DEPARTMENT OF COMPUTER SCIENCE AND TECHNOLOGY
ASSESSMENT DESCRIPTION 2020/21

UNIVERSITY OF HULL

MODULE DETAILS:

Module Number:	600085	Trimester:	1
Module Title:	Embedded Systems Development		
Lecturer:	YC		

COURSEWORK DETAILS:

Assessment Number:	1	of	1		
Title of Assessment:	Smart House Heating Control				
Format:	Program	Demonstration	Report		
Method of Working:	Group				
Workload Guidance:	Typically, you should expect to spend between	40	and	70	hours on this assessment
Length of Submission:	This assessment should be **no** more than: *(over length submissions **will be** penalised as per University policy)*	2000 **words** *(excluding diagrams, appendices, references, code)*			

PUBLICATION:

Date of issue:	09/11/2019

SUBMISSION:

ONE copy of this assessment should be handed in via:	Canvas		If Other (state method)	
Time and date for submission:	**Time**	2pm	**Date**	06/01/2021
If **multiple hand–ins** please provide details*:*				
Will submission be scanned via TurnitinUK?	No	If submission is via TurnitinUK, these should be one of the allowed types e.g. Word, RT, PDF, PPT, XLS etc. Specify any particular requirements in the subumission details		

The assessment must be submitted **no later** than the time and date shown above, unless an extension has been authorised on a *Request for an Extension for an Assessment* form: search 'student forms' on https://share.hull.ac.uk.
Canvas allows multiple submissions: only the **last** assessment submitted will be marked and if submitted after the coursework deadline late penalties will be applied.

MARKING:

Marking will be by:	Student Name

ASSESSMENT:

The assessment is marked out of:	100	and is worth	50	% of the module marks
N.B If multiple hand-ins please indicate the marks and % apportioned to each stage above (i.e. Stage 1 – 50, Stage 2 – 50). It is these marks that will be presented to the exam board.				

ASSESSMENT STRATEGY AND LEARNING OUTCOMES:

The overall assessment strategy is designed to evaluate the student's achievement of the module learning outcomes, and is subdivided as follows:

LO	Learning Outcome	Method of Assessment *{e.g. report, demo}*
2	*Construct and deploy software applications for constrained resource processors, using low level assembler and generating appropriately timed and sequenced signals for successful communication with external peripheral devices.*	Report & Demonstration
3	*Use available resources (datasheets and specifications) to design and create software which serves as driver for given hardware device and expose hardware behaviours via an appropriately designed Application Programmer Interface (API).*	Report & Demonstration
4	*Work within a team to create a fully functional embedded appliance that makes use of a number of different peripheral interfaces to deliver a consumer-ready product*	Report & Demonstration

Assessment Criteria	Contributes to Learning Outcome	Mark
A1 : Understanding of hardware/software interfacing	2,3	20
A2 : Software development to a given specification	2,3,4	60
A3 : Appropriate driver architecture design	3	20

FEEDBACK

Feedback will be given via:	Verbal (via demonstration)	Feedback will be given via:	Feedback Sheet
Exemption (staff to explain why)			
Feedback will be provided no later than 4 'teaching weeks' after the submission date.			

This assessment is set in the context of the learning outcomes for the module and does not by itself constitute a definitive specification of the assessment. If you are in any doubt as to the

relationship between what you have been asked to do and the module content you should take this matter up with the member of staff who set the assessment as soon as possible.

You are advised to read the **NOTES** regarding late penalties, over-length assignments, unfair means and quality assurance in your student handbook, which is available on Canvas.

Smart House Heating Control

Create a smart thermostatic controller using the PIC QL200 development board. This device will contain a Time of Day clock and provide the following features and displays:

- Setting of current time and date
- Display of current temperature
- Display of current time and date
- Entry of a trigger temperature
- Output control for a heating circuit: When the temperature drops below the selected trigger temperature for a given duration of time the heating control output will be turned on and three short beeps are produced as confirmation. The given duration of time should be adjustable from 0 to 90 seconds.
- When the temperature rises above the selected trigger temperature for a given duration of time the heating control output will be turned off and 2 long beeps should be produced as confirmation. The given duration of time should be adjustable from 0 to 60 seconds. Notes different duration of time should be allowed for turning on and turing off the heating control output.
- The heating behavior should begin at 7:00 am in the morning and end at 10:30 pm. Outside these time the heating control output will be turned off.

The output control for heating circuit shoud be simulated by using a LED, that is, LED on indicates heating circuit on and LED off indicates heating circuit off.

PROJECT DELIVERABLES

The assessed deliverables for this work are as follows:

- A **system demonstration** showing the temperature control features as described above
- A **group report** containing the deliverables outlined in the Coursework Assessment specification (Maximum 2000 words excluding diagrams, appendices, references, user manual, code)

GROUP ORGANISATION

The group must organise itself into two members who are each responsible for one or more of the interfaces required. The interfaces are as follows:

- Real time clock
- Temperature Sensor
- LCD panel
- Input switches
- Sounder

Once a member has been allocated an interface they must perform the following for that interface:

- Create low level driver code to interface with the device
- Design an application program interface (api) to allow other developers to use the device from their code. This should contain functions that can be used to initialise the device and perform a set of relevant activities with it.

Once the low level drivers have been created the group must then work together to produce a device with the required behaviours. Each member of the group must be allocated at least one part of the development project.

WebPA will be used for group members to assess their individual contributions.

System Demonstration – 50% of the overall mark allocation

The demonstration should last no more than twenty minutes, with an additional five minutes for questions. It should demonstrate the overall functionality of the system that has been produced by the group. The following behaviours should be demonstrated:

- Set the date and time
- Displaying the current time
- Setting the trigger temperature
- Heating output enabled when temperature below trigger after the set delay
- Heating output disabled when trigger temperature reached after the set delay
- Indicative beeps produced when heating triggered
- Heating output disabled when out of heating hours (between 10:30 pm and 7:00 am)

The demonstration should be structured and managed by the development group. The demonstration should show the proper operation of the device during all conditions. The system should provide additional behaviours to simulate clock and temperature inputs which will enable all the behaviours to be demonstrated.

All members of the group should take part in the demonstration and explain the part of the system for which they had responsibility.

At the end of the presentation there will be five minutes set aside for questions from the audience.

Group Report – 50% of the overall mark allocation

The group should prepare a single report which describes the overall system and how to use the devices that are part of it. In another word, the overall system resources allocations,listtings of codes, I/O pins configurations, how the drivers are integrated, main logic flows, and a user manual. The report should include the following sections:

- Overall System: A description of the complete application and listings of the code created by the group.
- System hardware components and their configruations pins mappings
- Lists of drivers and their specification
- System logic flows
- Critical Evaluation as a group: Conclusions drawn, lessons learnt as a group, role of each group member in the development.
- Critical Evaluation for each individual in the group: usefulness of techniques, lessons learnt.
- Individual contribution: The amount each individual contributed to the overall development. This breakdown must be agreed by the entire group.
- System operating manual (excluded for the words limit)
- Program source should be supplied in a ZIP archive along with the report.

600085 Embedded Systems Development Demonstration Marking Form

Assessor: _____

Presentation Assessment

Assessment Item	Comments	Weight
System Demonstration (A2) • Setting of current time and date • Display of current temperature • Display of current time and date • Entry of a trigger temperature • Adjustable delay for on and off • Output control for a heating circuit • Timed heating control • Sounder • Simulation of time and temperature inputs • Sanity checks (e.g. leap years) • Persistant configurations • System responsiveness		60%
System Implementation (A1,A3) • Implementation of the interface • Device Driver API • Documentation and comments of codes		20%
System Design (A3) • Driver Architecture		20%

Overall Comments

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Mark Awarded: _____ Date: _____ Signed: _____

600085 Embedded Systems Development Group Marking Form

Assessor: _____ Team: _____

Report Assessment

Assessment Item	Comments	Weight
System Deliverables should at least cover these points: (A1,A2) • System goal and requirements • overall system design • interfaces and pin mappings • system logic flows • listing of drivers, specifications and functions and features • operating manual		50%
Software Design: (A3) • Appropriate device driver design		20%
Implementation and Test: (A3) • Testing performed		20%
Critical Evaluation and Group effectiveness: (A2) • Conclusions drawn • Lessons learnt • Role of each group member in the development. • Individual refelections		10%

Overall Comments

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Mark Awarded: _____ Date: _____ Signed: _____