

2024 / 25

School of Science and Computing

☎ +353 (0)51 302037

✉ Eleanor.Reade@setu.ie

🌐 www.wit.ie/schools/science_computing



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TU**

Ollscoil
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an Oirdheiscirt

South East
Technological
University

Module Descriptor

Embedded Firmware (Computing and Mathematics)

Embedded Firmware (A04604)

Short Title: Embedded Firmware
Department: Engineering Technology
Credits: 5

Level: Advanced

Description of Module / Aims

This module builds on concepts introduced in Embedded Systems Architecture & Hardware module. It covers the programming of high performance embedded processor systems using C and assembly language. Software development tools are extensively used with the main emphasis being on application development, testing, debugging and verification.

Programmes

stage/semester/status		
COMP-0970	BEng (Hons) in Information Engineering (International) (WD_EEELC_BI)	4 / 8 / M
COMP-0970	BSc (Hons) in Applied Computing (WD_KACCM_B)	4 / 8 / E
COMP-0970	BSc (Hons) in Applied Computing (WD_KCOMP_B)	4 / 8 / E
COMP-0970	BSc (Hons) in Computer Science (WD_KCMSC_B)	4 / 8 / E
COMP-0970	BSc (Hons) in Physics for Modern Technology (WD_KPHTE_B)	4 / 8 / E
COMP-0970	BSc (Hons) in the Internet of Things (International) (WD_KINTT_BI)	4 / 8 / M
COME-0004	BEng (Hons) in Electronic Engineering (WD_EONIC_B)	4 / 8 / M

Indicative Content

- Architecture of Embedded Systems and programming model.
- Instruction set and assembly language programming.
- Subroutines, parameter passing, and good programming practice
- Exceptions and interrupts, Vectored Interrupt controller (VIC), C and assembly language constructs for Structured Programming.
- APCS compliant modules , Mixed programming/translation in C and assembly
- Polling and interrupt driven I/O, accessing and programming I/O devices, timer devices.
- Software development tools, Application Programming Interface (API), libraries.
- Program design, modular programming, testing, debugging and verification, documentation and maintenance

Learning Outcomes

On successful completion of this module, a student will be able to:

1. Demonstrate knowledge and understanding of processor's instructions and its peripheral devices
2. Create programs in Assembly language, C language and mixed languages using APCS standard
3. Analyse and translate C language software into Assembly language and vice-versa
4. Design application programs, and document it, in C/Assembly language using structured and modularised approaches
5. Use software development tools to write, compile, test and debug programs
6. Create and use software libraries and API

Learning and Teaching Methods

- Lectures and tutorials
- Practicals
- Mini-Project (Teamwork)

Learning Modes

Learning Type	F/T Hours	P/T Hours
Lecture	36	
Practical	12	
Independent Learning	87	

Assessment Methods

	Weighting	Outcomes Assessed
Continuous Assessment	40%	
Practical	40%	4,5,6,7
Final Written Examination	60%	1,2,3

Assessment Criteria

Essential Material(s)

- Furber, S. B. *ARM System On Chip Architecture*. 2nd.. UK: Adison-Wesley, 2001 (Seminal).

Supplementary Material(s)

- Smith, W.A. *C Programming for Embedded Microcontrollers*. 2nd.. UK: Elektor International Media BV, 2008.

Requested Resources

- ENGINEERING LAB: Electronics