

*Microcontrollers &
Programmable Logic Controller
– Case study*



Dr. George Grodzicki
School of Engineering
University of Western Sydney
Australia

ICEE–2010

MC & PLCS

2

[UWS, School of Engineering,
Sydney, Australia](#)



- Bachelor degrees
- Civil, Computer, Electrical, Robotics /
Mechatronics
- Accredited courses ...IEAust
- Construction, Industrial Design

Graduate attributes

- Set by IEAust + UWS
- Observable on graduation
- Roles as professional engineers
- Relevance of discipline competence
- Emphasized to the class

Microcontroller

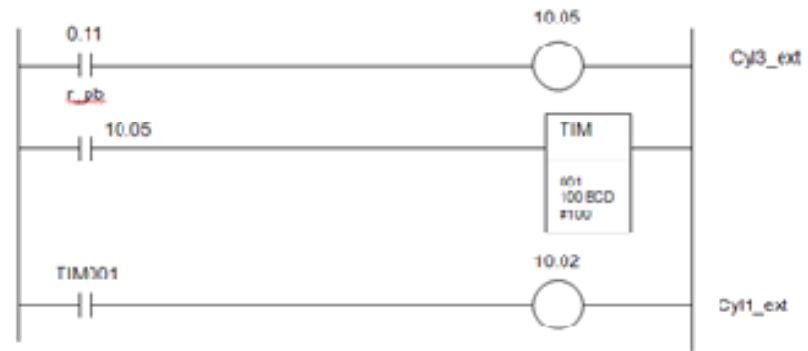
- Computer on a chipCPU, memory, peripherals
- For control applications
- Assembly language programmable

PLC

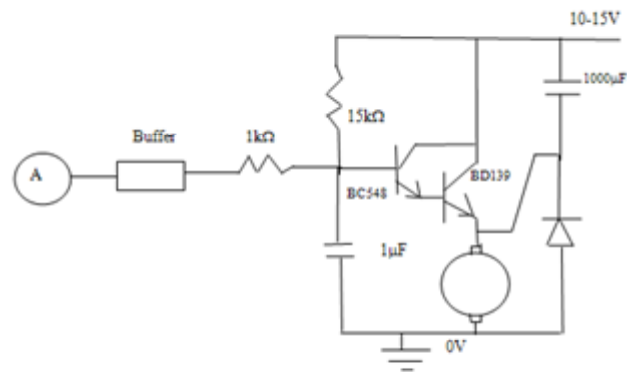
- Specialised industrial grade computer
- Ladder logic programmable ... plus more

Not so different then ...

PLC Ladder diagram



Microcontroller



Integrated delivery

- As two distinct parts

Shift to ...

- Putting the emphasis on similarities

Contrasts

at the *user interface ...*

MC & PLCS

7

Mixed cohort 2007

- 44% Robotics & Mechatronics program
- 46 % Electrical / Computer programs
- 10% Postgraduate, industrial design eng

Bit of a challenge ...

Unit Assessment student driver

- Practical tasks 35%
- Quizzes – Multiple choice 10% + 15%
- Final exam - closed book 40%

Delivery....

- Lectures 1.5 to 2 hrs /wk
1st hr: MC ; 2nd hr: PLCs
- Tutorials/practicals .. 2 hr / wk
- Alternating weeks:
 - MC labs 2hrs even weeks
 - PLC Labs 2 hrs odd weeks

Lab Book Marking

- Keep records of their practical work
- Signed off & data ... demonstrated
- Marking criteria ... handed out at the start
- Only one recorded practical marked - by lots

Keeps them guessing...

Delivery.... Use of Blackboard site

- Reader for the MC portions
- Blackboard site for posting up PLC portions

Delivery.... Use of Blackboard site

- Post up documents.....
- Remote access
- Discussion board
- Test statistics .. Quiz results
 - feedback to student
 - *where they are .. rest of class*

- Leaving things to “Stu Vac” bad idea
- Engage from the start
- Homework each week + feedback in time
- Quizzes 3 times per session... ditto
- Physical labs
- Simulations

Apparatus for the PLC

- Frame mounted PLC + power supply
- Pneumatic cylinders
- Solenoid operated .. via PLC

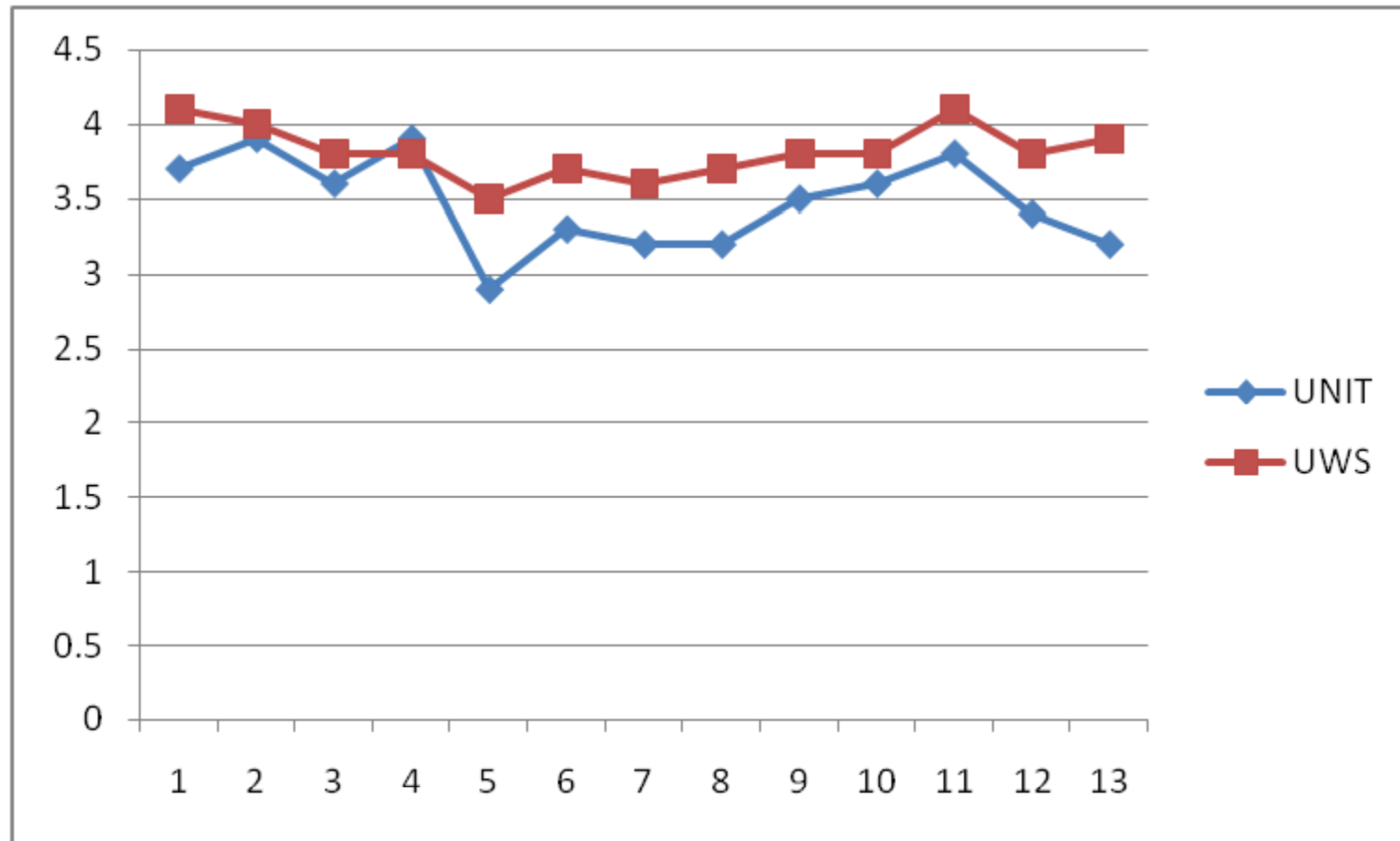
Apparatus for the Microcontroller

- Frame mounted MC PCB + power supply
- Toggle switches, leds, small dc motor, LCD

Common approach

- Similar but different
- Processor, memory, power supply, I/O, memory size.
- User programs.....downloaded then run
- Sample code ... applied to other uses
- Interrupts a challenge with MC .. *help*

Student Feedback on Units ratings 1-5



Final reckoning

- Limited success SFU
- 13 Questions, scaled 1-5
strongly agree to strongly disagree...
- Small number of respondents 16/38 ?
- Q13 ... “Overall I’ve had a satisfactory learning experience in this unit”
0 SA, 9 A, 2 N, 4 D, 1 SD

Final reckoningSFU

Q2: “See the relevance of this unit to my course”

1 SA, 12 A, 2 N, 1 no response

Q12 “This unit helped me develop my skills in critical thinking, analysing, problem solving & communicating”

1 SA, 8 A, 5 N, 2 SD

..... *failed to hit the mark ??*

Limited success

- MC ... too difficult
Understanding of structure of MC – registers, addressing...
- Integrated approach abandoned ... end
- Separate parts delivered .. in 2010
- Work ready attributes definitely