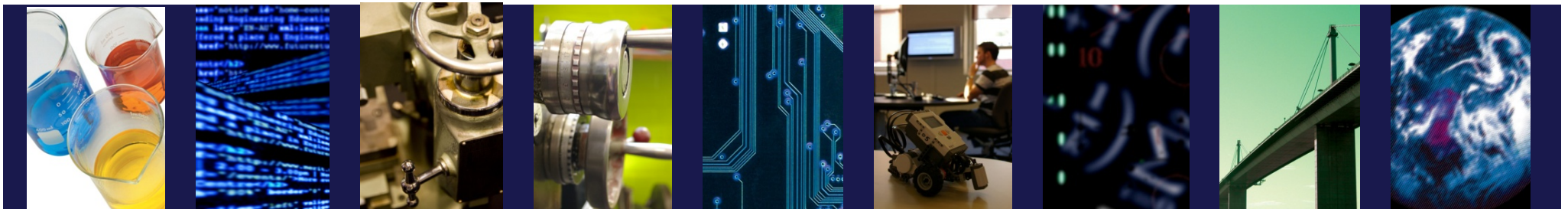


Melbourne School of Engineering

Engineering Systems Design 1

Lecture EN01 – Subject Overview



Welcome!

- Welcome to Engineering Systems Design 1
 - In this subject you will learn about the different streams of engineering, how to tackle **design projects**, how to **model systems**, and **work in teams** to **solve engineering problems** through lectures, examples, and hands-on workshop classes
- We hope this subject is a little different from other ones you are doing, and gives you a taste of engineering... and how fun it can be!

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Subject Overview

- Engineering Systems Design 1 introduces you to the world of engineering through a mix of design projects, interactive workshops and lectures. This subject centres on the **engineering method**, **system modelling**, the **approach to problem solving** and **engineering design** that makes engineers unique. The subject will prepare you for an exciting and rigorous engineering education...
...that will allow you to serve an increasingly complex society!

Subject Objectives - 1/2

- **Explain** the importance of engineers and engineering;
- **Apply** basic knowledge of **fluid mechanics**, **water treatment** and **online sensing and image processing** to solve design problems across multiple engineering disciplines;
- **Identify** the nature of a technical problem and make appropriate simplifying assumptions to achieve a solution;

Subject Objectives - 2/2

- **Develop** and **construct** mathematical, physical and conceptual models and utilise such models for purposes of analysis and design;
- **Analyse** possible alternative engineering approaches and **evaluate** their advantages and disadvantages in terms of functionality, cost, sustainability and all other factors;
- **Demonstrate** competency in current tools for analysis, simulation, visualisation, synthesis and design.

What are We Going to Learn About?

The Profession and Professionalism

the different disciplines of engineering
what engineers do

Technical Skills

numerical modelling, data gathering, data analysis
fluid mechanics
conservation of material and energy in engineering processes
mass transport in two phase flow (bubbles!)

Enabling Skills

communication
teamwork
problem solving
project planning

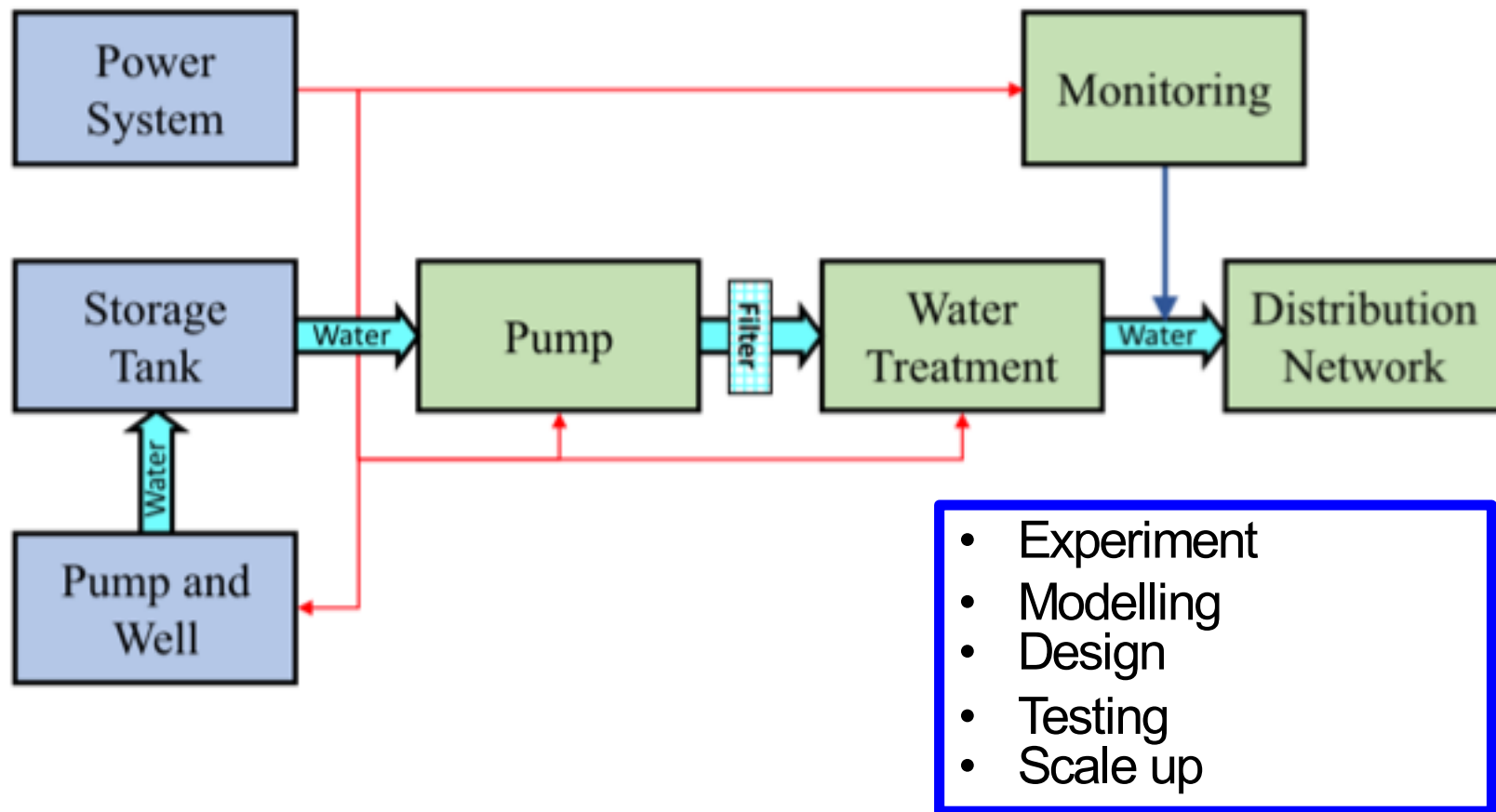


**Do not underestimate the
importance of these
enabling skills!**

The focus of the subject is a **Design Project**

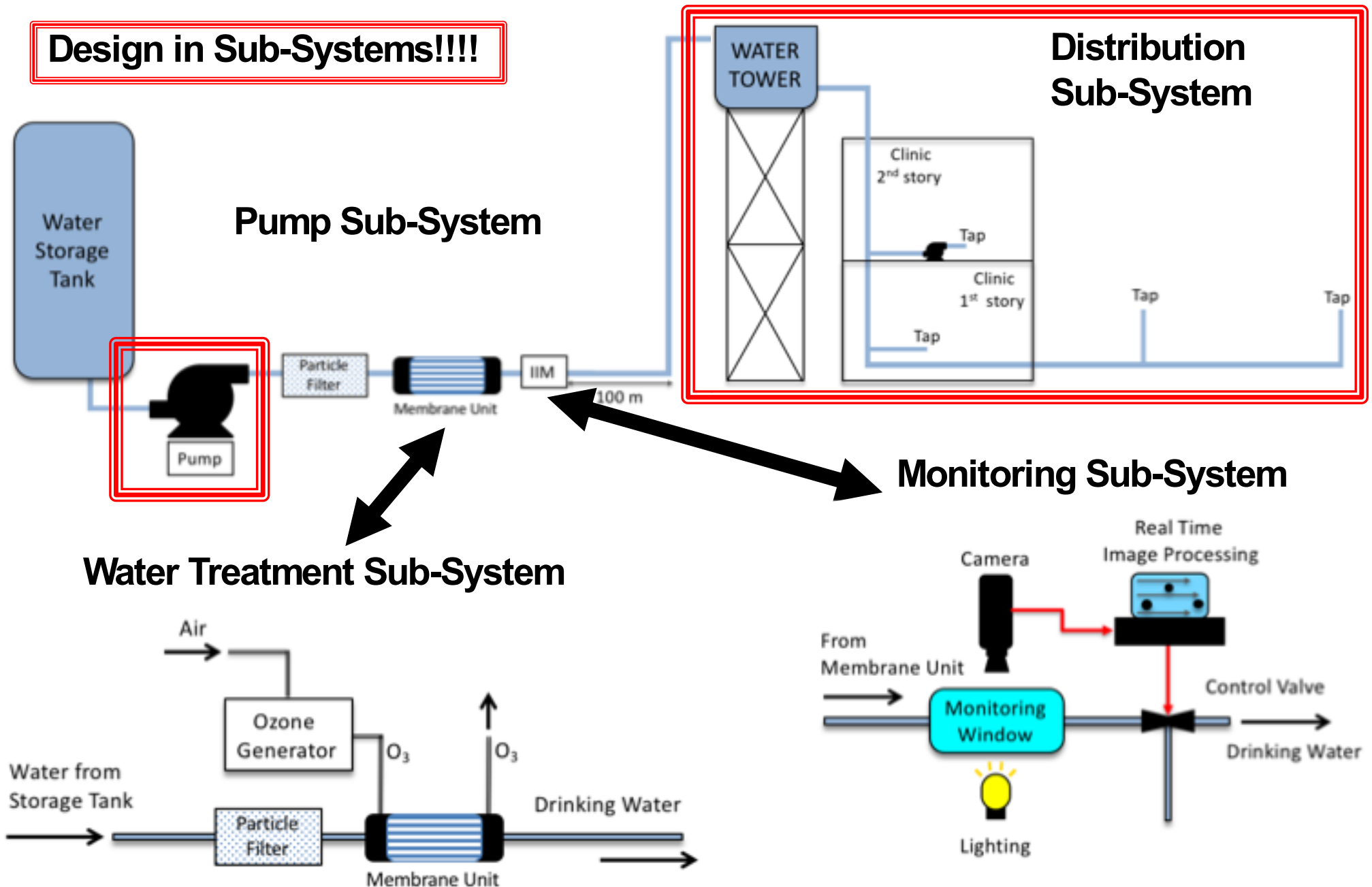
The Design Project!

Designing a renewable water pumping system for a remote community... sounds simple, eh?



The Systems

Design in Sub-Systems!!!!



Subject Schedule

Week	Starting	Lecture 1 (Monday)	Lecture 2 (Wednesday)	Lecture 3 (Friday)	Workshop
1	23-July	Introduction (RD/DS/LS)	Engineering and Society (RD)	MATLAB and Problem Solving	
2	30-July	Fluid Mechanics Introduction (RD)	Pipe Flow 1 (RD)	Pipe Flow 2 (RD)	Team Formation/ MATLAB
3	6-Aug	Pump 1 (RD)	Pump (2)	3D Printing Impellers	MATLAB/ Pipe Flow
4	13-Aug	Designing Fluid Networks (RD)	Fluid Mech. Examples (RD)	No Lec	Pump Curves
5	20-Aug	Mass Balance 1 (DS)	Mass Contactor (DS)	Membrane 1 (DS)	Impeller Design and Test
6	27-Aug	Membrane 2 (DS)	Water Treatment (DS)	Water Treatment /Membranes (DS)	Membrane Pressure drop
7	3-Sept	Presentations (DS)	Report Writing/MS Revision (DS)	MS quiz in class	Membrane Design/finish 3d impeller
8	10-Sept	Image Processing Intro (LJ)	MATLAB/coding /camera(LJ)	MATLAB/coding/ cameras (LJ)	Presentations
9	17-Sept	No lec	No lec	No lec	Matlab/image handling
Break	24-Sept		NO LECTURES		
10	1-Oct	MATLAB/coding/ (LJ)	Image Processing (LJ)	Image Processing (LJ)	Use EDS for team meetings
11	8-Oct	Image Processing (LJ)	Image Processing Cool stuff(LJ)	Made Possible By Melbourne	Image Processing
12	15-Oct	Product Development (RD)	Exam Technique (DS)	Revision (RD/DS/LJ)	Image – testing on Rig
SWOT vac	22-Oct				
EXAM					

NOTE : Latest version
is always on the LMS

Module 1 : Engineering, Engineers and Society

- What is Engineering?
 - Engineering Disciplines
 - Role of Engineers in society
- Learning and Problem Solving
 - Heuristics
- Communication skills
 - Report writing
 - Presentations
- Teamwork skills

Module 2 : Pumps and Pipe Flow

- Learn basic concepts in **fluid mechanics** around pumping and the flow of water in pipes.
- You will use **fluid mechanics models** (EBE) to understand experimental measurements of pipe flow and losses.
- You will both **design and test 3D printed pump impellers**, measuring their efficiency through pump curves
- **Use your pump curve and validated fluid mechanics models** to design the pump and distribution network sub-systems

Module 3 : Water treatment using Membranes

- Learn **how to use the Conservation of Mass law** in a flowing systems (i.e. pipes) and other engineering processes
- **Introduction to water treatment** and the key aspects needed for water disinfection
- Apply **basic membrane design equations** to ozone disinfection of water.

Module 4 : Online Sensing and Image Processing

- Learn **how a digital camera works** (e.g. your phone camera) and the parameters that are important to acquire an image.
- Understand the key concepts around **image processing and automated image analysis**.
- Learn how to develop a **real-time image processing** filter using **MATLAB**

Modules 5, 6 & 7?????

- ESD 1 and 2 are two parts of a total sequence

1	2	3	4	5	6	7
Engineering, Engineers and Society	Pumps and Pipe Networks	Water Treatment and Membranes	Sensor, Image Processing	Digital Circuits	Computer Programing	Mechanics: Statics and Dynamics
Engineering Systems Design 1				Engineering Systems Design 2		

Generic Skills

Completing ESD 1, you should have improved your

- **Ability** to **interact** with people in other engineering disciplines
- **Ability** to realistically **assess** the scope and dimensions of a project or task
- **Communication skills** in order to make effective oral and written presentations
- **Ability** to **apply** creative approaches to identify and develop alternative concepts and problem solving procedures
- **Perception** of learning and development and understanding for need of critical review.

Lectures

- Three one-hour lectures per week
 - Lecture 1 : Monday 1:00 pm
 - Lecture 2 : Tuesday 10:00 am
 - Lecture 3 : Wednesday 1:00 pm
- Lecture recordings will be placed on the Learning Management System (LMS)
 - Not a substitute for attending lectures!
 - Seriously, we've done studies, coming to lectures leads to higher marks!

Timetable	Monday	Tuesday	Wednesday	Thursday	Friday
0800					
0900					
1000		Lecture 2			
1100					
1200					
1300	Lecture 1		Lecture 3		
1415					
1515	Chemistry-189 (Masson Theatre)				
1615					
1715					

FBE-G06 (Prest
Theatre)

Redmond Barry-102
(Latham Theatre)

Poll Everywhere!!!

- For in-lecture participation and feedback

Go to: pollev.com/esdpoll on your mobile device / tablet / laptop

Let's test it out now!

Workshops

- You should have already been assigned to a 3-hour workshop time.
- You may only change your workshop time if there are vacancies in other classes
 - You may NOT change workshop time slot after Week 2
- All Workshop classes are held in Design Studio 2 (Ground Floor Old Engineering building)
- **Workshops commence in Week 2,**

Workshops

Located in Old Engineering

Engineering Design Studio 2
is on the Ground Level



Workshops

Enter via
this door



Workshops

- You will work in **teams of SIX** in the workshop classes on a large-scale design project and associated tasks
- **During semester you will be asked to rate how well your team members have contributed to the workshops and projects, not just a number/mark, group health in a number of areas**

Workshops – Late Policy

- If you are late to a workshop
 - **More than 15 minutes late**
 - Can participate in workshop but will not receive marks for any in-class submissions
 - **More than 30 minutes late**
 - Not permitted to participate in the workshop
- If you have a valid excuse for being late you will need to supply evidence to your demonstrators

Assessment Summary

- There are two categories of the assessment for ESD 1:
 1. Individual 45 %
 2. Team-based 55 %

You must pass the Individual assessment to pass the subject!

Assessment Schedule

Week	Starting	Workshop	Quiz	Peer Assessment	Presentation	Report	Reflective Journal
1	23-July						RFJ, 5 X 1% Total = 5
2	30-July	1 % A&P					Project Reflection
3	6-Aug	1 % A&P					Eng: What is it?/ Why study it?
4	13-Aug	1 % A&P, Team Management Plan 5%					The Learning Process
5	20-Aug	1 % A&P		Round 1			Time Management
6	27-Aug	1 % A&P					Team Reflection
7	3-Sept	1 % A&P	5%				
8	10-Sept	1 % A&P			10%		
9	17-Sept	1 % A&P					
Break	24-Sept						
10	1-Oct			Round 2		Draft (5%)	
11	8-Oct	1 % A&P					
12	15-Oct	1 % A&P					
SWOT vac	22-Oct						
EXAM				Round 3		Final (35%)	

Individual – Reflective Journal (5%)

- Series of **short weekly pieces** on varying topics to be submitted electronically through the link on the LMS. These typically involve some **reading** on a topic, personal **reflection**, and a couple of paragraphs to be written.
- Each Submission is **worth 1% each (for a MAX total of 5%)**
- To receive the full 1% for a single entry, you must
 - **Submit** an entry by the due date; AND
 - **Evaluate** anonymously three other people's entries according to a provided set of criteria by the due date
- The reflective journal timetable plus some further information about the submission and evaluation stages are on the LMS.
- Submission of the journal is through the link on the LMS using Turnitin (plagiarism checking software)

Individual – Workshop (10%), Quiz (5%) and Exam (25%)

- Workshop Attendance and Participation (A&P) Mark (10%)
 - 5% is for attendance (and on time arrival)
 - $0.5\% \times 10 \text{ workshops} = 5\%$
 - 5% is based on from your score on in workshop assessment
 - This includes [Polleverywhere quizzes](#) in workshops
 - [Cody Coursework](#) homework problems (online MATLAB interface)
 - [LMS homework quizzes](#) on subs-system background
- Individual quiz online in Week 7 (5%)
- Two-hour written exam in the exam period (25%)

Individual Assessment Hurdle

- You must pass (50%) the individual assessment to pass the subject as a hurdle requirement.
- Assume you can get 100 marks, where individual = 45 marks
- The individual mark is made up of four parts:
 - journal (5 marks) + A&P mark (10 marks) + quiz (5 marks) + exam(25 marks) = 45
- You must get at least 22.5 marks of the possible 45 marks on the assessment
- This means if you do poorly on one part, you can make up for it by doing well on another part.

Assessment – Team Project (55%)

- Major Assessments
 - Team Contract (5%)
Start in workshop 2, Due in Week 4 online
 - Presentation (10%)
Team Presentation in Week 8
 - Draft Report (5%)
Due end of Week 10 for feedback
 - Final Report (35%)
40 page report due in exam period
- Some workshop classes require **team submissions** or in-class assessment by your demonstrators
- Workshop classes will involve designing, building (and breaking!) items for an experimental testing rig

Assessment – Peer Assessment

- Three times during Semester (Weeks 5, 9 and during the exam period) you will rate your **own performance** and each of your **team members' performance** in the project
 - Week 5 rating is for feedback only, for group health
 - Week 10 is feedback for the presentation and the exam period ratings will moderate your team project assessment
- You will use an online system called Qualtrics to do the ratings, more information on this in week 4.



Resources - Subject website

www.lms.unimelb.edu.au

- The LMS site is the main resource for this subject. It contains:
 - Lecture slides
 - Workshop material
 - Additional readings
- Through the LMS you will
 - receive announcements
 - submit assignments
 - receive your project marks

Submissions through LMS

- PDF files only!

All submissions done electronically through the LMS (reflective journals, major assignments) must be in the PDF file format

Other file formats will not be accepted due to software compatibility reasons

Read the document on LMS explaining how to create a PDF file from a word processor if you are unsure.

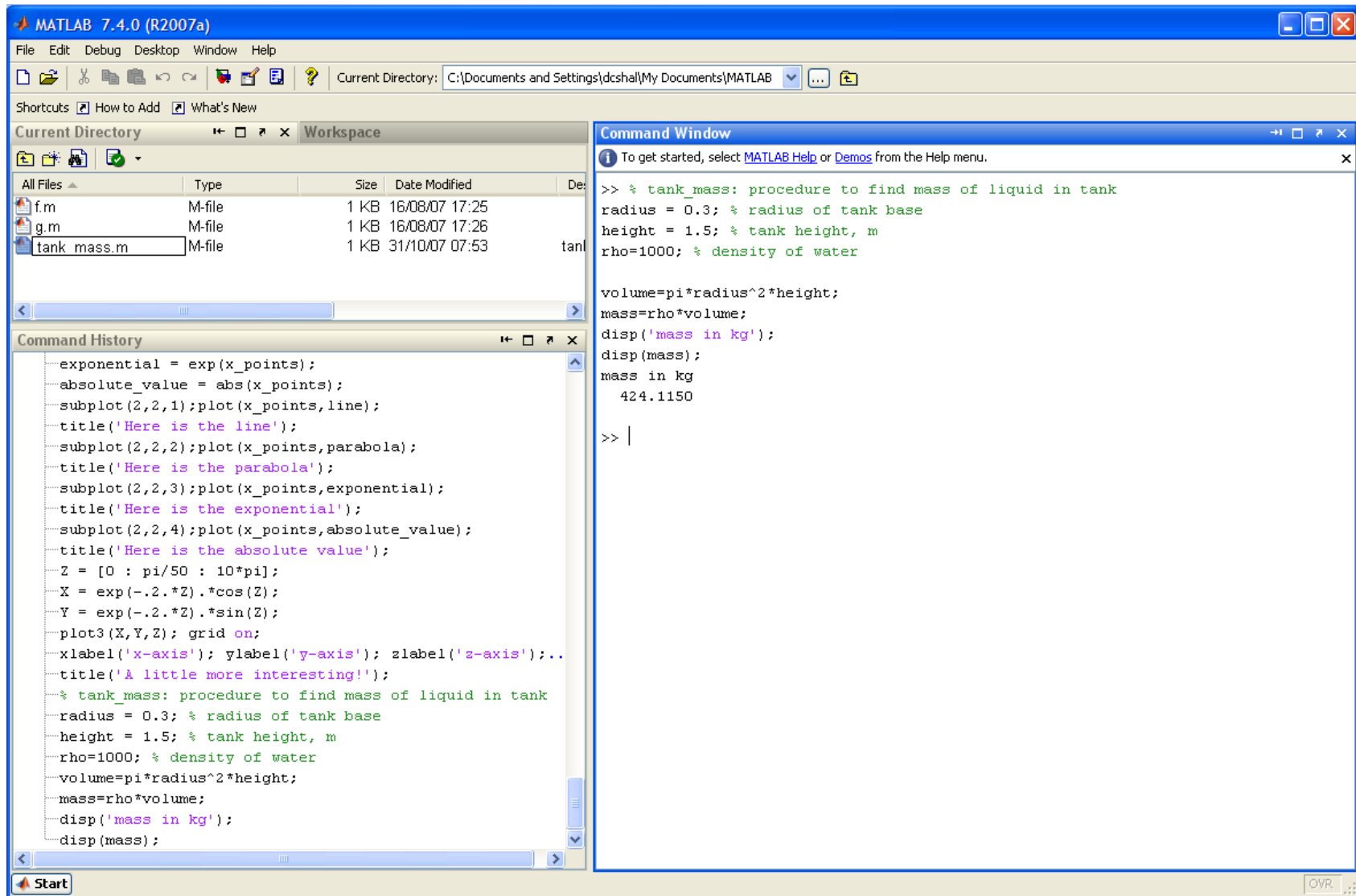
Resources - Computers

- All enrolled students have access to the University's computer facilities. Some of these facilities have 24-hours access.
- See Stop1 if your student card does not give you access to the Design Studios

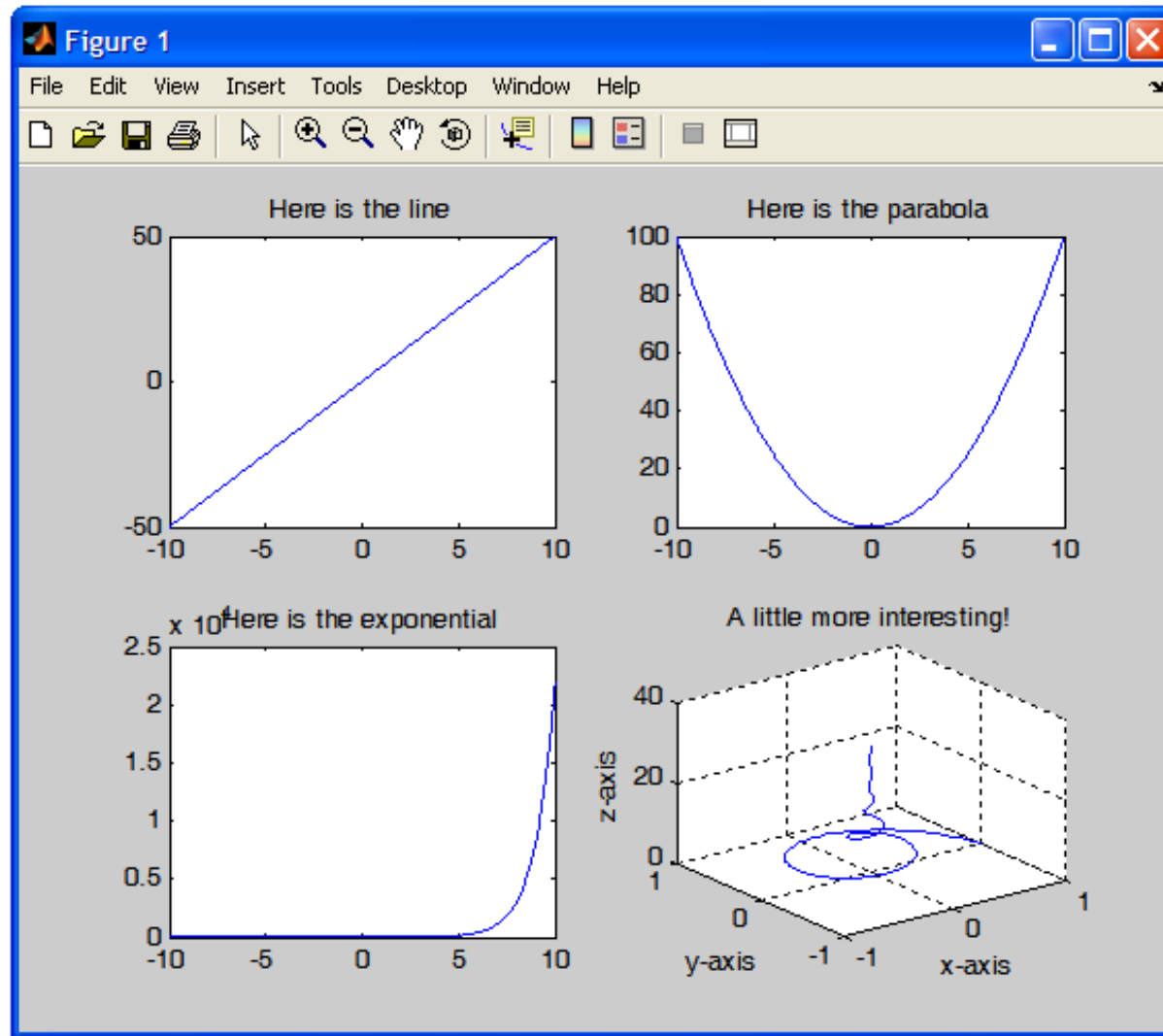
Computer Packages - MATLAB

- You will make heavy use of the mathematical programming package, [MATLAB](#), in both Engineering Systems Design 1 and 2.
- The latest version of [MATLAB](#) is available for use on the Engineering School computers.
- You will need to install a licensed copy of [MATLAB](#) on your computer for free using the University's site license?
 - Instructions on LMS!!!
- You must get a mathworks ID using your Melbourne Uni Student email!
 - You need to do this when installing MATLAB
 - This is the only way you will get credit for individual assessment in the workshops

Computer Packages - MATLAB



Computer Packages - MATLAB



ESD 1, “New and Improved?”

Based on student feedback, this is the new ESD 1 including these new aspects:

- Better support for MATLAB
 - More practice problems and homework
 - Everyone sit in front of a computer, in the workshops learning how to use MATLAB
- Problem workbook for workshops
 - Problems covered in workshops and additional practice problems for outside of the workshop
- Revised project, new sub-systems
 - pumps & pipes, membrane, real time monitoring and image analysis
- A new experimental rig
 - Not a tinker toy, real engineering instrumentation for quantitative measurement
- Revised technical content and lectures
 - More focus on the design project, a little less math
 - Less lectures, more than 50% of contact time in the workshops!

ESD 1, “New and Improved?”

- It also means we’re trying new things and we’ve [generated or redeveloped](#) a large number of new documents, problems sets, manuals, and lectures
- **THIS MEANS WE NEED YOUR HELP**
- We’re not perfect (but we’re close) so if you see a typo or wording on something isn’t clear, please post it on the [LMS forum](#) so we can fix it
- We will also have a forum for general comments on how you think different parts of the subject went.
- We’re hoping you’ll have a role in shaping the subject

How do I Pass ESD 1? do well in

- Learning involves building upon knowledge and constructing new links to familiar concepts
 - This is not an easy process!
- Participation is the key
 - Get involved in Engineering and ESD 1!
 - Contribute in your workshop class
 - Put in the effort to maximise your learning
- Keep up to date with
 - Lecture slides
 - Reflective journals
 - Team assignments

Support - Contact

- Demonstrators
 - directly during workshop classes
 - via email out of class times
- Lecturers
 - after the lecture
 - via email
 - through the ESD 1 discussion board on LMS
 - consultation sessions (to be announced later)

Next Lecture...

- Engineering and Society
 - Definitions
 - Role of Engineers in society
 - Engineering Method
 - Disciplines
 - Differences
 - Professional Accreditation
 - Graduate Attributes