UNSW AUSTRALIA

Faculty of Engineering

School of Petroleum Engineering

Never Stand Still | Engineering

PTRL 3022 &5005

Design Project for Petroleum Engineers

Course Outline

Term 3, 2020

Contents

Version control

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

Revision	Date	Changes
0	10/7/2018	Initial version
1	5/8/2019	Habib Zughbi
2	5/9/2020	Habib Zughbi

Course staff

Position	Name	Contact details
Coordinator/Lecturer	Dr. Habib Zughbi	Email h.zughbi@unsw.edu.au Office Tyree Building
Teaching Assistants	TBA	

Out of class communication and consultation

All class-wide communication outside of class times will be made through Moodle. It is strongly recommended that you regularly check Moodle so as not to miss any important announcements. The address of the UNSW Moodle site is https://moodle.telt.unsw.edu.au/.

Questions about the course or the content covered can be raised at appropriate times during the lectures or tutorials or on the course discussion forum on Moodle.

If you have a specific or personal issue that cannot be answered through Moodle or in class then please contact the coordinator directly. Since academic schedules can be quite irregular it is difficult to arrange regular consultation. One-on-one e-mail should be used as a last resort since it is an inefficient use of everyone's time.

Course overview

Course Size

This course is 6 units of credit and is taught in a single stream. Both the undergraduates taking PTRL3022 and the postgraduates taking PTRL5005 will cover the same material and complete the same assessment tasks.

Units of credit indicate the nominal workload for students. The normal workload expectations at UNSW are 25–30 hours per session for each unit of credit; including class contact hours, preparation and time spent on all assessable work.

Summary of the Course

This course covers front-end engineering design of new production facilities for a potentially viable oil/gas field. Various oil/gas processing systems are studied, including oil/gas/water separation, crude oil stabilization and desalting, gas dehydration, condensate handling, acid gas removal, and gas fractionation. Design tasks include process simulation, preparation of flow diagram, cost estimates and economic analysis.

In addition to applying first principles in initial calculations, extensive use of a commercial process simulation software package is made to firm up the detailed design. An integrated approach to design is followed including optimization of energy consumption and environmental footprint of the facility. Each student/group of students shall submit a final design report.

Aims and Rationale of the Course

The development of engineering skills and judgment needed in the solution of open-ended problems from a technical-economic viewpoint are the major goals of this course. These skills are essential for any practicing graduate.
Each project will be designed from conception to implementation including

- Preliminary feasibility study
- Preparation of process flow diagram,
- Process design & equipment sizing,

- A brief cost estimate and analysis of project.

Applications will be in areas related to the petroleum industries. Environmental aspects are included in the project

The technical aspects of Integrated Design are covered throughout the Petroleum Engineering Program as part of other natural gas engineering, fluid flow, thermodynamics and heat transfer. This course complements these other courses by aiming to:

1. Combine students existing knowledge of fluid flow, mass and energy conservation, thermodynamics with a thorough grounding in the analysis and prediction of the VLE of oil/gas through the application of a widely used industrially process simulation package and by applying these concepts to selected unit operations,
2. Introduce students to ways of optimizing resources from an oil/gas fields and the environmental and economic context of the development of production facilities.

Student learning outcomes

Upon successful completion of the course students should be able to:

1. Apply mass and energy conservation principles, fluid flow, thermodynamics and separation theories to separate oil/water/gas streams into constituent phases, stabilize the crude oil, recover the individual components from the gas stream in a well-designed gas plant in order to optimize available
2. Perform preliminary design/analysis calculations for common unit operations in gas-oil separation.
3. Apply integrated approach principles to maximize usage and minimize waste/rejected resources.

Graduate Attributes

UNSW aspires to develop graduates who are rigorous scholars, capable leaders, profession practitioners and global citizens.

The University has articulated a comprehensive list of Graduate Attributes (GAs) as a set of desired learning outcomes for all UNSW students. The full list, comprising sub-sets of the above four broad areas, may be found here:

https://my.unsw.edu.au/student/atoz/GraduateAttributes.html

The core graduate attributes which we develop in Natural Gas Engineering are:

- Scholars who have an understanding of their discipline in its interdisciplinary context (GA 1a)
- Scholars who are able to apply their knowledge and skills to solving problems (GA 1d)
- Scholars who are capable of effective communication (GA 1f)
- Leaders who are collaborative team workers (GA 2c)

Teaching strategies

This course aims to promote thorough engagement in the learning process. To achieve this aim it is essential that you take responsibility for your own learning, and that the teachers facilitate that learning by establishing a supportive as well as challenging environment. This philosophy is reflected in the Guidelines on Learning that Inform Teaching at UNSW, which may be found at http://teaching.unsw.edu.au/guidelines.

The teaching approach to be employed will involve lectures, tutorials and hands on sessions using a process simulation package.

The lectures will cover briefly all the theoretical principles required to complete this course and to also carry out necessary preliminary calculations for an initial study of the design project. Further, some content will be introduced before the lectures by way of readings. You are expected to read any prescribed materials in advance of classes to enable active participation.
The hands on sessions using a process simulator are aimed at enhancing students' skills required to use the process simulation package, firm up the design calculations and apply integrated design principles to optimize the design from energy and other consumables (solvents, etc.) consumption point of view.

You are encouraged to take notes and ask questions/make comments during classes in a polite and respectful manner. The course material is supported and expanded on in the supporting academic texts and other teaching resources.

Course schedule

The following is an indicative schedule of the particular topics we will cover this semester. It may be modified to accommodate the needs of the class.

Week	Topics covered
1	Course introduction; discussion of design problem statement, introduction to gas oil separation
2	Introduction to mass conservation/balance
3	Introduction to energy conservation/balances
4	Vapour liquid equilibrium; flash calculations,
5	Applications to mass, energy and separation principles. Quiz 1 – Wednesday Online Introduction to process simulation, components list, thermodynamic models
6	Flex Week. Available for consultation
7	Process simulation – basic unit operations – material and energy streams, two- and three-phase separators; pumps, compressors, mixers, heat exchangers
8	Process simulation – Oil manager – Characterization/cutting/installing of crude oil -
9	Process simulation: Gas separation; gas dehydration, Convergence issues, gas sweetening – Quiz 2 (Computer lab)
10	Process Simulation: Use of various thermodynamic models, Energy integration, Optimisation of resources
11	Wednesday Final Exam

Class times and locations

Type of class	Day	Time	Room
Lecture	Monday	18:00–20:00	Online
Lecture/Tutorial	Wednesday	18:00–21:00	Online

Assessment

The table below gives details of each assignment task and any subcomponents, whether it is individual or teamwork and the due dates. Feedback will be given for each submission, except the final exam.

#	Description	Type	Date	Marks
E01 & E02	**In-Semester Quizzes** • 2 quizzes, closed book in class quizzes	Indiv.	Wed W5 and Week 9	22.5 each quiz (total of 45)
E03	**Final Report**	Indiv.	5 p.m. Wed. Week 11	15
E03	**Final exam** • A 2 hour, closed-book exam covering the entire course.	Indiv.	Wed. Week 11	40

Resources for students

Online resources

Lecture slides, course notes and spreadsheets, plus links to other online resources will be provided on the course Moodle page (http://moodle.telt.unsw.edu.au/).

Recommended text

1. Plant Design and Economics for Chemical Engineers (4th edition) by M. S .Peters and K. D. Timmerhaus, McGraw-Hill, 1991.
2. Plant Design and Economics for Chemical Engineers (4th edition) by M. S .Peters and K. D. Timmerhaus, McGraw-Hill, 1991.
3. Applied Process Design for Chemical and Petroleum Plants (2nd edition) by Ernest E. Ludwig, 1983, Gulf Publishing Company, Book Div., vols1, 2 &3

Students will be suggested additional handbooks and texts related to particular topics covered in the course.

Academic honesty and plagiarism

According to the UNSW website :
http://www.lc.unsw.edu.au/plagiarism

> *Plagiarism is taking the ideas or words of others and passing them off as your own. Plagiarism is a type of intellectual theft.*

Plagiarism happens for a number of reasons—one is because some students decide consciously to gain credit for the work of others. However, most incidents of plagiarism are not a matter of deliberate cheating but of underdeveloped academic skills.

This course will be an important opportunity for you to develop skills in writing and referencing your sources so that you avoid plagiarism. Look

at the website above for help, or see the resources available through The Learning Centre. A standard UNSW statement on plagiarism is given on the following page:

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.

Course evaluation and development

We welcome feedback on this project and the course in general. We also welcome direct written and verbal feedback from students.

Expectations of Students

We expect everyone – staff and students – to treat each other with respect.

UNSW expects regular attendance at lectures and tutorials/laboratory classes/seminars. Although exceptions may be made for special circumstances, we do expect University commitments to take precedence over regular work activities, holidays etc.

Students are expected to be regular and punctual in attendance at all lectures and tutorials. Students who attend less than 80% of their possible classes may be refused final assessment. In the case of illness or of absence for some other unavoidable cause students may be excused by the Registrar for non-attendance at classes for a period of not more than one month or, on the recommendation of the Dean for a longer period. The following link gives further guidance for attendance at or absence from classes:

https://my.unsw.edu.au/student/atoz/AttendanceAbsence.html

UNSW has rules for computer use, for example, for email and online discussion forums. You will have to agree to them when you first access the UNSW network. You can read the relevant policies and procedures here:

https://www.it.unsw.edu.au/students/policies/

Occupational Health and Safety

Like the wider community, UNSW has strict policies and expectations on Occupational Health and Safety and you should read these. They may be accessed on:

http://www.gs.unsw.edu.au/policy/ohspolicy.html

The School also has policies that you must get to know and follow.

Examination Procedures and Advice Concerning Illness or Misadventure

If you can fore see that your participation or performance in this class is going to be significantly affected by illness or some other unavoidable cause, then you should contact the project coordinator as soon as possible.

If you find that your performance in an assessable component has been significantly affected by illness or other unexpected circumstance, then you should make an application for special consideration as soon as possible after the event by visiting UNSW Student Central.

Applying for special consideration does not mean that you will be granted additional assessment or that you will be awarded an amended result. The latter will be granted at the discretion of teaching staff and will be considered only in exceptional circumstances. The timing of any additional assessment is entirely at the discretion of teaching staff.

For additional clarification -

4. Students who do not attend a written examination will fail unless they have a valid doctor's certificate proving that they are ill at the time of the examination.
5. Students who attend a written examination, but who fall ill during the examination will be assessed on the examination paper they submit unless they have a valid doctor's certificate proving that they are ill at the time of that examination.
6. In the case of illness, the doctor's certificate must be handed to the Student Centre and copied to the course authority no later than 3 days after the date of the written examination.
7. If a student can prove illness with a doctor's certificate, in extreme cases only the course authority might give special consideration and arrange another examination before the following UNSW semester. In such cases, the course authority either will arrange another written examination or alternatively will arrange an oral examination attended by 2 or 3 academics. Whether or not the course authority arranges another examination and the form and timing of such an arrangement are entirely at the discretion of the course authority, whose decision is final.
8. The School keeps a register of special consideration applications. The history of a student's previous applications for special consideration is taken into account when considering each case.
9. If special consideration is granted, the course authority will assess a student based on the final examination and not any previous examination paper that the student might have submitted (see 2 above).

Further information about special consideration can be found at:

https://my.unsw.edu.au/student/atoz/SpecialConsideration.html

Equity and Diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (9385 4734 or www.studentequity.unsw.edu.au).

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