutical Engineering

Double and Combined Programmes

It is possible for students to enhance their engineering qualifications by combining studies in Engineering with studies in other faculties. Information can also be found at: **http://www.ecms.adelaide.edu.au/enrol/guides/**

The complete Academic Program Rules governing the award of combined degrees is available online as a pdf file from the University's website. The URL is:

www.adelaide.edu.au/calendar/ug/eng

B.E. (Chem.)/B.Sc
B.E. (Chem)/B.Ma&Comp.Sc. (Computer Science focus)
B.E. (Chem)/B.Ma&Comp.Sc. (Mathematics focus)
B.E. (Chem)/B.A.
Arts Studies Combined with the B.E.(Chem)
B.E. (Chem.)/B.Ec.
B.E.(Chem.)/B.Fin..
B.E. (Chem.)/B.Sc (Biotech)

B.E. (Petroleum.)/B.E. (Chemical)

The Bachelor of Engineering degree in the specialisations listed above may be awarded in the Pass or Honours grade. The award of the Honours grade shall be made for meritorious performance in the course with greatest weight given to performance in the later years. The Honours grade may be awarded in one of the following classifications: First Class, Second Class Division A, Second Class Division B. (There is no Third Class for the Bachelor of Engineering degree). To qualify for the degree a candidate shall regularly attend lectures and do written, laboratory, and other practical work (where such is required), and pass examinations in the subjects prescribed in the Specific Course Rules for one of the specialisations listed above. Before being admitted to the degree a candidate shall also submit satisfactory evidence of completion of a period of practical experience in work approved by the Faculty of Engineering as appropriate to the course which the candidate has followed. Candidates are required to complete satisfactorily subjects to the value of 24 Units at each of Levels I, II, III and IV.

Candidates Transferring after Completing a Science Degree

A candidate who has completed the academic requirements for the degree of B.Sc. should consult the Head of the School of Chemical Engineering before preparing an application to the Faculty of Engineering for appropriate status. Normally, acceptable candidates may proceed to the degree of B.E. (Chem.) by completing a further two-year program as specified by the Acting Head of School.

Prerequisite Subject Requirements

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A student may not normally undertake a subject for which the prerequisite subject requirements have not been satisfied. Although the School of Engineering is reluctant to waive the prerequisite requirements of a subject, it is recognised that there can be situations where it is appropriate. Accordingly, if a student has sound academic reasons for a waiver of the requirement, he or she should apply to the School of Engineering through the Head of the School which offers the subject concerned.

SUMMARY OF AIMS, OUTCOMES ASSESSMENT AND SYLLABUS FOR LEVEL II CHEMICAL ENGINEERING SUBJECTS

CHEMENG 2010 : INTRODUCTION TO PROCESS SIMULATION

Level:	*II*
Units:	*3.0*
Duration:	*Semester 1*
Lecturer:	*Dr. Yung Ngothai*
When:	*Refer Timetable under Current Students in MyUni*

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AIMS:

i. To introduce students to the principles of material and energy balances and the techniques used in chemical process calculations

ii. To develop systematic problem solving skills so as to be able to deal with the complexity of large problems.

iii. To introduce students to the key concepts of process design and to provide basic instruction in application of knowledge learned to industrial process design.

OUTCOMES:

At the end of this course students should be able to:

1. Perform calculations with different systems of units and apply concepts of dimensional consistency.
2. Understand the various basic concepts used in chemical engineering and process calculations.
3. Formulate and solve problems involving mass and energy balances.
4. Understand how to use computers for solving process design problems.
5. Know the various stages involved in undertaking engineering projects in the chemical process industry.
6. Use key concepts of process simulation to solve an open-ended mass & energy balance for a relatively complex process flowsheet.
7. Present a properly formatted design report.
8. Work efficiently and productively in small teams.

SYLLABUS:

1. *Material Balances:* fundamentals of material balances; material balance calculations; balances on multiple-unit processes; recycle and bypass; material balances with chemical reactions; combustion process. (6L, 6T).
2. *Gases, Vapours, Liquids and Solids*: ideal gas; real gas relationships; gaseous mixtures; equations of state; compressibility charts; phase rule; multiphase systems (2L, 2T).
3. *Energy Balances*: concepts and units; forms of energy; use of thermodynamic data; the general energy balance; energy balances on physical processes; the mechanical energy balance; energy balances with chemical reaction (8L, 8T).
4. *Introduction to Chemical Process Design*: stages involved in the evolution of chemical engineering projects; and introduction to the concept design process: establishing a process flowsheet, and preparing mass and energy balances. Written Communication (3L).
5. *Design Project*: The report workshops will enable you to address any group and technical issues that arise with the report. The report teamwork will provide groups with mutually agreeable times to conduct team meetings and coordinate their report work. (5h Report Workshops, 5 h Report Teamwork).

ASSESSMENT:

Tutorial assignments:	10%
Mid-semester Test	10%
Design Report:	20%
Final examination:	60%.

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TEXTBOOK:

- R.M. Felder & R. W. Rousseau, *"Elementary Principles of Chemical Processes", 3rd Edition*, 2005 Edition with Integrated Media and Study Tools, Wiley (2005).

REFERENCES:

- D. M. Himmelblau & J. B. Riggs, *"Basic Principles and Calculations in Chemical Engineering", 7th Edition*, Prentice-Hall (2004).
- R. M. Murphy, *"Introduction to Chemical Processes: Principles, Analysis, Synthesis"*, McGraw-Hill (2007).
- R. L. Earle & M. D. Earle, *"Unit Operation in Food Processing - the Web Edition"*, http://www.nzifst.org.nz/unitoperations.
- G.V. Reklaitis, *"Introduction to Material and Energy Balances"*, Wiley (1983).
- D. Shallcross, "Physical Property Data Book for Engineers and Scientists", IChemE (2004).
- G.F.C. Rogers & Y.R. Mayhew, *"Thermodynamic and Transport Properties of Fluids - SI Units", 5th Edition*, Blackwell (1995) .
- R.H. Perry & D. Green, *"Perry's Chemical Engineers' Handbook", 7th Edition*, McGraw-Hill (1997).

GRADUATE ATTRIBUTES

1. Ability to apply knowledge of basic science and engineering fundamentals.
2. In-depth technical competence in at least one engineering discipline.
3. Ability to utilize a system approach to design and operational performance.
4. Ability to focus on the integration of process safety considerations with environmental concerns, waste minimization and control system specifications.
5. Confidence to tackle real-world problems and issues central to engineering and to work as individuals and co-operatively in multidisciplinary and multicultural teams.
6. Enthusiasm and interest for undertaking life-long learning and the continual updating of engineering skills.

CHEM ENG 2011: CHEMICAL ENGINEERING THERMODYNAMICS

Units:	*3.0*
Duration:	*Semester 2*
Lecturer:	*Professor Keith King*
When:	*Refer Timetable under Current Students in MyUni*

AIMS

To introduce students to:

1. The fundamental concepts and principles of modern chemical engineering thermodynamics with an emphasis on relevance to other parts of the chemical engineering curriculum.
2. The application of these principles to the solution of energy flow and equilibrium (phase and reaction equilibria) problems.

OUTCOMES

At the end of this course, students should be able to:

1. Compute the thermodynamic properties of pure gases and liquids, and their mixtures.
2. Determine the heat and work requirements for physical, chemical and biochemical processes.
3. Determine the equilibrium condition for chemical reactions and for the transfer of chemical species between phases.
4. Identify and formulate problems in chemical and biochemical engineering therrmodynamics and find appropriate solutions.

ASSESSMENT

Tutorial assignments and tests: 30%.
Final examination: 70%.

TEXT BOOK

J. M. Smith, H. C. Van Ness, and M. M. Abbott, "Introduction to Chemical Engineering Thermodynamics", McGraw-Hill, 7th Edition, 2005.

Reference Books (these texts are useful but do not need to be purchased by the student)

B. E. Poling, J. M. Prausnitz, and J. P. O'Connell, "The Properties of Gases and Liquids", McGraw-Hill, 5th Edition, 2001.

S. I. Sandler, "Chemical, Biochemical, and Engineering Thermodynamics", Wiley, 4th Ed., 2006.

Syllabus

PVT Relationships and Equations of State

The law of corresponding states: PVT surfaces, critical constants, law of rectilinear diameters, virial equation, "simple" fluids, "normal" fluids. Empirical equations of state: van der Waals, Redlich-Kwong. Generalized correlations.

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Thermodynamic Properties of Real Substances

Thermodynamic functions. Estimation of thermodynamic properties from PVT data and heat capacities. Detailed calculation of thermodynamic properties for real gases. Generalized correlation of thermodynamic properties; hypothetical ideal-gas states. Fugacities of gases, liquids and solids. Phase changes: Clausius-Clapeyron equation. Vapor pressure. Properties of 2-phase systems. Property representations. Steady-state flow: compressors and turbines, throttling devices, nozzles.

Power generation

Carnot cycle. Rankine cycle: steam power plant; superheat, reheat and regeneration. Thermodynamics of mechanical explosions.

Refrigeration and Liquefaction

Carnot refrigeration cycle. Refrigerant charts and diagrams. Vapor-compression cycle: expansion valves, expansion engine. Absorption refrigeration. Liquefaction: Joule-Thomson effect, Linde process.

Phase Equilibrium and Multicomponent Systems

General conditions of equilibrium. Criteria of equilibrium. Composition of phases in equilibrium. Ideal-liquid solutions; Raoult's Law; Henry's Law; Lewis-Randall Rule. Vapor-liquid equilibrium at low and high pressures. Dew point and bubble point. Phase equilibrium constants. Excess mixture properties. Gibbs-Duhem equation; partial molar quantities. Activity coefficients: Margules and van Laar equations, thermodynamic consistency tests. Empirical and predictive liquid mixture models.

Chemical Reaction Equilibria

Reaction thermochemistry. Reaction equilibrium constants. Temperature dependence of equilibrium constants: van't Hoff equation. Pressure dependence of equilibrium yields; inert gas effects. Complex equilibria: multiple reactions. Heterogeneous gas-solid, gas-liquid and liquid-solid reactions. Thermodynamics of chemical explosions.

Biochemical Applications of Thermodynamics

Pharmaceuticals. Biochemical reactions. Fermenters and other bioreactors.

GRADUATE ATTRIBUTES:

- The ability to apply knowledge of basic science and engineering fundamentals.
- Ability to communicate effectively, not only with engineers but also with the community at large.
- In-depth technical competence in at least one engineering discipline.
- Ability to utilise a systems approach to design and operational performance.
- Understanding the social, cultural, global and environmental responsibilities of the professional engineer and the need for sustainable development.
- Understanding of professional and ethical responsibilities and commitment to them and expectation of the need to undertake lifelong learning and capacity to do so.
- Confidence to tackle real-world problems and issues central to engineering and to work as individuals and cooperatively in multidisciplinary and multicultural teams.
- Enthusiasm and interest for undertaking life-long learning and the continual updating of their engineering skills.

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CHEMENG 2012: PRINCIPLES OF PHARMACEUTICAL ENGINEERING

Units:	*3*
Duration:	*Semester 1*
Lecturer:	*Dr Jingxiu Bi*
When:	*Refer Timetable under Current Students in MyUni*

Aims:
The aims of this course are:
- Basic information about drug discovery and development, FDA requirements and approval processes,
- The role of key operational units in drug manufacturing processes
- Brief introduction to process design emphasizing unique requirements of pharmaceutical plants (e.g. high purity, specialized utility systems, etc) will be included

Outcomes:
(1) Outline the profile of pharmaceutical industry, key issues of FDA approval processes;
(2) Understand the core steps of pharmaceutical products development and processes;
(3) Understand the principles of sterilization, cell grow kinetics and bioreactor operation;
(4) Understand the principle and phenomena of membrane separation and its application in pharmaceutical manufacturing process
(5) Understand the principles of four core chromatography-gel filtration chromatography, ion-exchange chromatography, hydrophobic interaction chromatography and affinity chromatography and their application in downstream process.
(6) Understand the key analytical methods to evaluate the pharmaceutical product purity and structure.
(7) Case study-how to apply all of these technologies to fulfill a project design to produce recombinant protein for clinical trial. And present the project design in the course;

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Assessment:
- Examination: 70% (3hr closed book)
- Assignment: 20%
- Presentation: 10%

Textbook
Course material includes information supplied by Dr. Jingxiu Bi through MyUni.

References Books:
1) Shuler M.L. & Kargi F. Bioprocess Engineering 2nd Edition, 2002 (Prentice-Hall International);
2) Janson J.-C. and Ryden L., Protein Purification, principles, high resolution methods and applications . Wiley VCH, 1997, 2nd Edition

Syllabus
Principles for separation operations to recover products from biological processes & natural resources will be developed - membrane filtration, chromatography, centrifugation, cell disruption, aqueous two-phase extraction, etc. Brief introduction to process design emphasizing unique requirements of pharmaceutical plants (e.g. high purity, specialized utility systems, etc.) will be included.

Unit1: Introduction (2L)
Brief introduction of pharmaceutical industry profile, global pharmaceutical products market. What are the main tasks of pharmaceutical engineers in the modern pharmaceutical engineering?

Units2: Cell growth and bioreactors operation (8L)
Including the principles of
- Sterilization (1L)
- Cell growth kinetics (2L)
- Bioreactor operation of batch culture, continuous culture and fed-batch culture (2L)

- Cell disruption (1L)

Unit3: Membrane Separation and Precipitation Operation (4L)

- Pressure driven membrane process of ultrafiltration (UF), microfiltration(MF), reverse osmosis (RO). Concentration driven membrane process of dialysis and osmosis.
- Different membrane configurations, dead-end and cross-flow membrane operating modes.
- How to overcome the membrane fouling or polarization?
- Application: Solution concentrated by membrane and product precipitation.

Unit 4: Principle of chromatography and application (8L)

- General introduction of chromatography technology and instrument (1L)
- How to improve the resolution of chromatography (1L)
- Chromatography operation—column equilibrium, solution loading, elution, washing and CIP (1L)
- Principles of ion exchange chromatography and important factors to improve column efficiency (2L)
- Principles of hydrophobic interaction chromatography and operating mode (1L)
- Principles of affinity chromatography and innovative affinity ligand design (1L)
- Integration of Chromatography in the downstream process (1L)

Unit5: Specific requirement of high purity and structure of pharmaceutical products (6L)

- Core analytical methods of products characterization-such as HPLC, SDS-PAGE, CD. (2L)
- Process optimization and product quality control (1L)
- Case study and presentation (3L)

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GRADUATE ATTRIBUTES:

- The ability to apply knowledge of basic science and engineering fundamentals.
- Ability to communicate effectively, not only with engineers but also with the community at large.
- In-depth technical competence in at least one engineering discipline.
- Ability to utilise a systems approach to design and operational performance.
- Ability to function effectively as an individual and in multi-disciplinary and multicultural teams; with the capacity to be a leader or manager as well as an effective team manager.
- Understanding the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development.
- Understanding of professional and ethical responsibilities and commitment to them; and expectation of the need to undertake lifelong learning, and capacity to do so.
- Ability to focus on the integration of process safety considerations with environmental concerns, waste minimisation and control system specifications.
- Confidence to tackle real-world problems and issues central to engineering and to work as individuals and cooperatively in multidisciplinary and multicultural teams.
- Enthusiasm and interest for undertaking life-long learning and the continual updating of their engineering skills.

CHEMENG 2013: PROCESS MODELLING AND COMPUTATIONS

Units:	*3*
Duration:	*Semester 2*
Lecturer:	
When:	*Refer Timetable under Current Students in MyUni*

Aims:

Outcomes:

Assessment:

Textbook

References Books:

Course Outline

GRADUATE ATTRIBUTES:

- The ability to apply knowledge of basic science and engineering fundamentals.
- Ability to communicate effectively, not only with engineers but also with the community at large.
- In-depth technical competence in at least one engineering discipline.
- Ability to utilise a systems approach to design and operational performance.
- Ability to function effectively as an individual and in multi-disciplinary and multicultural teams; with the capacity to be a leader or manager as well as an effective team manager.
- Understanding the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development.
- Understanding of professional and ethical responsibilities and commitment to them; and expectation of the need to undertake lifelong learning, and capacity to do so.
- Ability to focus on the integration of process safety considerations with environmental concerns, waste minimisation and control system specifications.
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- Enthusiasm and interest for undertaking life-long learning and the continual updating of their engineering skills.

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CHEM ENG 2014: PROCESS ENGINEERING IIA

Units value :	*3*
Duration :	*Semester 1*
Lecturer:	*Dr Zeyad Alwahabi*
When:	*Refer Timetable under Current Students in MyUni*

Aims:
1. Basic concepts and principles of heat transfer encountered in chemical process industries
2. Analytical, empirical and numerical techniques for the solution of heat transfer problems.
3. Introduction in diffusion mass transfer.

Outcomes:
At the end of the course, students should be able to:
1. Describe fluid flow phenomena in terms of the basic principles of fluid mechanics.
2. Determine the pressure drop along a specified piping system.
3. Size a centrifugal pump.
4. Select flow meters and convert the measurement to a flow rate.
5. Understand the principle of operation of a range of fluid motive devices and flow measuring devices.
6. Calculate the settling rate of spheres in liquids.
7. Understand the concept of an economic pipe diameter
8. Determine the flow of liquid in each branch of a simple network.
9. Conduct dimensional analysis on engineering fluid mechanics systems
10. Construct mass, momentum and energy balances on fluid mechanics systems.

Assessment:

Assignments:	12%
Test 1	08%

Final Examination 80%

Text Book:
Holman, J.P., Heat Transfer, (McGraw-Hill)

Recommended Reading:
Incropera F. P and Dewitt, D. P., Fundamental of Heat and Mass Transfer, (Wiley)

Course Synopsis:

At the conclusion of the course, students should be able to:
1. Understand the basic concepts and laws of the three modes of heat transfer
2. Apply analytical techniques to the solution of simple conduction heat-transfer problems
3. Understand and use empirical equations to solve forced and natural convection heat-transfer problems
4. Solve simple radiation heat transfer problems
5. Analyse the heat transfer processes involved in boiling and condensation.
6. Perform basic calculations of common heat exchangers to determine relevant design parameters.
7. Solve simple diffusion mass transfer problems
8. Understand the workings of relevant instrumentation

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Syllabus:

Introduction to heat transfer
- Conduction, thermal conductivity
- Convection
- Radiation

Steady-state conduction heat transfer
- Single-dimension heat transfer
- Planar, cylindrical, spherical geometries
- Overall heat transfer coefficient
- Critical insulation thickness
- Fins
- Multi-dimensional heat transfer - graphical analysis

Unsteady-state conduction heat transfer
- lumped heat capacity system
- Transient heat conduction in semi-infinite solid
- Convection boundary condition

Convection heat transfer
- Analogy between fluid friction and heat transfer
- Thermal entry length for pipe
- Dimensional analysis in heat transfer
- Forced laminar and turbulent convection, correlations for pipe flow
- Liquid metal heat transfer
- natural convection

- mixed free and forced convection

Radiation heat transfer

- Radiation properties
- Geometric (shape) factors

- Heat exchange between grey bodies types of exchangers: double pipe, shell & tube, cross-flow, plate, compact

- Fouling factors (coefficients)
- Log mean temperature difference and correction factors
- Effectiveness – NTU method
- Methodology of a heat exchanger calculation

Diffusion Mass transfer

- Physical origins
- Mass diffusion coefficient
- Mixture composition
- Fick's law of Diffusion
- Conservation of species

- Mass Diffusion without chemical reactions

GRADUATE ATTRIBUTES:

- The ability to apply knowledge of basic science and engineering fundamentals.
- In-depth technical competence in at least one engineering discipline.
- Ability to utilise a systems approach to design and operational performance
- Understanding the social, cultural, global and environmental responsibilities of the professional engineer and the need for sustainable development.
- Ability to focus on the integration of process safety considerations with environmental concerns, waste minimisation and control system specifications.
- Confidence to tackle real-world problems and issues central to engineering and to work as individuals and cooperatively in multidisciplinary and multicultural teams.
- Enthusiasm and interest for undertaking life-long learning and the continual updating of their engineering skills.

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CHEMENG 2015: PRINCIPLES OF BIOTECHNOLOGY II

Units: *3*
Duration: *Semester 2*
Lecturer:
When: *Refer Timetable under Current Students in MyUni*

Aims:

Outcomes:

Assessment:

Textbook

References Books:

Course Outline

GRADUATE ATTRIBUTES:

- The ability to apply knowledge of basic science and engineering fundamentals.
- Ability to communicate effectively, not only with engineers but also with the community at large.
- In-depth technical competence in at least one engineering discipline.
- Ability to utilise a systems approach to design and operational performance.
- Ability to function effectively as an individual and in multi-disciplinary and multicultural teams; with the capacity to be a leader or manager as well as an effective team manager.
- Understanding the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development.
- Understanding of professional and ethical responsibilities and commitment to them; and expectation of the need to undertake lifelong learning, and capacity to do so.
- Ability to focus on the integration of process safety considerations with environmental concerns, waste minimisation and control system specifications.
- Confidence to tackle real-world problems and issues central to engineering and to work as individuals and cooperatively in multidisciplinary and multicultural teams.
- Enthusiasm and interest for undertaking life-long learning and the continual updating of their engineering skills.

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CHEMENG 2016: PROFESSIONAL PRACTICE II

Units:	*3*
Duration:	*Semester 2*
Lecturer:	*Dr Peter Ashman*
When:	*Refer Timetable under Current Students in MyUni*

Aims:

Outcomes:

Assessment:

Textbook

References Books:

Course Outline

GRADUATE ATTRIBUTES:

- The ability to apply knowledge of basic science and engineering fundamentals.
- Ability to communicate effectively, not only with engineers but also with the community at large.
- In-depth technical competence in at least one engineering discipline.
- Ability to utilise a systems approach to design and operational performance.
- Ability to function effectively as an individual and in multi-disciplinary and multicultural teams; with the capacity to be a leader or manager as well as an effective team manager.
- Understanding the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development.
- Understanding of professional and ethical responsibilities and commitment to them; and expectation of the need to undertake lifelong learning, and capacity to do so.

- Ability to focus on the integration of process safety considerations with environmental concerns, waste minimisation and control system specifications.
- Confidence to tackle real-world problems and issues central to engineering and to work as individuals and cooperatively in multidisciplinary and multicultural teams.
- Enthusiasm and interest for undertaking life-long learning and the continual updating of their engineering skills.

CHEM ENG 3002: Essay & Seminar

Units value : *2*
Duration : *Semester 2*
Lecturer: *Ms Dorothy Missingham*
When: *Refer Timetable under Current Students in MyUni*

Aims

The objectives of the essay and seminar program are to:

1. Provide students with learning opportunities to develop skills in researching, critically analysing, preparing and presenting relevant to a specified topic.
2. Assist students to develop and refine oral skills, relevant to professional and academic engineering communication.
3. Assist students to develop and refine written academic and professional engineering communication.

Outcomes

At the end of this course, students should be able to:

1. Prepare a clearly and cogently written research on specified topics
2. Prepare written material for other professional and academic purposes within the engineering discipline.
2. Prepare and deliver clear and confident public presentations and answer questions on a specified topic.
3. Chair a public presentation.

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Assessment

- 70% assignment based
- 10% group work
- 10% peer/self assessment
- 20% participation (including class exercises, professional expectations, attendance).

<u>GRADUATE ATTRIBUTES:</u>

- Confidence to tackle real-world problems and issues central to engineering and to work as individuals and cooperatively in multidisciplinary and multicultural teams.
- Understanding the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development.
- Ability to communicate effectively, not only with engineers but also with the community at large.
- Understanding of professional and ethical responsibilities and commitment to them; and expectation of the need to undertake lifelong learning, and capacity to do so.
- Enthusiasm and interest for undertaking life-long learning and the continual updating of their engineering skills.
- Enthusiasm and interest for undertaking life-long learning and the continual updating of their engineering skills.

CHEMENG 2018: PROCESS ENGINEERING IIB

Units value: *3*
Duration: *Semester 2*
Lecturer: *Professor Mark J. Biggs*
When: *Refer Timetable under Current Students in MyUni*

Aims:
To provide an introduction to the fundamentals of fluid mechanics and their application in the process engineering context, and to foster relevant problem solving skills.

Outcomes:
On successful completion of the course, you should be able to:
1. discuss the basic principles and analysis of both static and dynamic fluid systems;
2. discuss the principle of operation of a range of fluid motive and flow measuring devices;
3. undertake dimensional analysis of engineering fluid systems; and
4. design pipe networks including branches, pumps and flow measurement devices;

Assessment:
Assessment will be via coursework (20%) and exam (80%). The coursework will be in the form of two mini-assignments of equal weighting. The exam will be two hours in length and you will be required to answer two out of three questions in a closed-book format.

Text Books:
Munson, B., Young, D. and Okiishu, T. *Fundamentals of Fluid Mechanics* (4th edition), John Wiley and Sons (2002).
Copies of the overheads and links to various other online resources will be provided on MyUni.

Syllabus:
1. Introduction to fluids and fluid mechanics: definition of a fluid; shear, strain rate and viscosity; compressible and incompressible flows; inviscid and viscous flows; steady and unsteady flow; laminar and turbulent flow; continuum view of fluids and its range of applicability.
2. Fluid properties: definition of quantity and property, intensive and extensive properties; density; absolute, gauge and vacuum pressures; thermal properties; compressibility and elasticity; thermal expansion; surface tension; dynamic viscosity; kinematic viscosity.
3. Fluid statics: Pascal's law; Archimedes principles; force on a submerged body.
4. Fluid kinematics: Flow regimes; Lagrangian and Eulerian descriptions; streamlines, streaklines and pathlines; dimensionality and directionality.
5. Conservation of mass, momentum and energy: control-volume rate-of-change equation; simplified forms; conservation of energy; Bernoulli's equation; conservation of momentum.
6. Equations of Motion: Euler, Cauchy and Navier-Stokes equations.
7. Dimensional analysis: geometric, kinematic and dynamic similarity in fluid mechanics; Buckingham's Pi Theorem; key parameters for incompressible and compressible flows (e.g. Reynolds, Froude and Mach numbers).
8. Flow in pipes and conduits: regimes of flow; developing flow; energy loss in pipes; Darcy-Weisbach equation; friction factor; Hagen-Poiseuille equation; pipe flow calculations.
9. Flow through pipe fittings: expansions and contractions; loss coefficients; equivalent lengths.
10. Pipe networks: multiple pipe systems; pipe networks; economic pipe diameter.
11. Flow measurement: venturi and orifice meters; rotameters; pitot and impact tubes.
12. Solids in fluids: drag and lift coefficients; form and friction drag; boundary layers; spheres in liquids; Stokes equation.
13. Turbomachinery: centrifugal machines; centrifugal pump selection and sizing; NPSH; similarity and scaling laws; other turbomachines.

Graduate attributes:
- The ability to apply knowledge of basic science and engineering fundamentals.
- Ability to communicate effectively, not only with engineers but also with the community at large.
- In-depth technical competence in at least one engineering discipline.
- Confidence to tackle real-world problems and issues central to engineering and to work as individuals and cooperatively in multidisciplinary and multicultural teams.

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- Enthusiasm and interest for undertaking life-long learning and the continual updating of their engineering skills.

Instructions to Undergraduate Students Working in Undergraduate Laboratories

General

The University of Adelaide recognises its obligation to take all reasonable precautions to safeguard the health, safety and welfare of its employees and students while they are at work. The University of Adelaide also believes that students leaving this University must take with them an attitude that accepts good health and safety practice as normal. To this end, University Laboratory Conduct Procedures have been developed and where practical must be adhered to by all that work in departmental laboratories. It is strongly recommended that new students and research workers familiarise themselves with the University Laboratory conduct procedures and view the film entitled "Safety in Laboratories" available from the Occupational Health & Safety Unit.

Persons who fail to comply with these procedures may be prohibited from working in laboratories.

The University procedures should be read in conjunction with the Australian Standard 2243, "Safety in Laboratories", Parts 1 to 10 inclusive. Australian Standards can be accessed via a link through the Barr Smith Library.

The School acknowledges the University Laboratory Conduct Procedures and recognises the specific requirements of chemical engineering laboratories. With this in mind the School has formulated specific laboratory regulations which reflect the particular nature of its laboratories. Laboratory users are reminded that these School procedures are in addition to the Universities requirements.

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Engineering North Emergency Procedures

R.A.C.E

*** Remove**

*** Alert**

*** Contain**

*** Evacuate**

Immediately upon discovering a fire or other emergency

1. Remove Others.

Do not put yourself or others at risk.

2. Alert Others

Sound the Alarm.

Break glass type alarm points are situated in the corridors.

Telephone for Help. *RING 35444*

Explain location and extent of fire or emergency.

AFTER HOURS An emergency telephone is located on the ground floor of the north engineering building near the main southern entrance. (Marked X on the evacuation map.)

3. Contain the Emergency

Fight the fire ONLY if safe to do so. Do not put yourself or others at risk.

4. Evacuate

The evacuation alarm will sound firstly as a "**Beep-Beep"** sound. This is the alert phase. You should prepare to evacuate by making your area safe. This means switching of equipment and collecting your personal belongings. The alert phase will then change to the evacuate phase which is a "**Woop- Whoop"** sound. This will be accompanied by a verbal instruction.

This means ALL occupants MUST EVACUATE.

Proceed via the safest route to the assembly area. Take your personal effects, keys, bags, etc. with you as you may not be able to re enter the building. Follow Exit Signs or the directions of wardens in red hats.

DO NOT RE-ENTER THE BUILDING until permitted to do so by authorised persons.

Assembly Area

*All occupants **must** assemble on the School of Petroleum Engineering gardens with overflow onto Frome Road footpath under instructions from wardens*

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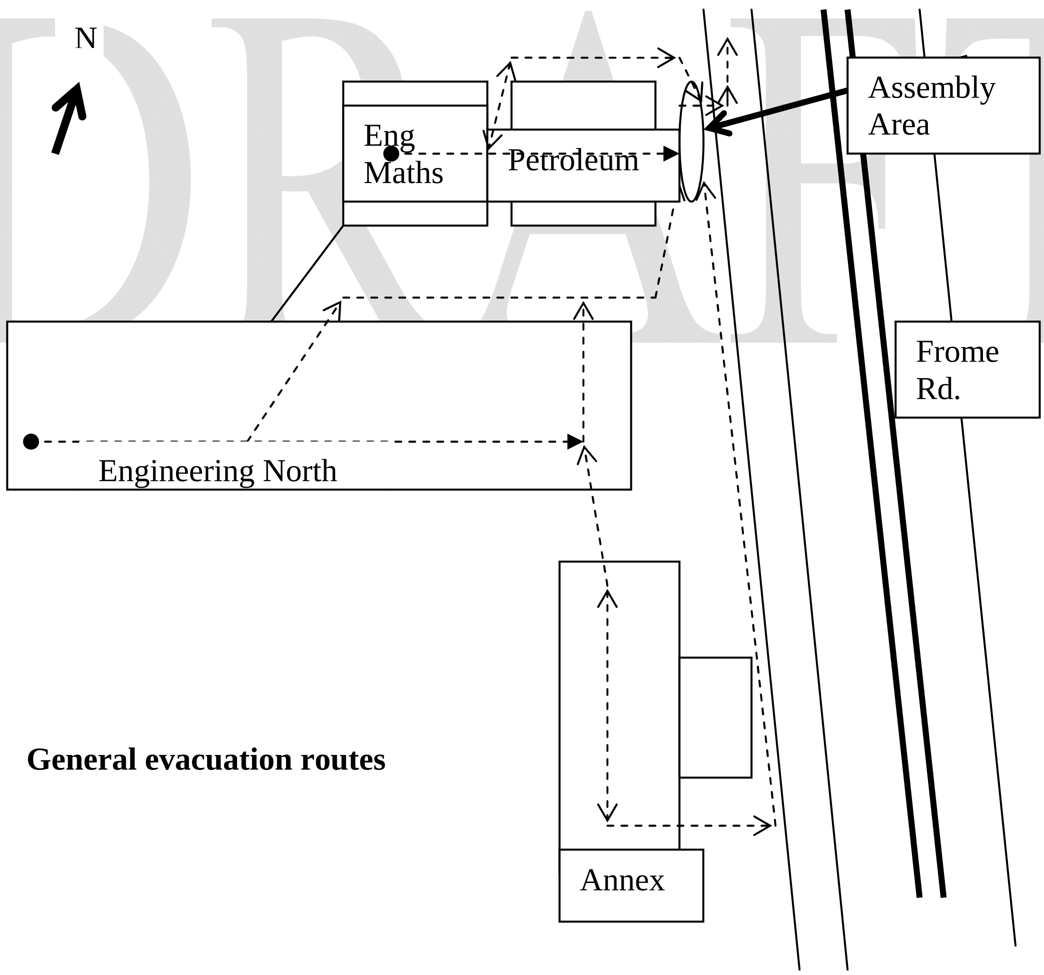

General evacuation routes

BOMB THREAT PROCEDURE
(Endorsed by University Council April 1995)

NOTIFY security on 35444 and the supervisor of the area.

FOLLOW the instructions of the wardens in red hats.

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SCHOOL EQUITY POLICY

The department of Chemical Engineering has an Equity, Diversity and Sexual Harassment Policy. The policy is a statement of the School's commitment to providing a workplace for all staff, students and visitors that is free from harassment and bullying, deals with all people in a fair and equitable way and respects the diversity of peoples who engage with the School.
The School has a Equity Officer who is trained in equity, diversity and anti-harassment matters and who may be consulted at any time to confidentially assist in matters of concern.

The School equity officer is Andrew Wright, Room N115, North Engineering Building