School of Mechanical and Manufacturing Engineering

# MMAN2130 Design and Manufacturing

## Term 3 – 2019

## Week 1

**David Lyons** CEng GCULT **– Course Convenor**

david.lyons@unsw.edu.au

# MMAN2130

## Our Team

UNSW:

David Lyons – *Course Convenor, Lecturer (Tuesdays)*

*To be announced – Lecturer (Thursdays)*

Alex Lau – *Head Demonstrator*

Isabella Yan – *Demonstrator*

Carlo Pane - *Demonstrator*

Leigh Huang - *Demonstrator*

Ben Quinn – *Demonstrator*

Kevin Tian - *Demonstrator*

Weber Ting – *Demonstrator*

TAFE NSW:

Jon Jackson – *Assistant Head Teacher, Fitting and Machining and* Jon Jackson's team.

# MMAN2130

## Your lecturers - Tuesdays:

David Lyons CEng GCULT

- Chartered Engineer

**Student of engineering → Graduation: BE(Hons) → STAGE 1: practise under supervision; election as Member → *min*. 3-5 years experience → STAGE 2 → Chartered: supervise others → Election as Fellow of professional body (eg. Engineers Australia) → Continuing Professional Development (CPD) and further study – lifelong learning…**

**Useful links:**

**STUDENT: https://www.engineersaustralia.org.au/Membership/Membership-Benefits/Student-Membership-Benefits (Student membership)**

**GRADUATION (STAGE 1):** https://www.engineersaustralia.org.au/sites/default/files/resource-files/2017-03/Stage%201%20Competency%20Standards.pdf **(hint: it's in your MMAN2130 Course Outline! Also the focus of your Industrial Training!)**

**TOWARDS CHARTERED (STAGE 2):** https://www.engineersaustralia.org.au/Chartered

- 32 years industry experience: Design | Management | Naval architecture | Composites
- University learning and teaching: 19 years experience (14 P/T, 5 F/T), GCULT

**https://teaching.unsw.edu.au/gcult**

- Member, Engineers Australia; RPEQ; Fellow – The Royal Institution of Naval Architects

# MMAN2130

About:

**Your lecturers:**

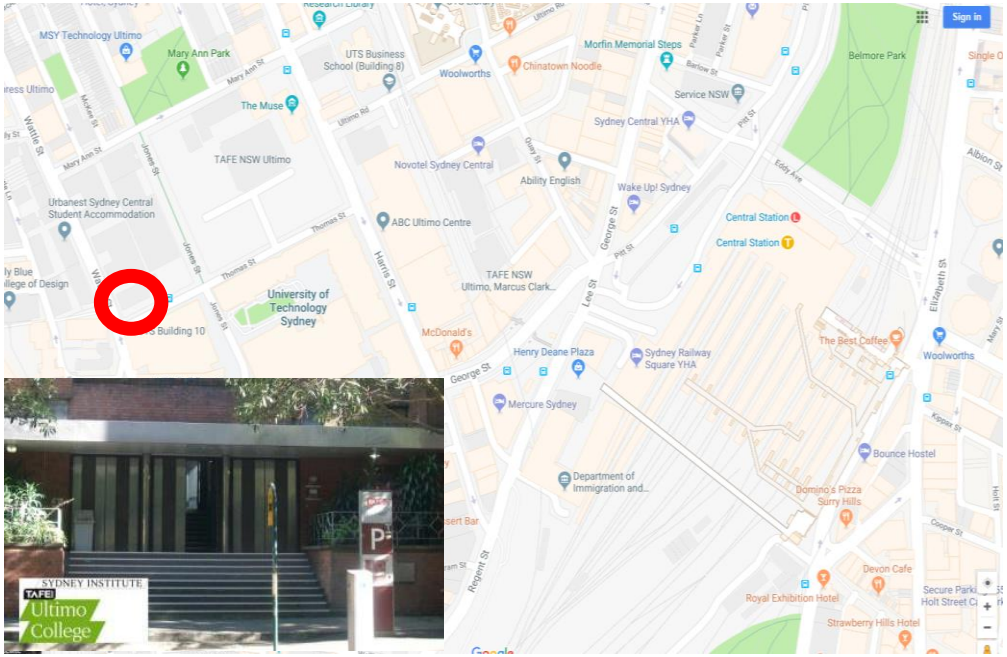
**Thursdays**

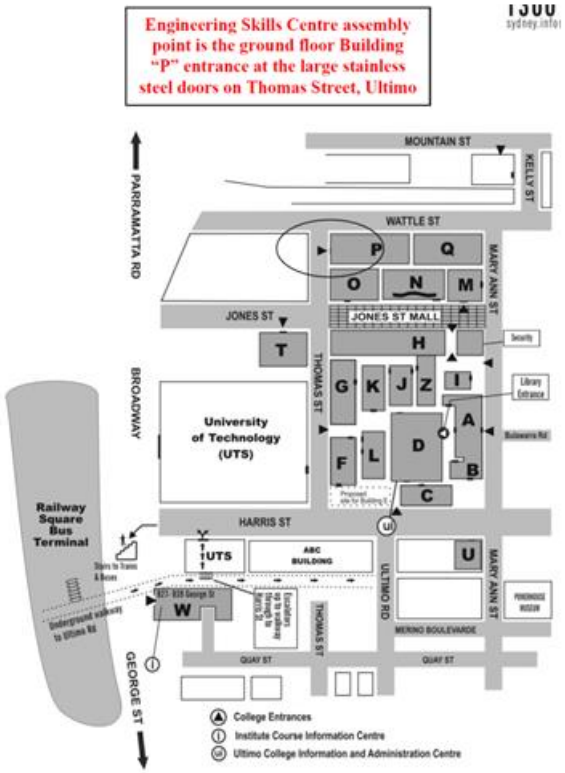
To be announced

# MMAN2130

**TAFE NSW @ Ultimo**

https://moodle.telt.unsw.edu.au/pluginfile.php/4491041/mod_resource/content/1/Engineering%2520Skills%2520Center%2520Info%2520Booklet%25202014%2520v3.pdf




ALLOW PLENTY OF TIME! ~10-15 MIN WALK FROM CENTRAL STATION

Parking: forget about it – take public transport

# MMAN2130

**TAFE NSW – Info Booklet**

**PPE**

- **Hair net or beret** (if hair cannot be restrained)
- **Beards –** cut short otherwise excluded!
- **Safety glasses** conforming to Australian Standard AS1337..:

Sydney TAFE

ENGINEERING SKILLS CENTRE

Fitting & Machining

Toolmaking

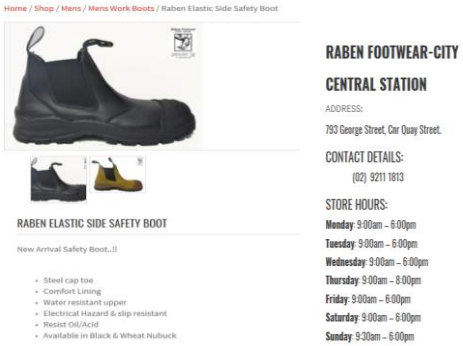
CNC & CAM

Fluid Power

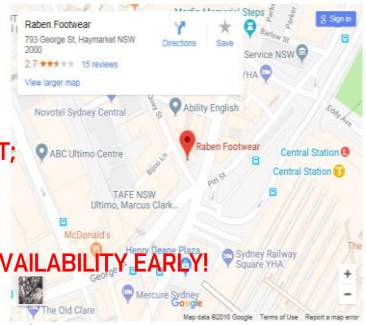
**UNIVERSITY INFORMATION BOOKLET 2014 (v3)**

ESC Information Booklet 2014 v3.docx Version IGF Tuesday, 18 February 2014 @ 1:57 PM Page 1 of 14

**Enclosed leather upper boots/shoes, with steel toe cap** to Australian Standard AS 2210 part 1 – 2010, having a solid leather upper (top) which:-
o does not melt when hot (so is suitable when welding or machining)
o does not allow sharp swarf or pointed objects to penetrate the top of the shoe or boot




OR BIG FEET;




CHECK AVAILABILITY EARLY!

IF YOU HAVE tiny

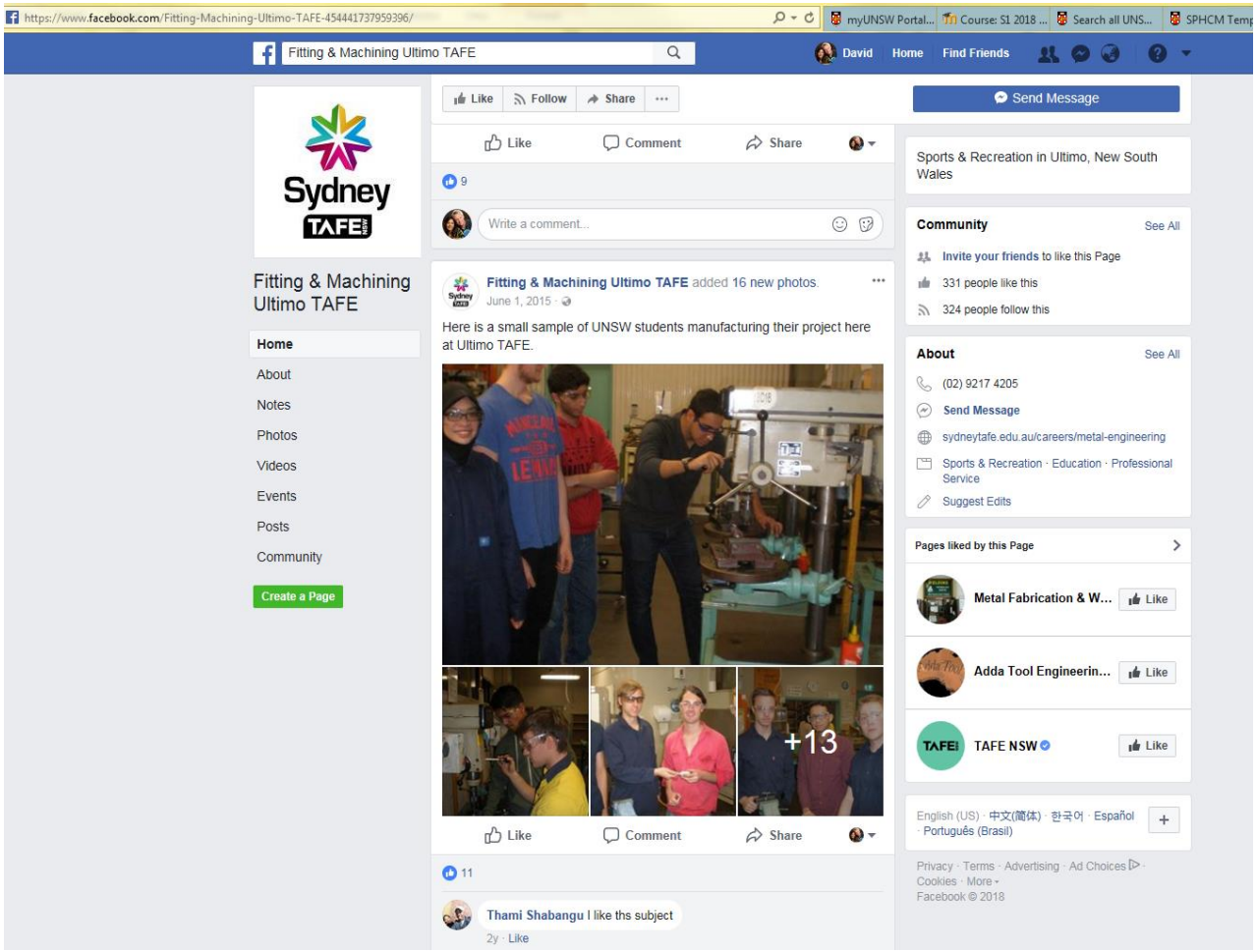


UNSW SYDNEY

# MMAN2130

**TAFE NSW @ Ultimo**

https://www.facebook.com/Fitting-Machining-Ultimo-TAFE-454441737959396/






UNSW SYDNEY

# MMAN2130

**TAFE NSW @ Ultimo**

**T3-2019 Timetable – TAFE groups of 15 members each**

| | | | |
|---|---|---|---|
| **TAFE "OTHER" at Ultimo Weeks 1-9 (Wed classes); 1-3,5-10 (Mon class): See Moodle for address TAFE PPE safety rules apply: see Moodle** | Monday | 5pm-9pm | Ultimo, OR |
| | *Wednesday* | *12noon-4pm* | *Ultimo, OR* |
| | *Wednesday* | *5pm-9pm* | *Ultimo* |
| | *Note: On UNSW timetable, TAFE shows 1 hour earlier start to allow for travel time to Ultimo* | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| OTH | M16A | 8269 | Rel | Full | 70/70 | 100% | Mon 16-21 (w1-3,5-9,11, See School) |
| OTH | W12A | 8270 | Rel | Open | 68/70 | 97% | Wed 12-17 (w1-9, See School) |
| OTH | W16A | 8271 | Rel | Open | 31/45 | 69% | Wed 16-21 (w1-9, See School) |

(i) **You CANNOT swap CAD or TAFE classes week to week. No "make-ups" possible for TAFE as you must work in your Pump Group.**

(ii) **You cannot miss more than one TAFE lesson (during weeks 2 to 10) – attendance for safety briefing in Week 1 at TAFE is compulsory. TAFE takes the roll and issues a certificate for the TAFE component of MMAN2130.**

**Sporting fixtures, personal reasons etc. are not acceptable reasons for missed attendances. (See (ii) above).**

# MMAN2130

**TAFE NSW @ Ultimo**

**MONDAY Groups – 5 TAFE Groups**

| TAFE Week | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
|---|---|---|---|---|---|---|---|---|---|---|
| Monday | 16-Sep | 23-Sep | 30-Sep | 7-Oct | 14-Oct | 21-Oct | 28-Oct | 4-Nov | 11-Nov | 18-Nov |
| **Monday Night 17:00-21:00 (5pm-9pm)** | | | | | | | | | | |
| NM2-1 | Measure | TURN 1 | TURN 2 | | Mill | Temp 1 | Temp 2 | Project | Project | Project |
| | PG02 | PLG01 | PLG01 | | PLG01 | PG02 | PG02 | Week 1 | Week 2 | Week 3 |
| NM2-2 | Measure | TURN 1 | TURN 2 | | Temp 1 | Temp 2 | Mill | Project | Project | Project |
| | PG02 | PLG01 | PLG01 | | PG02 | PG02 | PLG01 | Week 1 | Week 2 | Week 3 |
| NM2-3 | Measure | Mill | Temp 1 | Public | Temp 2 | TURN 1 | TURN 2 | Project | Project | Project |
| | PG02 | PLG01 | PG02 | Holiday | PG02 | PLG01 | PLG01 | Week 1 | Week 2 | Week 3 |
| NM2-4 | Measure | Temp 1 | Temp 2 | | TURN 1 | Mill | TURN 2 | Project | Project | Project |
| | PG02 | PG02 | PG02 | | PLG01 | PLG01 | PLG01 | Week 1 | Week 2 | Week 3 |
| NM2-5 | Measure | Temp 1 | Mill | | TURN 1 | TURN 2 | Temp 2 | Project | Project | Project |
| | PG02 | PG02 | PLG01 | | PLG01 | PLG01 | PG02 | Week 1 | Week 2 | Week 3 |

# MMAN2130

**TAFE NSW @ Ultimo**

**WEDNESDAY Afternoon Group – 5 TAFE Groups**

| TAFE Week | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
|---|---|---|---|---|---|---|---|---|---|---|
| Wednesday | 18-Sep | 25-Sep | 2-Oct | 9-Oct | 16-Oct | 23-Oct | 30-Oct | 6-Nov | 13-Nov | 20-Nov |
| **Wednesday 12:30-16:30 (12:30pm-4:30pm)** | | | | | | | | | | |
| NW2-1 | Measure | TURN 1 | TURN 2 | Mill | Temp 1 | Temp 2 | Project | Project | Project | |
| | PG02 | PLG01 | PLG01 | PLG01 | PG02 | PG02 | Week 1 | Week 2 | Week 3 | |
| NW2-2 | Measure | TURN 1 | TURN 2 | Temp 1 | Temp 2 | Mill | Project | Project | Project | |
| | PG02 | PLG01 | PLG01 | PG02 | PG02 | PLG01 | Week 1 | Week 2 | Week 3 | |
| NW2-3 | Measure | Mill | Temp 1 | Temp 2 | TURN 1 | TURN 2 | Project | Project | Project | |
| | PG02 | PLG01 | PG02 | PG02 | PLG01 | PLG01 | Week 1 | Week 2 | Week 3 | |
| NW2-4 | Measure | Temp 1 | Temp 2 | TURN 1 | Mill | TURN 2 | Project | Project | Project | |
| | PG02 | PG02 | PG02 | PLG01 | PLG01 | PLG01 | Week 1 | Week 2 | Week 3 | |
| NW2-5 | Measure | Temp 1 | Mill | TURN 1 | TURN 2 | Temp 2 | Project | Project | Project | |
| | PG02 | PG02 | PLG01 | PLG01 | PLG01 | PG02 | Week 1 | Week 2 | Week 3 | |

# MMAN2130

**TAFE NSW @ Ultimo**

**WEDNESDAY Evening Group – 3 TAFE Groups**

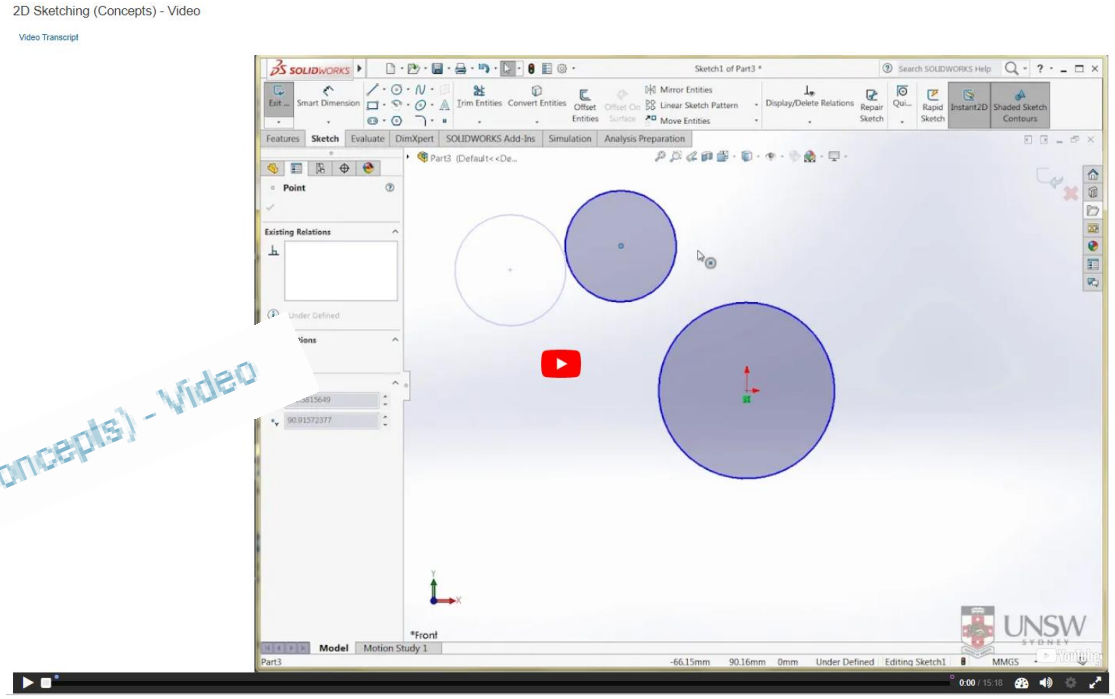
| TAFE Week | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 |
|---|---|---|---|---|---|---|---|---|---|---|
| Wednesday | 18-Sep | 25-Sep | 2-Oct | 9-Oct | 16-Oct | 23-Oct | 30-Oct | 6-Nov | 13-Nov | 20-Nov |
| **Wednesday Night 17:00-21:00 (5pm-9pm)** | | | | | | | | | | |
| NW2-6 | Measure | TURN 1 | TURN 2 | Mill | Temp 1 | Temp 2 | Project | Project | Project | |
| | PG02 | PLG01 | PLG01 | PLG01 | PG02 | PG02 | Week 1 | Week 2 | Week 3 | |
| NW2-7 | Measure | Mill | Temp 1 | Temp 2 | TURN 1 | TURN 2 | Project | Project | Project | |
| | PG02 | PLG01 | PG02 | PG02 | PLG01 | PLG01 | Week 1 | Week 2 | Week 3 | |
| NW2-8 | Measure | Temp 1 | Temp 2 | TURN 1 | Mill | TURN 2 | Project | Project | Project | |
| | PG02 | PG02 | PG02 | PLG01 | PLG01 | PLG01 | Week 1 | Week 2 | Week 3 | |

# MMAN2130

**CAD Labs**

**Getting to grips with Solidworks software**

***H5P videos: review before your CAD Session!***




**Start Week 2:**

| |
|---|
| Introduction to SolidWorks and 2D sketching |
| 3D Operations |
| Engineering drawing. CAD test. |
| Holes and hole wizard. |
| Assemblies. CAD test. |
| Fasteners |
| Additional techniques: Patterning & Mirroring. CAD test. |
| CAD summary |

**Week 10 is final CAD test (others in weeks 6 & 8 – 3.33% each)**

# MMAN2130

## CAD Labs – Timetable and group allocations

| | | | |
|---|---|---|---|
| **CAD Labs "TLB" Weeks 2-10** | Monday | 10:30am-12noon | Ainsworth (J17) 204, OR |
| | Monday | 12noon-1:30pm | Ainsworth (J17) 204, OR |
| | Monday | 2:00pm-3:30pm | Ainsworth (J17) 204 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TLB | M10A | 8266 | Enr | Open | 49/61 | 80% | Mon 10:30-12 (w2-3,5-11, Ainswth204) |
| TLB | M12A | 8267 | Enr | Open | 65/69 | 94% | Mon 12-13:30 (w2-3,5-11, Ainswth204) |
| TLB | M14A | 8268 | Enr | Open | 55/65 | 85% | Mon 14-15:30 (w2-3,5-11, Ainswth204) |

**CAD LAB group allocation questions? First, check Moodle, only then email Head Demonstrator, Alex Lau at alex.lau@unsw.edu.au**

# MMAN2130

***Time out …***

- What is DESIGN ?
- What is MANUFACTURING ?
- How do they relate?

# MMAN2130

**The Pump Project (Group-based design, build, test and report)**

**Pump groups usually have 5 members; course staff will allocate you**

- **Functional requirements:**

  **FUNCTIONAL SPECIFICATION for the PP175 Vertical Displacement Pump**

  *Pump requirement Specification v2*.pdf

- **Sketching concepts (weeks 2 & 3), then**
- **Drawing in Solidworks (weeks 3-8), then**
- **Manufacture (TAFE weeks 7-9)**

# MMAN2130

## Pump testing **Week 11 (Tuesday – to be confirmed)**

Tue 14-18 (w10, UGLAb116A)

Thu 14-18 (w10, UGLAb116A)

THIS IS WRONG in TIMETABLE!

# MMAN2130

## Weekly structure

**pre-LEC: Go to Moodle and go through the *H5P Pre-seminar Activities***

**LEC:**
**First hour is a weekly topical presentation and discussion of the H5P**
**Second hour is a *Design Conclave* with lecturer and tutors in your Pump Groups**

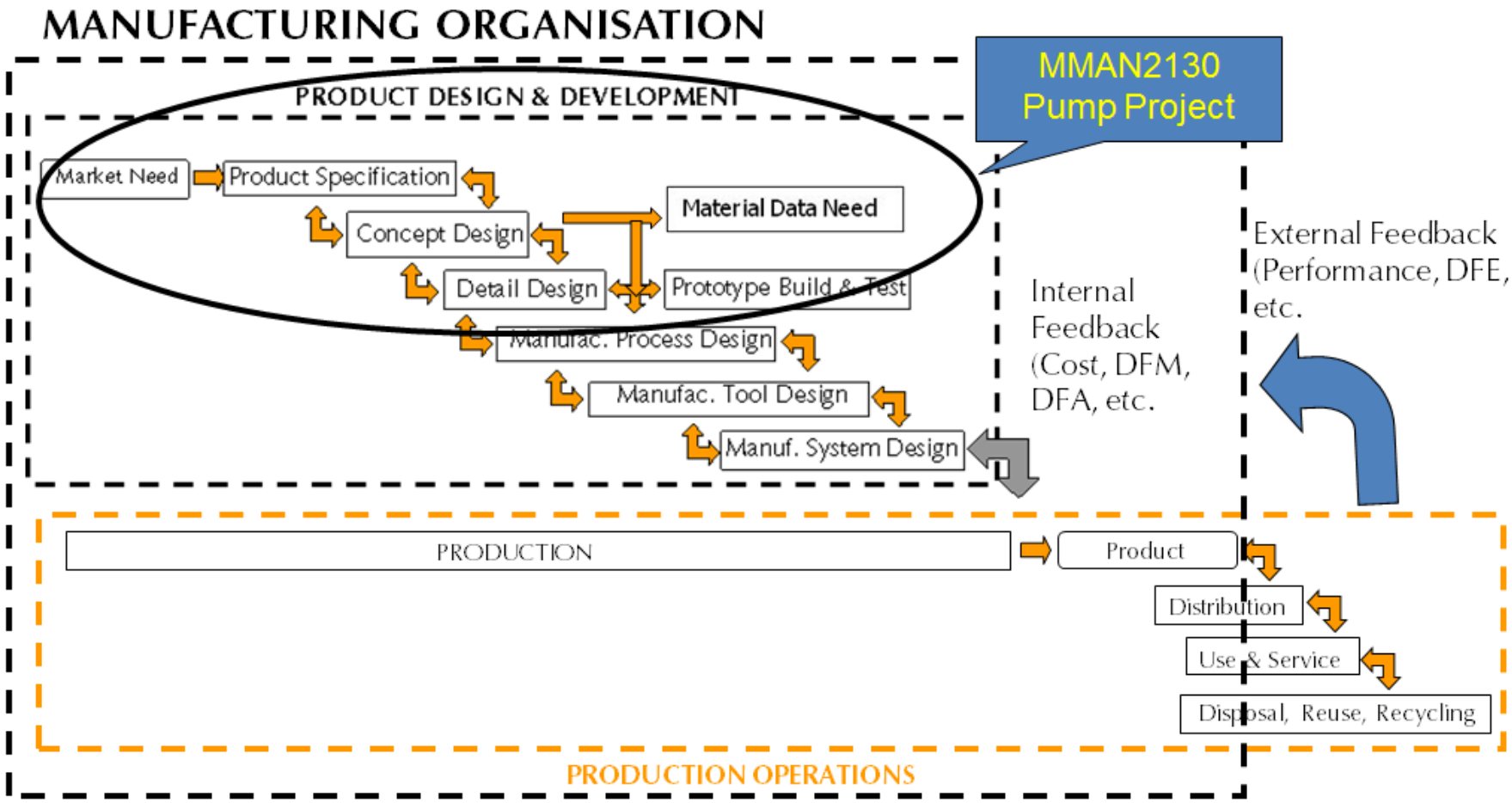
conclave [kon-kleyv, kong-] noun 1. a private or secret meeting. 2. an assembly or gathering, especially one that has special authority, power, or influence: e.g. a conclave of design engineers!

**pre-TUT: Go to Moodle and go through the H5P CAD Video**

**TUT: CAD labs with guided progress and tests in weeks 4, 6, 8 & 10.**
**Develop your pump component drawings and ask for help.**

**OTHER:**
**TAFE Week 1-Intro/safety/PPE, Weeks 2-6 Guided activities, Weeks 7-9 Manufacturing your pump component, Week 11 Pump testing in J18 UTL**

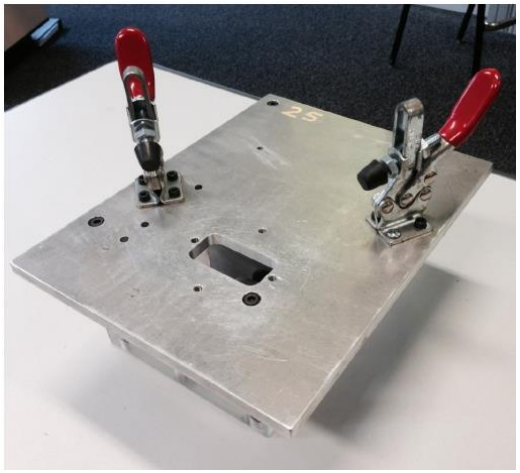
# MMAN2130 Pump Project
# Why are we doing this?

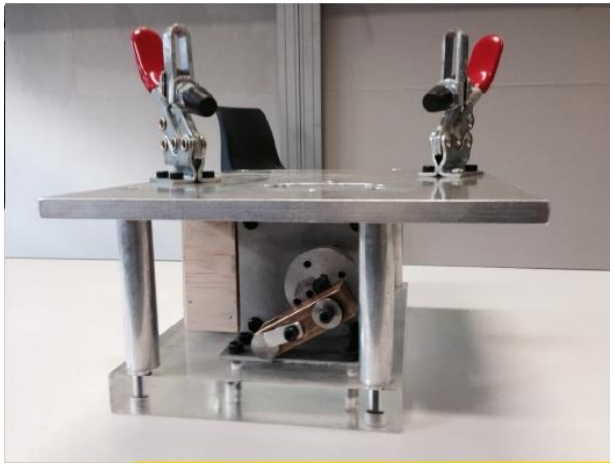



Courtesy Prof S Kara (UNSW, 2017)

- We will be mimicking a real product development project
- Project-based
- We will be engineering (i.e. designing and fabricating) a positive displacement, single acting, simplex, reciprocating pump
  - Groups of 5 members (randomly assigned )
  - Each group member allocated a component/sub-assembly

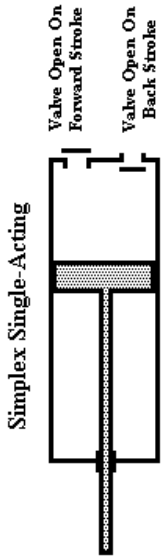
  - https://www.animatedsoftware.com/pumpglos/simplex.htm
  - The fixture and motor are provided to you in Week 11 during pump testing





**Courtesy Prof S Kara (UNSW, 2017)**

- How do I design and build such a pump?
  - Single acting: only draws or pumps fluid with every cycle
  - Simplex: only one piston
  - Reciprocating: moves backwards and forwards in a straight line (on a vertical axis)




https://www.youtube.com/watch?v=AkFx7Ssmqpw

**Courtesy Prof S Kara (UNSW, 2017)**

- Core engineering skills that you'll learn in this course:

  - **Theory**
    - Engineering drawing standards – AS1100
    - Process planning (eg. BOM, assembly chart, work method sheet)
    - Material considerations and selection
    - Design for high volume manufacturing
  - **Practical Skills**
    - Concept sketching
    - CAD – 2D/3D using Solidworks
    - Measuring, templating, cutting, turning, milling, drilling (TAFE)

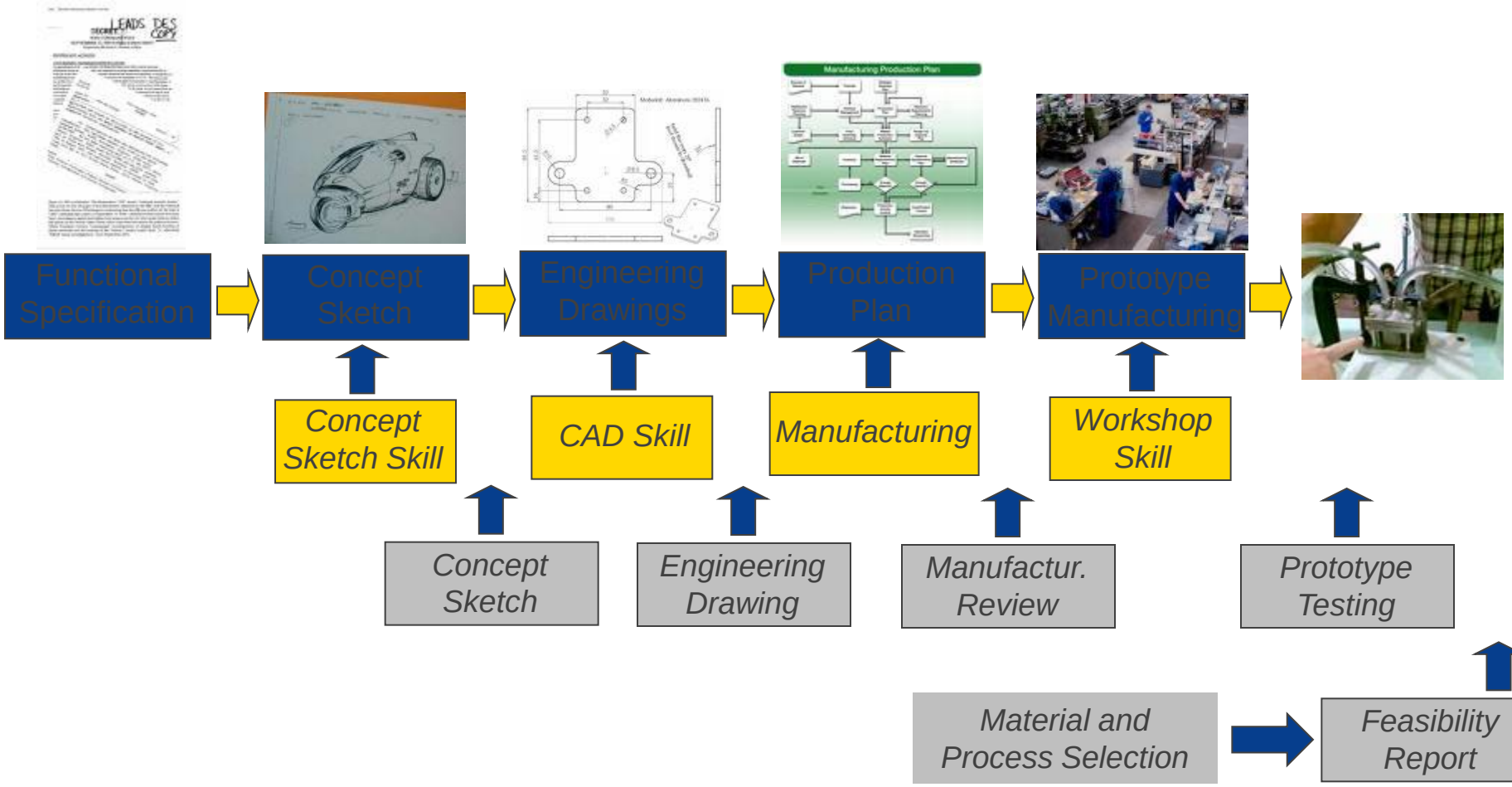
**Courtesy Prof S Kara (UNSW, 2017)**

Australian Standard AS1100 via the university library SAI Global subscription: http://subjectguides.library.unsw.edu.au/engineering

Go to Standards tab on right-hand side; Australian standards (via SAI Global). Log in with zPass, search Australian Standard AS1100 *Technical drawing* in several parts – ensure you access current version.

# MMAN2130 – Course Structure

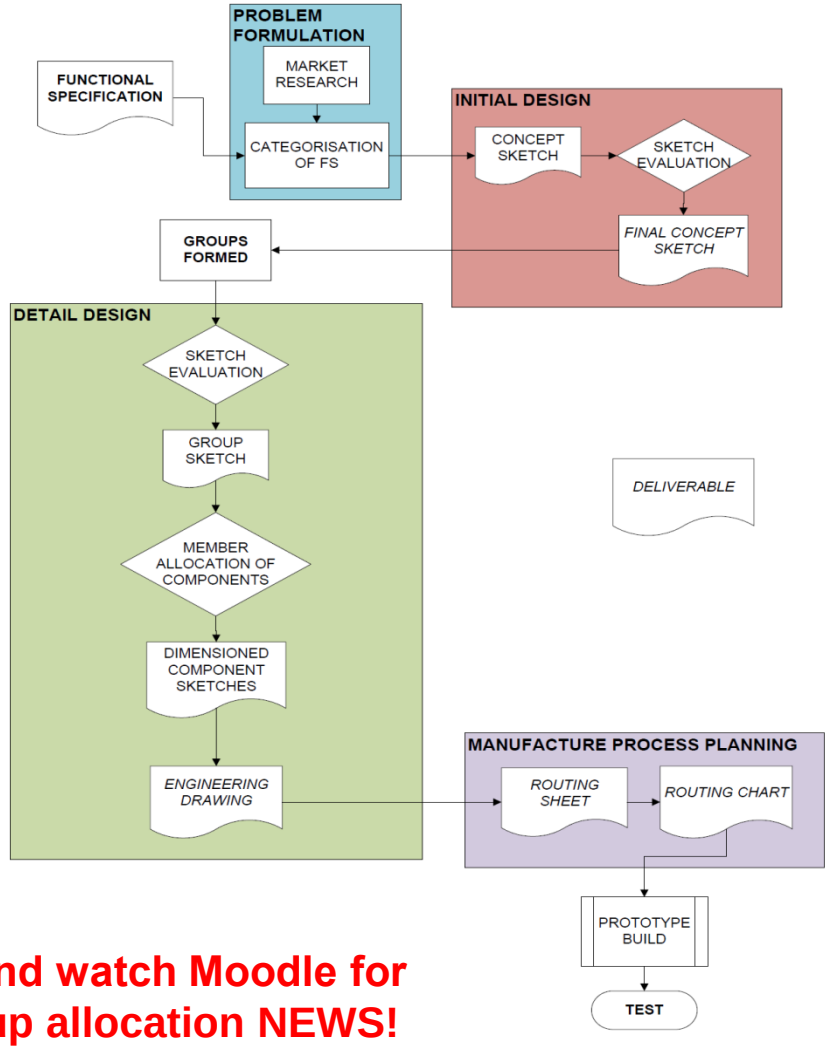
- Entire course structured around your pump project:




**Courtesy Prof S Kara (UNSW, 2017)**

## FUNCTIONAL SPECIFICATION for the PP175 Vertical Displacement Pump

*Pump requirement Specification v2*.pdf




- Start researching how piston pumps work! What kind of valve will you use?

**… and watch Moodle for group allocation NEWS!**