B38DF Computer Architecture and Embedded Systems

COURSE DETAILS
Course Code: B38DF
Full Course Title: Computer Architecture and Embedded Systems
SCQF Level: 8
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL					
Undergraduate:	Yes	**Postgraduate Taught**:	No	**Postgraduate Research**:	No
Additional Information:					

COURSE AIMS

- Understand fundamental computer architecture concepts
- Understand fundamentals of interconnection of computer components
- Understand factors that impact computer and embedded system performance
- Gain proficiency in verilog HDL programming
- Gain proficiency in datapath and controller RTL design of a simple processor implemented in verilog HDL
- Gain further proficiency with a modern FPGA digital system design tool for design entry, simulation, implementation and testing
- Appreciate the requirement for processor connection to the external environment
- Gain proficiency in interfacing techniques for embedded applications for memory and I/O
- Understand how embedded system performance is quantified and measured

LEARNING OUTCOMES – SUBJECT MASTERY

To be fully competent and conversant with the nature of hardware and software design, and their interaction in modern computer architectures and embedded systems.

To gain experience of design tools and software methodologies for the implementation of such architectures and systems.

To examine issues relating to the use of processor/ controller cores within embedded systems.

EA2i Students learn the factors that impact the performance of a computing system. Through examples they quantitatively evaluate the isolated impacts some of these factors. They learn how to compute the latency and throughput of given simple processing units. The knowledge is assessed through coursework tests and in the exam.

EA4i Students learn the overall operation of a computing system involving a processor, memory, and data storage. They learn how to connect these parts in order to build a simple micro-programmer. Their skills are assessed through hands-on lab-work as well as conceptual questions in the exams.

EA3p Students gain an understanding of the importance of coding of data for efficient storage and transfer. They learn sample security coding techniques and apply these methods for problem solving, assessed by class-test and exam questions.

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EP3p P2 Ability to apply relevant practical and laboratory skills through using a hardware description language and a programmable logic board. Their hands on skills are assessed through laboratory practices and laboratory reports that they prepare.

LEARNING OUTCOMES – PERSONAL ABILITIES

An ability to relate theoretical derivations to experimental results.

To work collectively with other students in tutorial and laboratory settings.

To perform theoretical and experimental work competently, and to document such work in a clearly understandable fashion.

SYLLABUS

Basic components of computer systems: Hardware, Software, CPU, Memory, Input-output devices. Basic concepts of computer systems: Program, Language, Architecture, Interpreter, Instruction. Teardown to show machine to high level language- from bits to code. Simple processor (CPU) architecture and organization. CPU implementation: Von Neumann and Harvard computer architectures. Instruction execution. Parallelism and Latency. Basic pipelining techniques to achieve greater performance. Primary/Internal Memory – Memory addresses, Parity bits. Secondary/External Memory – Memory hierarchy. Instructions – Instruction Formats, Addressing. Input/Output Device Connection – Buses. Embedded system design and interfacing concepts. Microprocessors and microcontrollers; their bus, interconnect architectures, interface timing and decoding, memory hierarchies, I/O port structures.

COURSE RELATIONSHIPS

Course Code	Level	Title	School	Type
B37VB	7	Praxis Programming	School of Eng & Physical Sci	Pre-Requisite

LOCATION AND ASSESSMENT METHODS

Edi	SBC	Ork	Dub	Malay	IDL	COLL	ALP	OTH	Method	Weight	Exam Mins	Type	Diet	Synoptic Course
Y			Y	Y		Y			Examination	60	120	Assessment	Semester 2	
Y			Y	Y		Y			Coursework	40		Assessment	Semester 2	
Y			Y	Y		Y			Examination	100	120	Reassessment	Semester 3	