Electric Circuits Course Definition File

1. Basic Information:

Course Name	Digital Electronic Circuits
Course ID	GDE101
Contact Hours (Registered Sessions)	12
Contact Hours (Synchronized Sessions)	18
Mid Term Exam	There is No
Exam	1.5
Registered Sessions Work Load	12
Synchronized Session Work Load	18
Credit Hours	3

2. Pre-Requisites: There is No

3. Course General Objectives:

This course aims to enable the student to understand the properties and characteristics of pulse waveforms (such as rise time, fall time, pulse width, period, frequency, and duty cycle). The student will acquire knowledge to be able to use the different number systems (Decimal, binary, and BCD), and to convert numbers from one system to the other. It aims to enable the students to be able to carry out the arithmetic operations in the binary and 2's complement number system (addition, subtraction, multiplication, and division), and to be able to add numbers in BCD number systems. The students will acquire knowledge to be able to use Boolean algebra, and Karnaugh-maps to minimize Boolean expressions. It also aims to enable them to understand the functions, operations, and applications of basic logic gates, and the standard combinational circuits (Adders, Comparators, Encoders, Decoders, Multiplexers, and Demultiplexers). And finally they will be able to understand the finite state machines.

4. Intended Learning Outcomes (ILO):

Code	Intended Learning Outcomes
ILO1	Comprehension of the main concepts in digital electronic circuits, such as digital signals and their characteristics.
ILO2	Understanding the number systems, such as decimal and binary systems. And understanding the arithmetic operations using binary numbers and 2`s complement numbers representation. Comprehension of digital codes, and error detection techniques.
ILO3	Understanding lows and rules of Boolean algebra and logic simplification using Karnaugh-maps.
ILO4	Understanding the operation of basic logic gates and fixed function logic circuits (Adders, Comparators, Encoders, Decoders, Multiplexers, and Demultiplexers).
ILO5	Understanding of the state machines operation.

5. Course Syllabus (18 hours of total synchronized sessions)

- RS: Recorded Sessions; SS: Synchronized Sessions;

ILO	Course Syllabus	RS	SS	Type	Additional Notes
ILO1	Basic Concepts Related to Digital Electronic Circuits • Introduction (Aims of the course) • Binary Digits, Logic Levels, and Digital Waveforms • Basic Logic Operations • Introduction to the System Concepts • Fixed Function Integrated Circuits	2	1.5	☒ Exercises ☒ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	An example of a typical coverage is found in "Digital Fundamentals": chapter 1 (see references list below)
ILO1 ILO2	Number Systems, Operations, and Codes • Decimal Numbers • Binary Numbers	4	7.5	☒ Exercises ☒ Assignments ☐ Seminars ☐ Projects	An example of a typical coverage is found in "Digital Fundamentals": chapter 2 (see

	• Decimal (Binary) to Binary (Decimal) Conversion • Binary Arithmetic • 1's and 2's Complements of Binary Numbers • Arithmetic Operations with Signed umbers • Binary Coded Decimal (BCD) • Digital Codes • Error Detection Codes			☐ Practices ☐ Others	references list below)
ILO1 ILO3	Boolean Algebra and Logic Simplification • Boolean Operations and logic Expressions • Laws and Rules of Boolean Algebra • DeMorgan's Theorems • Boolean Expressions and Truth Tables • The Karnaugh Maps	2	3	☒ Exercises ☒ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	An example of a typical coverage is found in "Digital Fundamentals": chapter 4,5 (see references list below)
ILO1 ILO2 ILO3 ILO4	Logic Gates and Logic Functions • Logic gates • Adder circuit • Comparator Circuit • Encoder and Decoder Circuits • Multiplexer and Demultiplexer Circuits	2	3	☒ Exercises ☒ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	An example of a typical coverage is found in "Digital Fundamentals": chapter 3,6 (see references list below)
ILO1 ILO5	Finite State Machines • Introduction to Sequential Circuits • Basic Design Steps • Encoding Style: From Binary to One-Hot	2	3	☒ Exercises ☒ Assignments ☐ Seminars ☐ Projects ☐ Practices ☐ Others	An example of a typical coverage is found in "Logic and Computer Design Fundamentals" chapter 5 (see references list below)

6. Assessment Criteria (Related to ILOs)

ISC	Interactive Synchronized Collaboration		Ex	Exams		Rpt	Reports
PF2F	Presentations and Face-to-Face Assessments		PW	Practice Work			

ILO Code	ILO	Intended Results	Assessment Type				
			ISC	PW	Ex	PF2F	Rpt
ILO1	Identify the key concepts in digital electronic circuits such as digital waveforms characteristics (such as rise time, fall time, pulse width, period, frequency, and duty cycle).		X	X	X		
ILO2	Understanding the different number systems (Decimal, binary, and BCD), and to convert numbers from one system to the other. Carrying out the arithmetic operations in the binary and 2's complement number system (addition, subtraction, multiplication, and division), and to be able to add numbers in the BCD number systems. Understanding the error detection using parity code or cyclic redundancy check.		X	X	X		
ILO3	To be able to use Boolean algebra, and Karnaugh-maps to minimize logic expressions.		X	X	X		
ILO4	Understanding the function, operation, and applications of basic logic gates, and the principles logic functions of standard combinational circuits (Adders, Comparators, Encoders, Decoders, Multiplexers, and Demultiplexers).		X	X	X		

ILO5	Understanding the function and operation of state machines circuits.		X	X	X		

7. Practice Tools:

Tool Name	Description
Multisim	Is a powerful tool which helps to simulate the logic circuits (optional)

8. Main References

1. "Digital fundamentals", 11th/E edition

Author: Thomas L. Floyd

ISBN-10: 0132737965. ISBN-13: 9780132737968,

Copyright year: © 2015. Publisher: Prentice Hall Pages: 912

Published 07/14/2014

9. Additional References

1. "Fundamentals of Digital Logic with VHDL Design", 3rd Edition

Author(s): Stephen Brown and Zvonko Vranesic

ISBN-10 0-07-126880-4, ISBN-13 978-0-07-126880-6

Copyright year: © 2009, Publisher: McGraw-Hill Education (UK) Ltd. Pages: 960

2. "Logic and Computer Design Fundamentals", 5th Edition,

Author(s): M. Morris R. Mano, Charles R. Kime, Tom Martin

ISBN-10: 0133760634. ISBN-13: 978-013376063

Copyright year: March 14, 2015, Publisher: Prentice Hall. Pages: 672

2001, Prentice Hall

3. "Digital Design Essentials"

By Prentice-Hall, 2002.

Author: Richard S. Sandige,

ISBN: 0201476894. ISBN-13: 9780201476897

Copyright year: 2001, Publisher: Prentice Hall. Pages: 670.