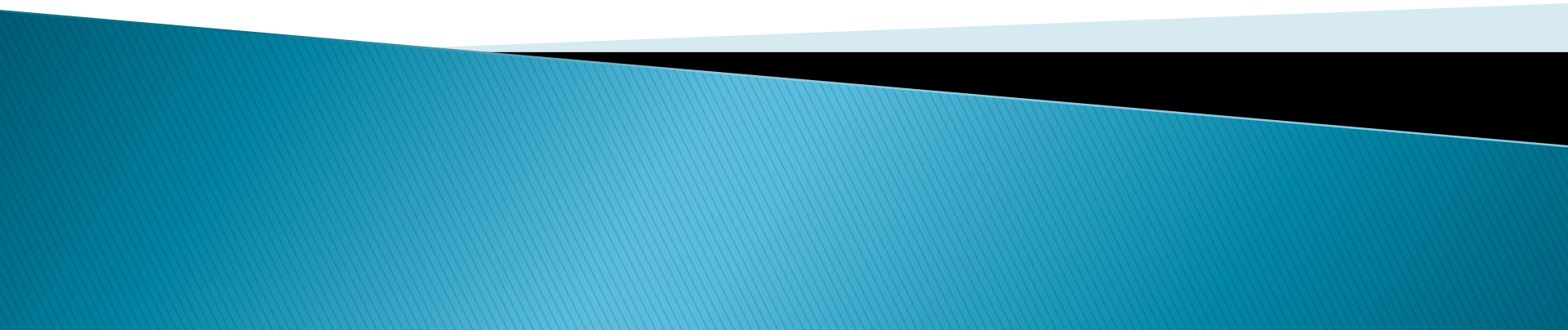


41012 Programming for Mechatronic Systems

Week 1



Overview

- Staff
- Link to Industry Needs
- Objectives
- Class Structure
- Assignments
- General Rules
 - Plagiarism
 - Late submissions
 - Peer Review
- In-class exercises

Subject Staff


- ▶ Subject Coordinators
 - Alen Alempijevic
- ▶ Teaching Staff
 - Alex Virgona



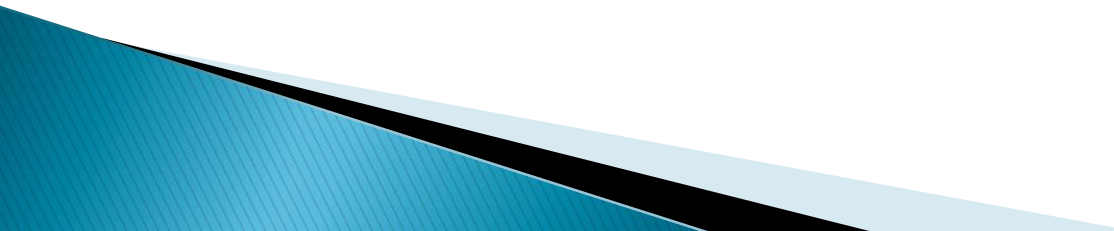
Mechatronic Systems

- ▶ 6.4B Devices Interconnected + System on
- ▶ Chip Devices Explosion
- ▶ Beyond Single Monolithic Code
- ▶ OO Paradigm – More Admissible to Systems
- ▶ C++ Essential on Many Layers
 - Android Backbone, Libraries, Applications
- ▶ Code Reuse / Testing / Documentation
- ▶ Robotics Jobs (demand)

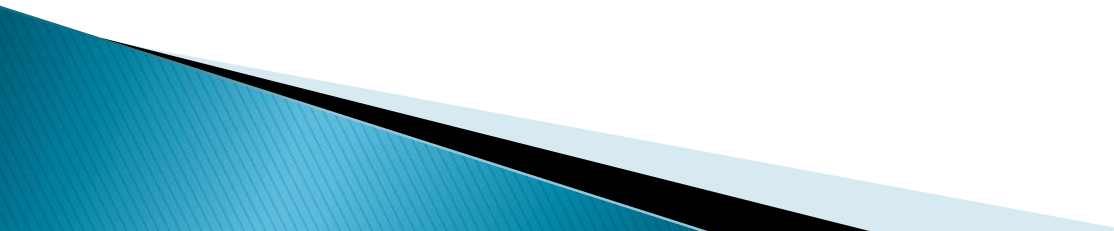
Subject objectives

- ▶ 1. **Design** classes that are reusable, reliable and maintainable
 - ▶ 2. **Apply theoretical knowledge** of sensors and control to practical programming problems
 - ▶ 3. **Select** appropriate class structures and data handling methods for task at hand
 - ▶ 4. **Implement and test** object-oriented applications of moderate complexity
 - ▶ 5. **Communicate** programming design decisions, dependencies, interconnections, use cases and testing procedures in a written document
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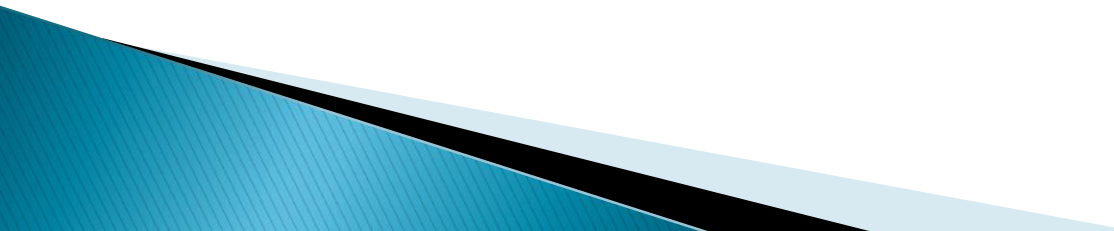
Class Structure

- ▶ Pre-readings given
 - ▶ Students view readings, attempt and come to class
 - ▶ We clarify concepts and push forward with examples
 - ▶ We build knowledge base (stratify knowledge) towards the assignments; more complex layers of understanding
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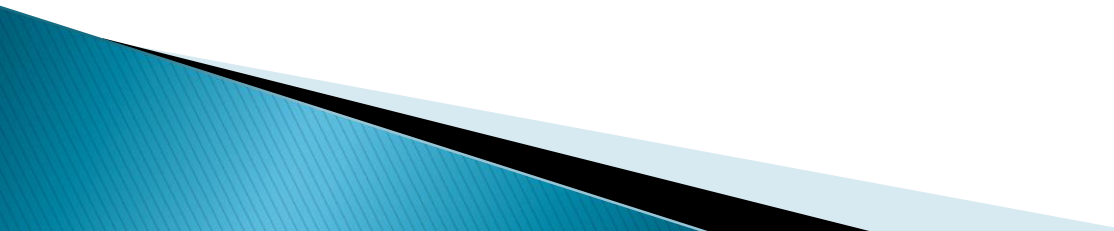
Assessment

- ▶ 1) Assessment I:
Developing Sensor Class (5%)
 - ▶ 2) Assessment II:
Utilising Abstraction for a Range of Sensor Classes (20%)
 - ▶ 3) Assessment III:
Threading, Synchronization and Data Integrity (20%)
 - ▶ 4) Individual Project: (40%)
 - ▶ 5) Code Review: (9% : 3%+3%+3%)
 - ▶ 6) Quizzes (6% : 6 x 1%)
- 

Teaching Delivery

- ▶ OS: Ubuntu
 - ▶ Compilation + Tools: CMake
 - ▶ Documentation: Doxygen
 - ▶ IDE: QtCreator
 - ▶ Unit Testing: gtest
 - ▶ Library : OpenCV
 - ▶ CBSE / Middleware : ROS
- 

General Rules

- ▶ Academic Conduct
 - Plagiarism
 - ▶ Late submissions
 - Penalty: -20% per day, Up to 5 days
 - ▶ Google Forms
 - Will be used for feedback (peer review)
 - Peer reviews will also be distributed (anonymous)
 - ▶ Feedback
 - Provided on each assignment on UTS Online with associated Rubric
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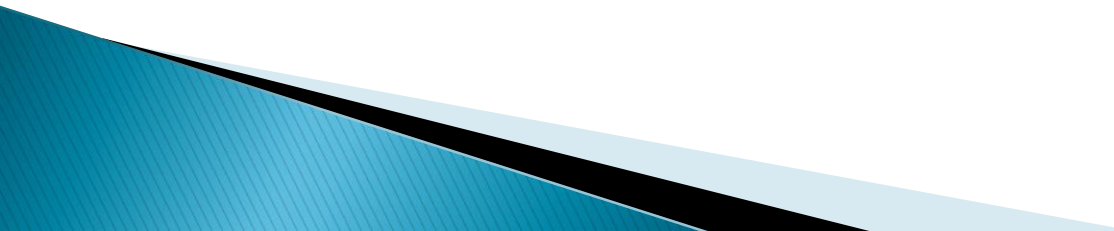
Compiling Samples

- ▶ Download the examples from [Lynda.com](https://www.lynda.com)
- ▶ Enable compiling of `working.cpp` from Chap1
- ▶ with CMake
 - Command line
 - QtCreator / Eclipse

Exercises

- ▶ Review of C
 - Pointers
 - Arrays
 - Functions
- ▶ Use material on following pages to query your understanding

Pointers & Reference

- ▶ Assign a double **x** of value **41012**;
 - ▶ Use a pointer **ip** to point to **x**
 - ▶ Print the value of what **ip** is pointing to
 - ▶ Make **y** reference to **x**
 - ▶ Print the value of what **y** is referencing to
 - ▶ Create a double **z** of value **1**
 - ▶ Use a pointer **ip** to point to **z**
 - ▶ Make **y** to reference to **z**
 - ▶ Print the value of what **ip** and **y** is referencing to
- 

C arrays – MACRO

- ▶ Create an array `x` of doubles with 10 elements
 - Populate the elements of array on creating of array, each element `[i]` has value `i`
 - Can you create a loop to populate elements of `x` (each `x[i] = i`), how to code end of loop?)
 - Can you use a pointer and loop to initialise elements of array

C STRINGS

- ▶ Create an string array (`char[]`) `x` to value `"41012"`
 - do we need to specify size on initialisation?
 - Initialise with (INITIALISER LIST)
 - Can you create a loop to show elements `x[i]` (how to code end of loop, can we have a check for NULL, what is `x[i]`?)
 - Can you use a pointer and loop to print elements
- ▶ ADVANCED, Why does `x[i]=NULL` work for `char[]` for termination of loop, and will not work for `double[]`

Loops – Typcasting

- ▶ Create an string array (`char[]`) `x` to value “41012”
 - Can we typecast to integer each value (and what the value of each integer is?) `(int)(x[i])`
 - Add up all the elements (as numbers)?
 - Can we count number of elements less than 2
 - Use a for loop
 - Use a while loop
 - ADVANCED: Use a for range loop

Switch Case – Const

- ▶ Create an string array (char[]) x to value “41012”
 - Switch on items 4,1,0,2 and print word for value (what type needs to be in case clause?)

Functions

- ▶ Create a function that accepts a double value as a parameter and
 - 1. Returns a square value
 - 2. Returns a bool value if the double is greater than zero and the square value instead of initial passed value
 - 3. Returns bool value if the double is greater than zero, the square value, the cube value and the passed value incremented by one
 - 4. Loop over item 3 for 1–20
- ▶ ADVANCED: How best protect the passed value?