Course Outline (Higher Education)

School:	School of Engineering, Information Technology and Physical Sciences
Course Title:	DIGITAL AND EMBEDDED SYSTEMS
Course ID:	ENGIN4402
Credit Points:	15.00
Prerequisite(s):	(ENGIN2401 or ENMTX2010) (ENGIN3401 or ENMTX3010)
Co-requisite(s):	Nil
Exclusion(s):	(ENMTX3050)
ASCED:	039999

Description of the Course:

This course introduces students to the digital and embedded systems and enhances their investigative, design and problem solving skills. The course discusses digital logic design, programmable logic devices, embedded system and covers the basic architecture of microcontrollers along with their applications in embedded systems. The embedded system takes into account both the hardware and software component in finding the solution to a problem. This presents significant challenges as appropriate skills are required to strike proper balance between the hardware and software components. Students will gain practical experience of interfacing computer with physical engineering systems. They will also gain skills in designing small systems to meet various design requirements. The course applies digital and embedded systems design to industrial applications, such as machine measurement and control, and, domestic applications including examples from both white goods and home entertainment.

Grade Scheme: Graded (HD, D, C, P, MF, F, XF)

Work Experience:

No work experience: Student is not undertaking work experience in industry.

Placement Component: No

Supplementary Assessment: Yes

Where supplementary assessment is available a student must have failed overall in the course but gained a final mark of 45 per cent or above and submitted all major assessment tasks.

Program Level:

Level of course in Program	AQF Level of Program					
	5	6	7	8	9	10
Introductory						
Intermediate						
Advanced				✔		

Learning Outcomes:

On successful completion of the course the students are expected to be able to:

Knowledge:

K1. Interpret different number systems and Boolean algebra.

K2. Demonstrate understanding of digital logic design, combinational circuits and synchronous sequential logic.

K3. Explain the principles and operations of different programmable logic devices.

K4. Demonstrate understanding of VHSIC hardware descriptive language (VHDL).

K5. Interpret the operations of microcontrollers and their application in embedded systems.

K6. Identify and explain I/O ports, programmable timer, interrupts, serial peripheral interfaces and other on-chip peripherals.

K7. Demonstrate the operation of CPU and memory handling methods.

K8. Explain Bus structure along with memory organisation and addressing.

K9. Discuss C, assembly language and event driven programming.

Skills:

S1. Design electronic circuits incorporating digital logic components.

S2. Design small embedded systems to meet design requirements.

S3. Analyse and verify the operation of digital and embedded systems using debugging tools.

S4. Design and analyse software program to control different microprocessor peripherals.

S5. Develop microcontroller interfaces.

S6. Program and operate different programmable logic devices.

Application of knowledge and skills:

A1. Design and implement practical programmable solutions using digital and embedded systems to meet design specifications.

A2. Identify, formulate and design solutions to a problem using microcontrollers and programmable logic devices.

A3. Test and analyse digital and embedded electronic circuits.

A4. Critically evaluate and debug errors in coding an embedded system.

Course Content:

Topics may include:

- Digital logic design and implementation.

- Review of combinational circuits, synchronous sequential logic and digital logic components.
- Programmable logic devices: read only memory, programmable logic array (PLA), programmable array logic (PAL), complex programmable logic device (CPLD) and field programmable gate array (FPGA).
- Introduction to VHSIC hardware descriptive language (VHDL).
- Overview of the microcontroller and computer architecture.
- On-chip and serial peripheral interfaces.
- A/D conversion.
- Programmable timer and interrupts.
- Memory interfacing and timing diagrams.
- Memory buffering and decoding.
- Modular and assembly language programming.
- C programming in embedded systems.

Values:

V1. Appreciate the use of programmable logic devices, digital and embedded systems in practical industrial systems.
V2. Comprehend the role of embedded systems in control and automation of a system / process.
V3. Contribute to a discussion related to the use of digital and embedded systems in controlling an industrial process.

Graduate Attributes

The Federation University FedUni graduate attributes (GA) are entrenched in the Higher Education Graduate Attributes Policy (LT1228). FedUni graduates develop these graduate attributes through their engagement in explicit learning and teaching and assessment tasks that are embedded in all FedUni programs. Graduate attribute attainment typically follows an incremental development process mapped through program progression. **One or more graduate attributes must be evident in the specified learning outcomes and assessment for each FedUni course, and all attributes must be directly assessed in each program**

Graduate attribute and descriptor		Development and acquisition of GAs in the course	
		Learning Outcomes (KSA)	Assessment task (AT#)
GA 1 Thinkers	Our graduates are curious, reflective and critical. Able to analyse the world in a way that generates valued insights, they are change makers seeking and creating new solutions.	K1-K9 S1-S6 A1-A4	1-3
GA 2 Innovators	Our graduates have ideas and are able to realise their dreams. They think and act creatively to achieve and inspire positive change.	K1-K9 S1-S6 A1-A4	1-3
GA 3 Citizens	Our graduates engage in socially and culturally appropriate ways to advance individual, community and global well-being. They are socially and environmentally aware, acting ethically, equitably and compassionately.	A1-A4	1-3
GA 4 Communicators	Our graduates create, exchange, impart and convey information, ideas, and concepts effectively. They are respectful, inclusive and empathetic towards their audience, and express thoughts, feelings and information in ways that help others to understand.	K1-K9 S1-S6 A1-A4	1-3
GA 5 Leaders	Our graduates display and promote positive behaviours, and aspire to make a difference. They act with integrity, are receptive to alternatives and foster sustainable and resilient practices.	A2-A4	1-3

Learning Task and Assessment:

Learning Outcomes Assessed	Learning Tasks	Assessment Type	Weighting
S1-S6, A1-A4	Experimental work and / or projects to verify students ability to apply knowledge and skills acquired in the course	Reports, demonstrations	10% - 30%
K1-K9, S1-S6	Relevant tasks and problems to enforce understanding of the students and help in gradual development of knowledge and skills throughout the course	Assignments, quizzes	10% - 30%
K1-K9	Questions and problems related to the course contents	Exams / Tests	40% - 60%

Adopted Reference Style:

Other (IEEE-Refer to the library website for more information.)

Refer to the library website for more information

Fed Cite - referencing tool