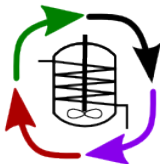


Engineering Economics and Problem Solving

ChE 4N4



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

Revision: 9 (September 2012)

Plan for today's class

1. Background
2. Administrative issues
3. Review of the course

Credits

Dr. Don Woods and Dr. Thomas Marlin

- ▶ What do they have in common?
- ▶ 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”, please)
- ▶ Worked with a number of companies since then 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
- ▶ Drop-in hours: Tuesday and Thursday afternoons
- ▶ Office is in BSB, room B105
- ▶ Arrange a meeting: kevin.dunn@mcmaster.ca
- ▶ Cell: (905) 921 5803
- ▶ extension 27337

Teaching assistants

Alicia Pascall

- ▶ pascalaa@mcmaster.ca
- ▶ JHE, room 370 (upstairs)
- ▶ extension 22008
- ▶ Currently doing her Masters with Tom Adams

Yasser Ghobara

- ▶ ghobary@mcmaster.ca
- ▶ JHE, room 369
- ▶ extension 24031
- ▶ Currently doing his Masters with Chris Swartz

Office hours will be arranged next week.

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

There is a printed course pack.

- ▶ Buy it for \$37 from Print Factory Ink, (corner of Sterling and Main, Westdale), **or**
- ▶ Print out the PDFs from the course website

There are too many textbooks and references to mention here. See printed notes and the course website for suggestions.

Most important books are on 24-hour reserve in Thode.

You will have to be selective in terms of what you download, buy, and spend your time reading.

Course website

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

- ▶ Please check **every day** for announcements (top left)
- ▶ Sometimes slides to supplement the course pack will be available.
- ▶ Check the day before class: won't be critical to bring, unless specifically mentioned.
- ▶ 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>

LEARNING CHEMICAL ENGINEERING

Courses

Contact info

About Kevin

Teaching

Feedback / questions

COMMENTS, FEEDBACK, AND 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.

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 ...

Please provide any comments and feedback about a course.
You may also ask any questions about a course here.

Course code: CHE _ _ _

Email address (optional)

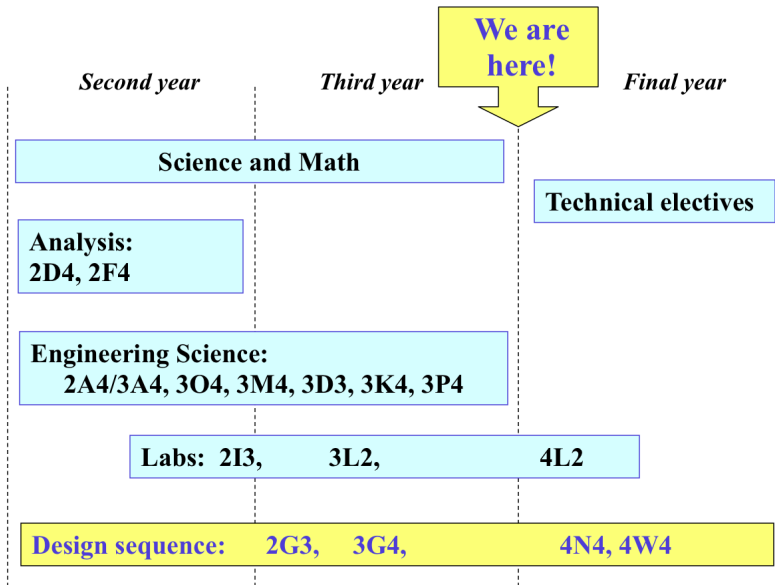
Send message to Kevin

Instructor, TA and student relationship

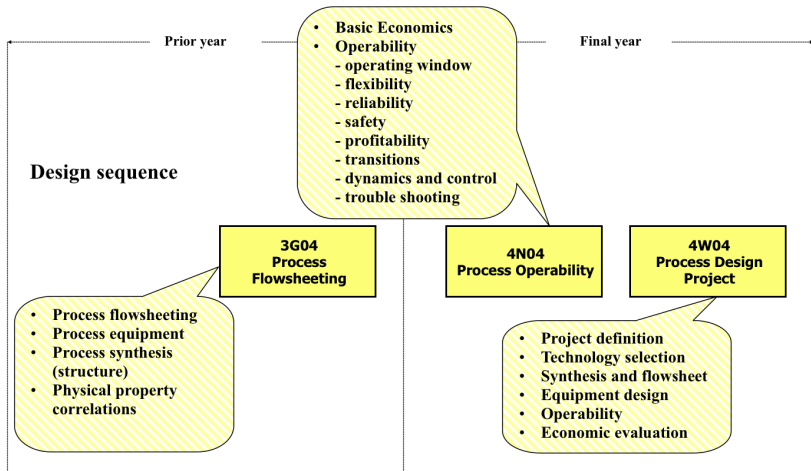
The relationship is one of *managers and colleagues*

- ▶ 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. if not, set up meeting with TA or myself
- ▶ Please email from your McMaster address (filtering)

4N4 in context

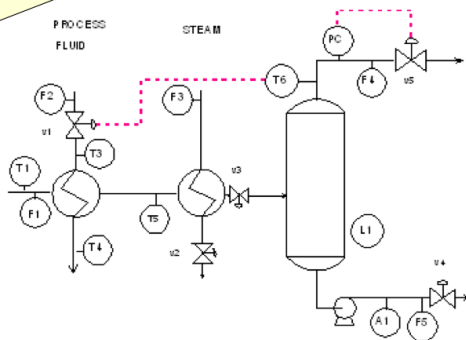
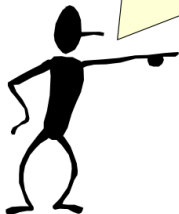


More on the “Design sequence”

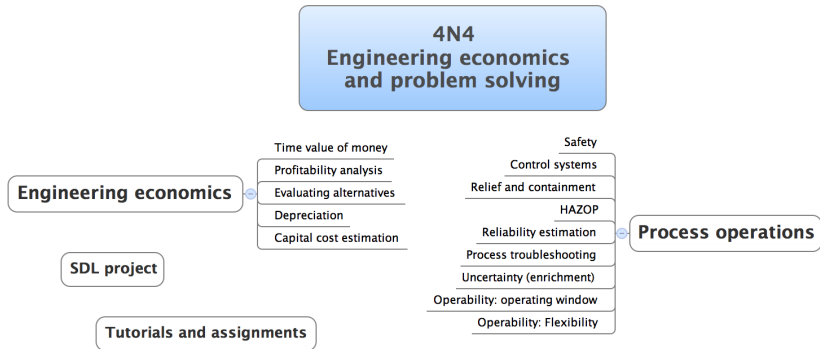


What does this course cover you'll learn to look at flowsheets in a different way

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



What we will cover



This course is preparation for engineering practice

- ▶ Professional Attitude
 - ▶ “I am responsible for my learning”
 - ▶ “I strive for many objectives (safety, reliability, *etc*) in practice”
- ▶ Professional Skills (more on this later)
- ▶ Technical Knowledge
 - ▶ Build on engineering science with new knowledge and practical applications

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
- ▶ **Discuss** with your group members how you feel
 - ▶ communicate, communicate, communicate
- ▶ **Eat well**: “garbage-in garbage-out” applies to bioreactors ... i.e. your body
- ▶ **Sleep**: regular all-nighters are no good

Trouble?

Things not going well? Please communicate *early*.

Grading

Term Task	Maximum points
Group learning projects and personal finance tutorial	10
Economic feedback on time value of money	15
Graded sensitivity analysis	15
Process drawings	10
Economics workshop on profitability and comparisons (graded tutorial)	40
Economics assignment on cost estimating and profitability	30
Safety (graded tutorial)	20
Interim report on SDL/process project	20
SDL/Process - Technical report	70
SDL/Process - Presentation and class notes	30
Group reflections - chairperson and group dynamics report	20
Course reflection - overview of the course, what you learned, how you learned	20
TOTAL	300

The final grade will be allocated from 65% term work, 10% midterm and 25% final exam, i.e.

$$\text{Student's grade} = 0.65(\text{Student's term work}) + 0.35(\text{Student's exams})$$

$$\text{Student's term work} = \frac{\sum \text{Student's term points from the above table}}{\text{Student's maximum term points}}$$

$$\text{Student's maximum term points} = 300 - \text{points from } \textit{excused} \text{ absences}$$

- ▶ *Grading allocation is subject to change*
 - ▶ Mid term exam: 10%
 - ▶ Final exam: 25%
- ▶ Course letters will be assigned using standard system

Midterms and exam

- ▶ Midterm: process economics section
- ▶ Final exam: on everything, including economics

All tests and exams:

- ▶ open notes – any form of paper
- ▶ any calculator
- ▶ no e-books

Tutorials

Tutorial slots **A** (*morning*) and **B** (*afternoon*) on Mondays:

- ▶ 1 question from the tutorial due as group hand-in (no cover page)
- ▶ Group presentation of each tutorial question in the last 30 minutes (for grades)
- ▶ Remaining questions due on next Thursday (with cover page)
- ▶ Pop quizzes will likely be part of the tutorial slot
- ▶ Please have an internet-enabled device in the tutorial (one per group)

During tomorrow's class

- ▶ Review the SDL project requirement
- ▶ Talk about group work
- ▶ You will complete a questionnaire about yourself, your goals and select group members
- ▶ Groups of 5 students

Other skills you will learn in 4N4

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

SDL Project

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

Self-directed learning (SDL)

Any examples of self-directed learning you've succeeded at recently?

- ▶ learn how to ride a motorcycle



Our 1st tutorial, next Monday, on personal finance: [completely SDL](#)

Why self-directed learning is important

- ▶ No employer has an obligation to employ you until retirement
- ▶ You must take action to get employment:
 - ▶ co-op terms
 - ▶ job market is looking for new hires and you have the profile they are looking for
 - ▶ you start your own company
- ▶ You will likely be a contract-based employee for the next few years (e.g. I'm still a contracted employee at McMaster)
- ▶ Your degree is no guarantee for employment: but it helps tremendously: **you don't need to remain in chemical engineering!**
- ▶ Once you start working: **keep yourself employable**
 - ▶ technologies in use that were never taught in engineering
 - ▶ new technologies will be invented after you graduate
 - ▶ new/different ways of doing business

SDL in this course

Self-directed learning is a process:

- ▶ identify what you already know
- ▶ recognize where you don't have the knowledge
- ▶ diagnose what you need
- ▶ figure out how to meet your needs (which resources to use?)
- ▶ implement it:
 - ▶ go to the library
 - ▶ multiple internet searches
 - ▶ meet with people
 - ▶ attend conferences
 - ▶ phone up colleagues for informational interviews
- ▶ evaluate the success: did it work? do I need to start over again?

SDL project

Apply what you have learned and are currently learning to a process.

- ▶ economics
- ▶ operability issues: startup and shut down
- ▶ safety
- ▶ troubleshooting
- ▶ summarize your learning (reflection on what was learned)

What SDL is not

- ▶ Not a chance for me to slack off and you do the work!
- ▶ Not where you find information to support a single hypothesis
(you should seek out multiple opinions)
- ▶ Not going to find your answers the first time
- ▶ Not always going to succeed in achieving your goal, but you will learn along the way
- ▶ Your group members are not competitors

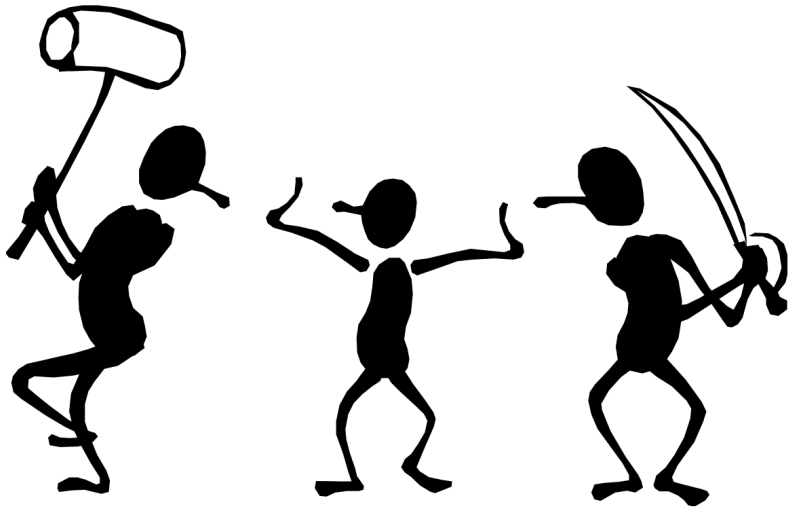
Why group-based work

- ▶ $1 + 1 + 1 + 1 + 1 = 8$: 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**

Working in groups: less of this



Signs of bad group dynamics

“Group work is terrible. I don't like my group members, some don't carry their share of the load, and some don't respect me.”

Symptoms:

- ▶ group norms are ignored
- ▶ poor attendance
- ▶ unequal distribution of work
- ▶ group splits into “camps”
- ▶ poor quality work, not really completed by deadline

Groups: we hope you only experience this



Group → Team

The role of your group members

- ▶ They support your learning process: help identify goals
- ▶ Accommodate each other's schedules
- ▶ Are resources themselves
- ▶ Are not competitors, but become a team

The role of the TAs and myself

- ▶ Give guidance at review meetings
- ▶ We provide a respectful and positive manager-colleague relationship
- ▶ We can help as a resource and for referrals
- ▶ Help evaluate your learning

Group selection

- ▶ How the process works:
 - ▶ Mutual selection (get to choose 3 of the 4 other members)
 - ▶ Tutorial slots evenly allocated
 - ▶ Not too many people of same stream in group
 - ▶ Interests
- ▶ Deadlines

Continuous group contribution

- ▶ Projects have many check points
- ▶ Projects are too big to complete in a couple of days
- ▶ No hitchhikers
- ▶ Peer evaluations will be used and applied
- ▶ Group-instructor or group-TA meetings to gauge contribution
- ▶ Discuss issues as they arise; don't wait until lots of pressure, then "blow up". If needed, see instructor.
- ▶ There might be cultural issues to overcome.

Improper group collaboration

- ▶ Any between-group sharing: electronic materials, documents
- ▶ including sharing materials between tutorial groups A and B
- ▶ Adding group members names that did not contribute

Group tips

- ▶ Make full use of collaboration tools such as
 - ▶ Google Docs
 - ▶ Zoho
 - ▶ Microsoft SkyDrive
 - ▶ Skype
 - ▶ Messenger

Group norms

How will your group deal with:

- ▶ Absent members
- ▶ Personality conflicts
- ▶ Not 100% agreement
- ▶ No one wants to take the lead (fear?)
- ▶ Person(s) with low motivation to work
- ▶ Uneven work distribution
- ▶ Lack of respect: blaming/insulting a person

Over to you ...

Please fill out the online questionnaire by the end of today.