


COURSE SYLLABUS
(Bachelor of Engineering – Electrical & Electronic (Power))
(Bachelor of Engineering – Electrical & Electronic (Communication))

FACULTY OF ENGINEERING NATIONAL DEFENCE UNIVERSITY MALAYSIA NAME DAN COURSE CODE : DIGITAL SYSTEM DESIGN (EEE 2243)		Page : 1 / 5
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LECTURE HOURS : 3 hrs × 14 weeks TUTORIAL/PBL HOURS : 1 hr × 14 weeks LECTURER: 1. MUHAZAM MUSTAPHA Bistari muhazam@upnm.edu.my	Revision : B Date of Issue : February 1st 2011 Last Amendment : February 20th 2012 Edition : 1 Procedure No: PK (O). UPNM.AKAD.01
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PRE REQUISITE: Digital Electronics (EEE 1213)

SYNOPSIS:

This course will cover the principles of digital system design. It builds on logic design principles learned in earlier course, digital electronics. This course demonstrates how digital design and rapid prototyping have been facilitated by FPGAs and hardware description languages. The content of this course includes Combinational and Sequential Logic, Finite State Machine, Register Transfer Level (RTL) design, design flow, high level design, hardware design language, FPGAs and some advanced topics in HDL.

OBJECTIVES:

This course is to prepare the students with the ability to design digital circuit at high level view, i.e. using an HDL. They are to be given case studies and design assignments to be done at such high level approach. Some basic experience of rapid prototype design will also be given as FPGA design including the skill of report writing.

COURSE OUTCOMES:

Having successfully completed the course, the students should be able to:


Course Outcome 1:	Knowledge and understanding of an HDL language and applying it to design digital systems (C5, P4)	PO1, PO2
Course Outcome 2:	Knowledge and understanding of datapath components and applying them into digital systems (C5, P4)	PO1, PO2
Course Outcome 3:	Analyze and design digital systems with HDL at RTL level (C5, P4)	PO3, PO4

MAIN REFERENCES:

1. Mohamed Khalil Mohd Hani, Stater's Guide to Digital System VHDL and Verilog Design, 2nd Edition, Pearson Prentice Hall, 2009
2. Frank Vahid, Digital Design, John Wiley, 2007
3. Stephen Brown & Zvonko Vranesic, Fundamental of Digital Logic with Verilog Design, 3rd Edition, McGraw Hill, 2009
4. John F. Wakerly, Digital Design Principles and Practice, 3rd Edition, Prentice Hall, 2000
5. Roth & John, Digital System Design using VHDL, 2nd Edition, Mason Thomson, 2007

Prepared by ; Name: ENGR. MUHAZAM BIN MUSTAPHA Signature:	Certified by ; Name: ASSOC. PROF. ENGR. NIK GHAZALI BIN NIK DAUD Signature:
Date:	Date:

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SYLLABUS & CONTACT HOURS:

Week	Topics / Contents	Hours
1	Verilog HDL (Combinational): Need for HDL, HDL kick start, constant, operators, boolean algebra style approach, behavioral style approach, IDE for HDL demo	3
2	Verilog HDL (Sequential): Finite state machines, controller design process, demos on oscillators, counter, boolean algebra and behavioral style	3
3	Elementary Components: multiplexer, decoder, demultiplexer, T flip-flop, JK flip-flop	3
4 – 6	Datapath Components: Registers, register file, adder, comparator, shifter, counter, timer, multiplier, subtractor TEST 1	9
7	Arithmetic Logic Unit Design: ALU Design	3
8 – 9	Register Transfer Level Design: High level state machines, RTL design steps, examples	6
10	Advanced Design Considerations – Timing: Timing consideration: static & dynamic timing, flop-based design, setup & hold, design window	3
11	Advanced Design Considerations – Power: Power consideration: why low power, types of power, dynamic power, short-circuit power, glitch power, leakage power, temperature, static power, power reduction strategies	3
12	Advanced Topics – Physical Implementation: Types of ICs, FPGA, 74 series, PLD, ASIC TEST 2	3
13 – 14	Advanced Topics – Programmable Controller: Programmable Controller: basic architecture, 3 and 6 instruction processor, assembly language	6

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STUDENT LEARNING TIME (SLT)

Teaching and Learning Activities (Format JPT)		Hours
Face to Face		
1	Lecture	42
2	Tutorial	14
3	Activity SCL / PBL etc	0
Self Learning		
4	Individual Assignments/ Group Assignment/ Project Implementation etc	14
5	Revision/ Self-learning/ Lecture preparation	32
6	Preparation for test/ exam/ presentation	10
Formal Assessment		
7	Continuous Assessment/ Quiz/ Test/ Presentation	5
8	Final exam	3
Total T&L Hours		120

Course credit for 'Analog Electronics & Devices' is 120 hrs. / 40 = 3.00 (3 credit)

TEACHING METHODOLOGY:

1. Students exposed to the fundamental concepts in engineering and given as many examples as possible on the application of such principles to solve related problems.
2. Students are required to go through the tutorial sets and group discussion.
3. Students are encouraged to expose themselves to problems from various other sources.

COURSE ASSESSMENTS:

Assessments	%	COs	POs
Quizzes	5	CO1, CO2, CO3	PO1, PO2, PO3, PO4
Assignments	15	CO1, CO2, CO3	PO1, PO2, PO3, PO4
Test 1	15	CO1, CO2	PO1, PO2
Test 2	15	CO3	PO3, PO4
Final Exam	50	CO1, CO2, CO3	PO1, PO2, PO3, PO4
Total	100		

* Additional tests, if taken will be averaged out.

* Passing marks is 40%.

Rules and Regulations: Refer to *Peraturan Akademik UPNM*

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Notes: Program Learning Outcome (PO) for;
Bachelor of Engineering (Electrical & Electronic (Power))
Bachelor of Engineering (Electrical & Electronic (Communication))
Relationship Between Programme Learning Outcome (PO) and Course Learning Outcome (CO)

	Course Learning Outcome (CO)	Relationship with Programme Learning Outcome (PO) (To cover 8 domains in MQF)											Delivery	Assessment		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11				
1	Knowledge and understanding of an HDL language and applying it to design digital systems	✓	✓												Lecture & Tutorial	Quiz, Assignment, Midterm & Final Exam
2	Knowledge and understanding of datapath components and applying them into digital systems	✓	✓												Lecture & Tutorial	Quiz, Assignment, Midterm & Final Exam
3	Analyze and design digital systems with HDL at RTL level			✓	✓										Lecture & Tutorial	Quiz, Assignment, Midterm & Final Exam

CO Contribution to PO:

1= Very insignificant and not being assessed. 2= Moderate contribution with indirect assessment
 3= Significant contribution with comprehensive assessment.

Relationship between CO and Generic Skills

Generic Skills	CO1	CO2	CO3	Assessment
Communication				
Critical Thinking and Problem Solving	✓	✓	✓	Assignment, Midterm, Final Exam
Team work				
Life-Long Learning and Information Management				
Ethics and Morale				
Leadership				

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Program Learning Outcome is the ability of the student to adapt all learning domains to show their proof of competency. This ability includes 8 domains in Malaysian Qualification Agency (MQA) and they are:

- i. Knowledge
- ii. Practical
- iii. Leadership
- iv. Ethics and Values
- v. Environmental Awareness
- vi. Entrepreneurship
- vii. Communication
- viii. Long-term studies

PO	Definition	MQF PO	Taxonomy
PO1	Ability to acquire and apply knowledge of sciences, electrical and electronic engineering principles.	PO1	C
PO2	Ability to apply techniques, skills and use modern engineering tools.	PO2	P
PO3	Ability to identify, formulate and solve electrical and electronic engineering related problems.	PO6	C
PO4	Ability to utilize systems approach to design and evaluation of operational performance.	PO2, PO6	C, P
PO5	Ability to communicate effectively and with confidence not only with engineers but also with the community at large.	PO5	A
PO6	Ability to respond and adapt to changing situations with special attention toward sustainable development or defense applications.	PO7	A
PO7	Ability to function effectively as an individual and/or in group with the capacity to be a leader/manager to achieve common goals.	PO5	A
PO8	Ability to adopt of professional ethical responsibilities and commitment to them.	PO4	A
PO9	Ability to incorporate the social, cultural, global and environmental responsibilities of a professional engineer in civilian and military context.	PO3	A
PO10	Ability to seek and acquire contemporary knowledge including defense matters.	PO7	A
PO11	Ability to possess entrepreneurship qualities.	PO8	A