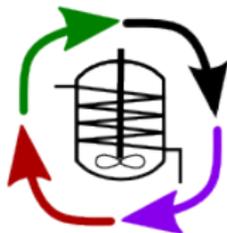


Engineering Economics and Problem Solving

ChE 4N4



© Kevin Dunn, 2013

kevin.dunn@mcmaster.ca
<http://learnche.mcmaster.ca/4N4>

Revision: 27 (September 2013)

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 - ▶ “Portions of this work are the copyright of Kevin Dunn”, *or*
 - ▶ “This work is the copyright of Kevin Dunn”

(when used without modification)

We appreciate:

- ▶ if you let us know about **any errors** in the slides
- ▶ **any suggestions to improve the notes**

All of the above can be done by writing to

`kevin.dunn@mcmaster.ca`

or anonymous messages can be sent to Kevin Dunn at

<http://learnche.mcmaster.ca/feedback-questions>

If reporting errors/updates, please quote the current revision number: 27

Welcome back

- ▶ Your final year (for most of you)
- ▶ What did you learn this summer?
 - ▶ At your co-op term perhaps?
 - ▶ Something about chemical engineering?
 - ▶ Learn something about yourself?

Credits

Dr. Don Woods and Dr. Thomas Marlin

- ▶ Have been the main instructors since the 1980's
- ▶ Course outline and topics covered are similar to theirs
- ▶ We will use their notes, slides, and other materials for most of the course

Background

About myself

- ▶ Undergraduate degree from University of Cape Town, 1999
- ▶ Masters degree from McMaster, 2002 (not a “doctor”, just call me by my first name please)
- ▶ Worked with a number of companies from 2002 to 2011 on data analysis and consulting projects
- ▶ Worked at GSK on a 1-year contract until June 2012
- ▶ Now working full-time at McMaster since July 2012
- ▶ Office is in BSB, room B105
- ▶ Arrange a meeting: kevin.dunn@mcmaster.ca
- ▶ Cell: (905) 921 5803

Teaching assistants

Danielle Maitland

- ▶ maitladm@mcmaster.ca
- ▶ Group B tutorials (afternoon)
- ▶ JHE, room 256
- ▶ Currently doing her Masters with Todd Hoare

Chris Ewaschuk

- ▶ ewaschcm@mcmaster.ca
- ▶ Group A tutorials (morning)
- ▶ JHE, room 370
- ▶ Currently doing his Masters with Chris Swartz

Office hours: you must arrange to meet with TAs by email, when mutually convenient

Instructor, TA and student relationship

The relationship is one of *managers and colleagues*

- ▶ You can expect TAs and I to answer emails promptly
- ▶ If you have questions
 1. Please email the TA with CC to me ← hopefully this solves your problem
 2. **Always start subject with group number**
 - ▶ e.g. [B4] Question about assignment 2
 3. if not, set up meeting with TA or myself
- ▶ Please email from your McMaster address (filtering)
- ▶ Make sure you email the TA for your group

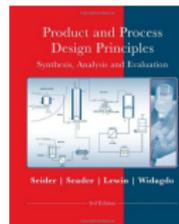
Video and audio recordings

- ▶ As long as feasible, I will try to video record all classes
- ▶ Useful if you miss a class
- ▶ Quality might not be the best
- ▶ Usually available 24 to 48 hours after the class
- ▶ Audio recordings will also be made available, when possible

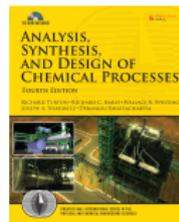
References and readings

Notes will be made available via the course website. Please print them and bring to class.

Recommended: Seider, Seader, Lewin and Widagdo, “Product and Process Design Principles” (3rd edition)



Recommended: Turton, Bailie, Whiting, Shaeiwitz and Bhattacharyya, “Analysis, Synthesis and Design of Chemical Processes” (3rd edition)



There are many other textbooks and references listed. You will have to be selective in terms of what you download, buy, and spend your time reading.

<http://learnche.mcmaster.ca/4N4>

- ▶ Please check **every day** for announcements (top left)



- [Course outline](#)
- [Course videos from 2013](#)
- [Copyright and other legal stuff](#)
- [Comments, questions, feedback?](#) [🔗](#) Don't wait for official course evaluations.

Announcements ([previous ones](#)) or [Follow @4n4che](#) 1 followers

- The course starts on 6 September 2013 at 09:30. See you at the first class where we will review the [course outline](#) and the course objectives. The optional slides are available for you to print and bring with.
 - We will be covering not only engineering economics in 4N, but also a bit of "personal economics". Take a look at [this article](#) [🔗](#). As engineers, you will have to decide on finances for the company are you working for which is
- ▶ Follow the Twitter feed: [@4n4che](#)
 - ▶ Check for updated slides and notes
 - ▶ Tutorials and assignments will be posted by Friday evening for the Monday tutorial slot

Course feedback via Learning website

- ▶ I might not have explained something clearly;
- ▶ you didn't get a chance to ask a question, *etc*

<http://learnche.mcmaster.ca/feedback-questions>

COMMENTS, FEEDBACK & QUESTIONS

This form is **completely anonymous**.

I will reply to you if you provide an email address. If not, I will reply publicly on the course website and/or at the next class, if appropriate.

Please note: If you would like to contact me by regular email, my address is kevin.dunn@mcmaster.ca

Some examples:

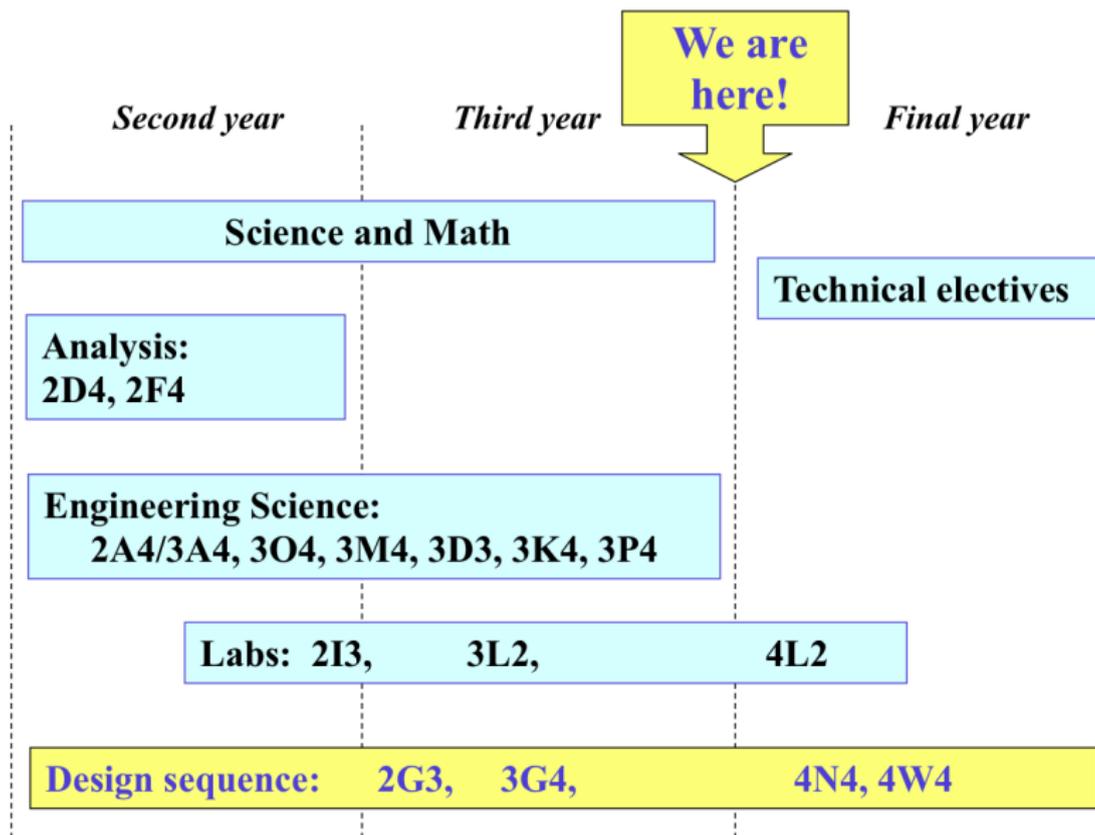
- Where can I find out more about....?
- In the class on Tuesday in reactor design, I didn't understand the concept of calculating....?
- I think that next year you should have the course project due earlier because ...
- There was a mistake in the slide about in today's class.

Course code: CHE _ _ _

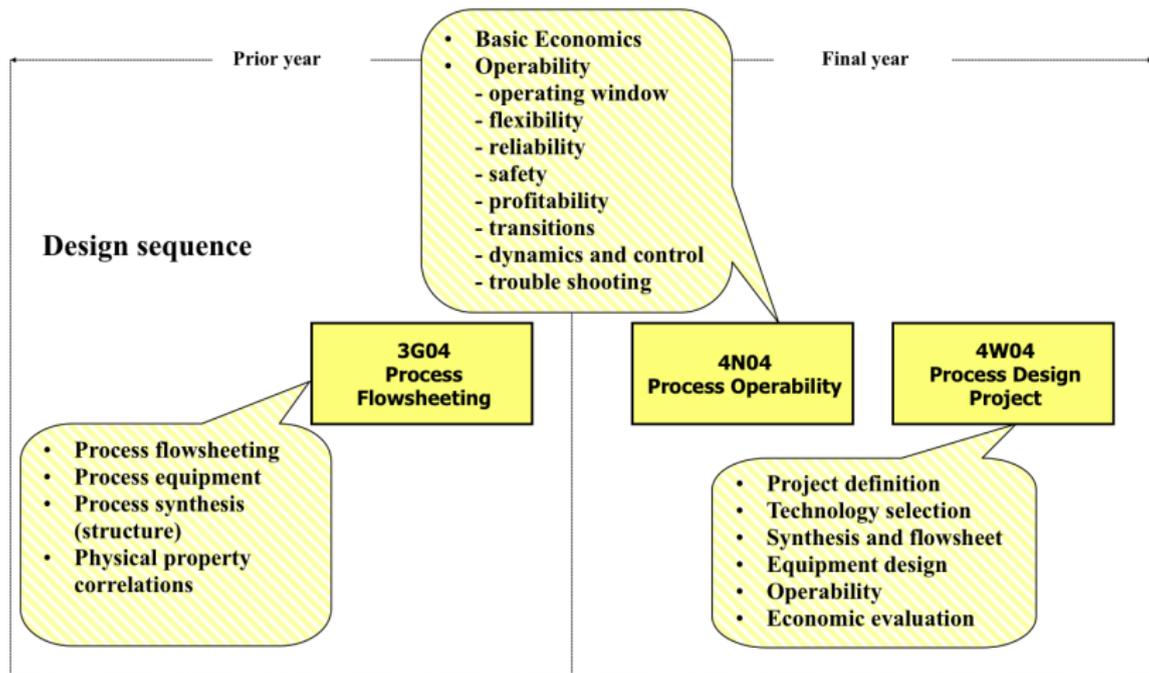
Email address (optional)

Please bear in mind that I cannot reply to you if you do not supply an email address.

4N4 in context

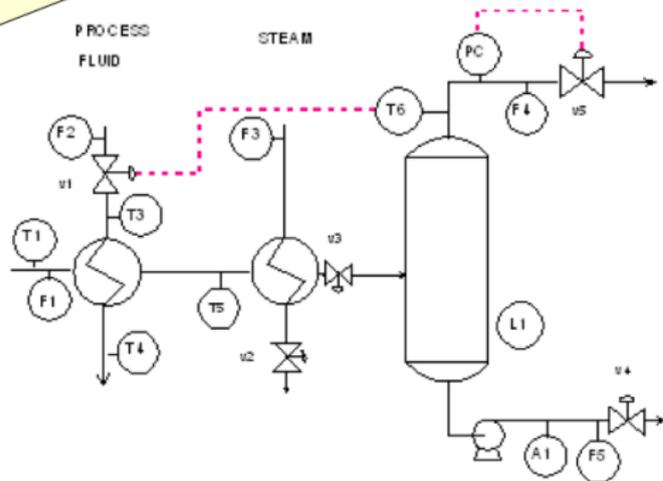


More on the “Design sequence”



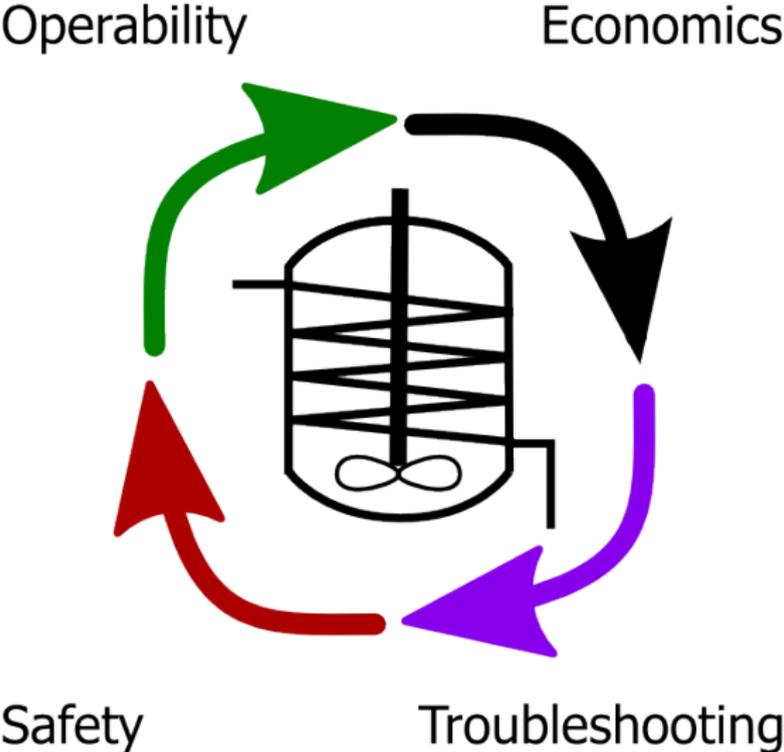
What does this course cover you'll learn to look at flowsheets in a different way

**Profit, Alarms, Safety relief, Safety Interlock,
Trouble shooting, Measurement uncertainty, Operability,
Efficiency,**



and engineering economics.

Main topics covered in 4N4



This is a unique course: not taught anywhere else in Canada.

This course is also preparation for engineering practice

- ▶ Professional attitude and skills
 - ▶ “I am responsible for my learning”
 - ▶ “I strive for many objectives (safety, reliability, *etc*) in practice”
 - ▶ Awareness of the PEO
 - ▶ Concepts around engineering ethics
- ▶ Technical knowledge
 - ▶ Build on **engineering science** with new knowledge and practical applications

Other skills you will learn in 4N4

- ▶ Presentation skills: e.g. present your solution to the class
- ▶ Setting goals
- ▶ Being a group chairperson and effective group member
- ▶ Dealing with (dys)functional groups
- ▶ Brainstorming inventive ideas
- ▶ Finding reliable learning materials
- ▶ Troubleshooting and getting to the root cause (use of case studies)
- ▶ Improve your technical writing skills
- ▶ Communication: cover letters, grammar, spelling
- ▶ Learning on your own
- ▶ Reading and interpreting economic data
- ▶ Introduction to engineering ethics
- ▶ Time management and project management
- ▶ Comfortable with engineering drawings
- ▶ Dealing with ambiguity and uncertainty

Some unsolicited advice

Final year is tough : many competing demands on your time

▶ **Manage your time**

- ▶ Recognize that lectures are $\sim 25\%$ of the work for this course
- ▶ Plenty of work outside the class: at least 8 to 9 hours per week
- ▶ Prioritize events in your academic life over your social life: yes ... *just for the next 8 months*
- ▶ And you will have to work on weekends, at least 1 day (not only on 4N, but other courses also)

▶ Exercise 3 to 5 times per week

- ▶ at minimum: a 20 min walk around campus to clear your head
- ▶ join the Pulse
- ▶ join a group class ... with your group members, do a cardio circuit, jog, push-ups, yoga, weights, etc

▶ Discuss with your group members how your work is going

- ▶ communicate, communicate, communicate

▶ Eat well: "garbage-in garbage-out" applies to bioreactors

i.e. your body

▶ Sleep: regular all-nighters are no good

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Trouble?

Things not going well? *Please communicate early.*

- ▶ You will provide anonymous **peer feedback** regularly. I will monitor this and step in where necessary.

Grading

Group-submitted assignment/tutorials	25%
Group project (meeting, interim and final reports)	28%
Midterm test	10%
Final exam	25%
Online questions, reflections and written peer feedback	12%

- ▶ Course letters will be assigned using standard system
- ▶ There are important notes in the outline regarding grading:
please read carefully!

Midterms and exam

- ▶ Midterm: process economics section
- ▶ Midterm: 16 October, starting at 18:30

- ▶ Final exam: cumulative of everything in the course, including economics

All tests and exams:

- ▶ open notes – any form of paper
- ▶ any calculator

Tutorials

Tutorials are starting this Monday, 9 September.

Slot **A** (*morning*, 11:30-13:30) and **B** (*afternoon*, 14:30-16:30)

- ▶ Group presentation of each tutorial question in the last 30 minutes
- ▶ Remaining questions due on next Friday (with cover page)
- ▶ Please have an internet-enabled device in the tutorial (at least one per group)

SDL Project

A major component of the course is the self-directed learning (SDL) project.

Tutorials will also be run in an SDL manner, to help provide skills.

I will cover the SDL topic and scope in 3 weeks time.

Why group-based work

- ▶ Groups of 5 members will be created
- ▶ $1 + 1 + 1 + 1 + 1 > 5$: magnify your strengths
- ▶ You will always work in groups after graduation
- ▶ Why do companies require group (team)work? [Turton, Ch 28](#)
 - ▶ Variety of viewpoints and expertise are brought together
 - ▶ Time constraints

Our case might be a little unrealistic though:

- ▶ You might often be the only (chemical) engineer on a team in a company
- ▶ But that means you have to know all your stuff

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Group selection

- ▶ How the process works: **mutual selection**. You get to name 3 members you'd like to work with
- ▶ But:
 - ▶ TAs and myself will ultimately form the groups
 - ▶ We will try to select at least 2 of the people you choose
 - ▶ Tutorial slots evenly allocated
 - ▶ Not too many people of same stream in group
 - ▶ Interests
 - ▶ Randomness

Over to you ...

Please **fill out the online questionnaire by the end of today** if possible, but it will be available until Saturday at 18:00.

If you want to change something afterwards, refill the questionnaire again.

First group-based tutorial is on Monday.