

RequirementsThis is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.

Co-requisite Modules

Embedded systems 1

No Co-requisite modules listed

SYST C3605: Embedded Systems 2

University						
Module Title:			Embedded Systems 2			
Language of Instruction:		n:	English			
Credits: 5		5				
NFQ Level:		7				
Module Del	ivered In		3 programme(s)			
Teaching & Learning Strategies:			A combination of lectures, class discussion, tutorial, projects, laboratory exercises and demonstrations will be used. Emphasis will be placed on active learning including problem / project bases learning			
Module Aim:			To enable the learner to have knowledge and understanding of the architecture & operation of a contemporary microcontrollers and to enable the learner to design embedded systems using the approprogramming language to interface a microcontroller to peripheral hardware such as ADCs, DACs LCDs etc			
Learning O	utcomes					
On success	ful completio	on of th	his module the learner should be able to:			
LO1	LO1 Compare contemporary microcontrollers and select the appropriate device for a particular application.		mporary microcontrollers and select the appropriate device for a particular application.			
LO2	Describe the architecture and operation of a specific contemporary microcontroller.		chitecture and operation of a specific contemporary microcontroller.			
LO3	Interface a	a micro	ocontroller to other hardware and peripherals to form an embedded system.			
LO4	Develop and debug software/firmware for an embedded system using the appropriate programming language and industry standard development tools.					
Pre-requisite learning						
Module Recommendations This is prior learning (or a practical skill) that is recommended before enrolment in this module.						
No recommendations listed						
Incompatible Modules These are modules which have learning outcomes that are too similar to the learning outcomes of this module.						
No incompa	No incompatible modules listed					

SYST C3605: Embedded Systems 2

Module Content & Assessment

Indicative Content

Computer architecture:

Architecture of a specific microcontroller based contemporary CPU core (MIPS, Risc-V, ARM etc.) Harvard, Von Neumann, registers, flags, pipeline, datapath etc.

Instruction set

Overview of the instruction set of the chosen microcontroller, RISC, ISA, load and store, branch & conditional execution etc.

Memory configuration:

Memory configuration, little / big endian, memory maps, heap, stack etc.

I/O ·

Memory mapped I/O, bitwise operators, pointers and pointers to structures. GPIO, ADC, Timers, serial I/O, DMA etc.

Interrupts & multitasking:

Interrupts and exceptions, interrupt controller, interrupt priority, exception handling. Event-triggered and time-triggered systems. Multitasking. Introduce the concepts of a real time operating system (RTOS), e.g. kernel, scheduler, threads, etc.

Software development :

Use of an industry standard IDE (Integrated Development Environment) Review of C. Mixing C and Assembly. Software debugging, JTAG, source level, single step mode, breakpoints, trace system, disassembly, variable watching, etc. Data structures (arrays, structures, linked lists), Sorting and searching techniques. Use of an API (CMSIS, HAL). File i/o, data-logging to SD card.

Coding standards

Introduction to coding standards for embedded systems, e.g., MISRA C, DO-178B.

Assessment Breakdown	%
Continuous Assessment	40.00%
Project	20.00%
Practical	40.00%

Continuous Assessment					
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date	
Examination	n/a	1,2,3,4	40.00	n/a	

Project				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Project	n/a	1,3,4	20.00	n/a

Practical					
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date	
Practical/Skills Evaluation	n/a	1,2,3,4	40.00	n/a	

No End of Module Formal Examination

SETU Carlow Campus reserves the right to alter the nature and timings of assessment



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Module Workload

Workload: Full Time				
Workload Type	Frequency	Average Weekly Learner Workload		
Lecture	Every Week	3.00		
Practicals	Every Week	2.00		
Independent Learning	Every Week	3.00		
	Total Hours	8.00		

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EEBEE_B	Bachelor of Engineering (Honours) in Biomedical Electronics	5	Mandatory
CW_EESYS_B	Bachelor of Engineering (Honours) in Electronic Engineering	5	Mandatory
CW_EEBEE_D	Bachelor of Engineering in Biomedical Electronics	5	Mandatory