Module Outline: Nature of Computing Comp3402 2021-22

This Module Outline provides details of your module and your learning objectives that you need to know to achieve a successful module outcome.

1. When do I have to attend my module sessions?

Occurrence	Day	Time	Room/Online
A	Mondays Tuesdays	12:15 – 13:45 11:15 – 12:45	CH1007
B	Mondays Tuesdays	14:15 – 15:45 13:15 – 14:45	CH1007

Room information*: *Students are advised to check room details on the Live Timetable System link on the UW website Student portal. Should on occasion class cancellations be necessary, notifications will be made in accordance with the Class Cancellation Policy, which can be found here.

2. Who will be teaching me on my module?

Name	Email address, Room number	Qualifications and experience:
Module Leader:	Dr. Colin Price, c.price@worc.ac.uk, Room CHLG020, Phone 542024	MA in Natural Sciences majoring in Experimental Physics (Cambridge), PhD Electronic Engineering (University of Leuven – Belgium), Fellow of the Higher Education Academy, National Teaching Fellow. Over 70 research publications in areas of Theoretical Physics, Literacy, Computer Science and Computer Science Education.
Module Tutor:	Dr. Pete Moody CH1005 542199 p.moody@worc.ac.uk	BSc Physics with Planetary and Space Physics (Aberystwyth). MSc Atmospheric Physics and Dynamics (Imperial College), PhD Atmospheric Physics (UMIST), PG Diploma in Computing for Commerce and Industry (Open University), Fellow of the Higher Education Academy.

To obtain help with your learning within this module please contact your Tutor or Module Leader by email.

Comp3402

3. **What is my module week-by-week contents and what do I have to prepare for each session?**

Module materials for your preparation and to enable you to participate in class are available in MyDay, which can be accessed at MyDay or the module's Blackboard site : add link. This module will run primarily from the Module Leader's staff website here (a link will be supplied on blackboard). The resource list for this module can be accessed via: Please add the link to the module's resource list.

See

W/C		Preparation	Learning Activities	Platform	LOs
13 Sept	Induction Week / Review Week				
20 Sept	1	PP1.1 Brief Read Chapter 1	**UNIT 1 (Part 1)** Image Processing: Enhancement and Segmentation	Octave	2
27 Sept	2				
4 Oct	3				
11 Oct	4				
18 Oct	5	PP1.2 Brief Read Chapter 2	**UNIT1 (Part 2)** Robot Vision: Object detection and line following	Parallax Robot Arduino	1
25 Oct	6				
1 Nov	Progress Week and Award Ceremonies				
8 Nov	7				
15 Nov	8				
22 Nov	9	PP2.1 Brief Read Chapter 3	**UNIT 2 (Part 1)** Control theory (Wind Turbines) - or – Dynamic Systems (Vibration Energy Harvesters)	Unreal-4 engine	4
29 Nov	10				
6 Dec	11				
13 Dec	12				
20 Dec	**Christmas Break**				
27 Dec	**Christmas Break**				

3 Jan	**Revision week and Personal mid-year review**				
10 Jan	**Assessment Week**				
17 Jan	13	PP2.2 Brief Read Chapter 4	**UNIT 2 (Part 2)** Neural Circuits. Central Pattern Generators. Sherlock Biped Robot	Octave Arduino	3
24 Jan	14				
31 Jan	15				
7 Feb	16				
14 Feb	17	PP3.1 Brief Read Chapter 5	**UNIT 3 (Part 1)** Design-Build-Test Project. (Group Work) Student choice of one of the following 1) Robot navigation using computer vision 2) Wind-turbine Investigations 3) Snake Robot 4) Vibration Energy Harvester Investigations	Arduino Octave	5
21 Feb	18				
28 Feb	Progression Week				
7 Mar	19				5
14 Mar	20				
21 Mar	21	PP3.2 Brief Read Chapter 6	**UNIT 3 (Part 2)** Modern Operating Systems Student choice of one of the following 1) Free-RTOS (Arduino) multi-tasking operating system 2) OpenMP Parallel Programming 3) Multicore programming (AURIX or Arduino Portenta)		**6**
28 Mar	22				
4 Apr	23				
11 Apr	Easter Break				
18 Apr	Easter Break				
25 Apr	24				

Bank Holiday Monday – 2 May 2022

Reassessment Week: w/c 4 July 2022

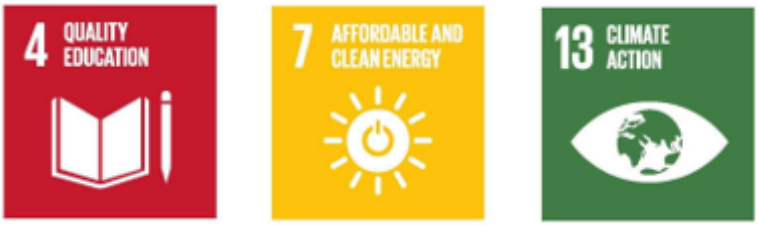
4. What are the main themes of my module?

Please consult the color-coded 'Roadmap' at the end of this document. You will see several subject-specific themes: (i) robots. (ii) image processing, (iii) control theory, (iv) neural circuits (Central Pattern Generators) and (v) dynamic systems.

There will be a fair amount of coding on this module, but nothing really scary.

In addition to these subject-specific themes there are two more general ones:

1) Sustainable Development Goals (UNESCO SDGs) in particular the study of wind turbines and also vibration energy harvesting. These should help you become more aware of some technical and theoretical aspects of green energy.



2) Learning by talking and listening. You will be actively encouraged to talk with your classmates and with your tutor to discuss ideas, solve problems, debug code, and plan your assignments. The theory behind how conversations help you learn has been developed by the Faculty of Education at Cambridge University. We are fortunate to be collaborating with these folk, to better understand their theory, it's called 'Dialogic Learning'.

5. How is my module taught?

There are three units of instruction, each spread over 8 weeks. Each unit is divided into two, with an associated position paper. So effectively you will focus on 6 domains of computing.

There will be occasions where you are able to choose between activities, according to your interest, and one group of 4 sessions will be dedicated to a 'Design-Build-Test' mini-project where you will work in small groups to solve a problem.

Teaching will consist of short tutor inputs (which will also be released as 'mini-lectures'). All sessions will be hands-on and will be organised through worksheets. You will be encouraged to have conversations with your fellow students both in class and outside sessions.

6. What will I be able to do when I have attended and actively participated in all sessions of my module?

Attendance is essential to your successful module outcome, your degree classification and the development of your employment skills. Active participation in all sessions, whether online or face-to-face, will help you to develop your Graduate Attributes and achieve the module's learning outcomes:

a) Learning Outcomes of this module are:

(1) Reflect, critically on alternative and emerging computing technologies.
(2) Critically analyse important contemporary applications of computers.
(3) Critically assess how an understanding of the natural world helps us create digital worlds through programming.
(4) Critically evaluate the structure and function of autonomous intelligent systems
(5) Critically reflect on the design of digital and analogue computers

(6) Critically appraise the principles of a modern operating system.

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b) Your contribution to your Graduate Attributes (which contribute to your employment skills) is:

Reflective and resilient lifelong learning: You will be encouraged to talk and listen and to value the place of conversation in learning. This is a good preparation for employment.

Problem solving: Some activities are creative, others allow you to investigate, but most will have an element of problem-solving (understood in its broadest sense) where you will have opportunity to develop your thinking skills.

Teamwork and effective communication: You will experience teamwork in the 'Design Build Test' mini-project (this will not be assessed) and you should take this as an opportunity to develop your communication skills; listening to others and reflecting on their point of view and so perhaps changing yours, becoming confident of your point of view and getting this across to others.

Digital citizenship: This should happen automatically because of the nature of the Course.

7. How does my module engage with the real-word environment?

We shall keep the SDGs in mind. We have received the donation of a real wind turbine by the company TESUP and we hope to collaborated with them during the module.

Your tutor is actively engaged in research and currently publishes at least two 5* journal articles each year despite his large teaching load. Almost certainly some of his research interests will permeate into this module.

8. What have previous students said about my module?

Here are some themes which have emerged from previous years:

1) Great teaching, enthusiastic lecturer

2) The way the content was broken down into smaller sections

3) Great variety of topics covered, thought-provoking

4) Position papers as assessment with very rapid feedback

9. Are there any special instructions for this module I need to be aware of?

Please make sure you have access to the following software on your own computer:

1) Octave

2) Unreal – 4 engine

3) The latest Arduino IDE

10. What are my assignments for this module?

Detailed information on the assignments for this module and instructions on how to complete them are provided in your Assignment Briefs which are available on your module's Blackboard site.

Comp3402 Nature of Computing RoadMap

Threads passing through the module shown by colors. Platform/technology used in text boxes.

Three units of work, one for each Position Paper. Each unit has two parts, one for each Position Paper part.

robots
image processing
control theory
neural circuits (CPG)
Dynamic Systems (ODEs)

Image Processing: Enhancement and Segmentation

Octave

UNIT 1

robot Vision: Object Detection and Line Following

Arduino

UNIT 2

Control Theory (Wind Turbines)

-or-

Dynamic Systems (Energy Harvester)

Unreal 4

Neural Circuits (CPGs) Biped (Penguin)

Octave
Arduino

UNIT 3

D-B-T

robot Vision: Navigation

-or-

Wind turbine investigations

-or-

Energy Harvester Investigations

Arduino

Arduino

-or-

Snake Robot

Arduino

robot RTOS multi-tasking

-or-

Open MP Parallel Programming

-or-

AURIX Multicore Programming

Arduino

Beyond Arduino