**Philadelphia University**
**Faculty of Engineering**
**Department of Computer Engineering**
**First Semester, 2015/2016**

# Course Syllabus

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|---|---|
| **Course Title:** Logic Circuits | **Course code:** 630211 |
| **Course Level:** 2nd year | **Course prerequisite (s) and/or requisite (s):** 0761099 |
| **Lecture Time:** 9:10 – 10:10 (S-T-T) | **Credit hours:** 3 |

## Academic Staff Specifics

| Name | Rank | Office Number and Location | Office Hours | E-mail Address |
|---|---|---|---|---|
| Dr. Qadri Hamarsheh | Assistant Professor | 6725 | 11:00-12:00 (M-W) | qhamarsheh@philadelphia.edu.jo |

**Course module description:**
This class is an introduction to the basic concepts, analysis, and design of digital systems. This consists of both combinational and sequential logic. Lectures will enable students to experience with several levels of digital systems.

**Course module objectives:**
At completing of this module the student should be able to:

- Design methodologies for electronic circuits, to use mathematical expressions to describe the functions of simple combinational and sequential circuits.
- Convert numerical data from one format to another and to use different formats to represent numerical data.
- Understand Boolean algebra, basic laws and rules in logic design, DeMorgan's theorem, Karnaugh map, and approaches to simplifying logic circuits.
- Understand systematical design methodology for combinational logic circuits and build this kind of digital systems by using some IC devices.
- Understand systematical design methodology for sequential logic circuits.

**Course/ module components**

- **Books (title , author (s), publisher, year of publication)**

1. Text Book: Digital Fundamentals, Thomas L. Floyd 10th ed., Pearson International Edition, 2009.

- **Support material (s) (Course website: Includes reference books and Course Notes_ Power Point Slides).**
  **http://www.philadelphia.edu.jo/academics/qhamarsheh**
  **Study guide (s)**
- **Homework and laboratory guide (s): Listed in the Course website.**

**Teaching methods:**

Lectures, tutorials, and problem solving.

**Duration**: 16 weeks, 48 hours in total
**Lectures**: 44 hours, 3 per week + three exams (four hours)
**Seminar**: 3 hours, (last week)
**Assignments:** 2
**Quizzes**: 3

**Learning outcomes:**

- Knowledge and understanding

  - Ability to analyze and understand the behavior of combinational and sequential digital circuits.
  - Ability to map and minimize Boolean functions as well as represent them in various standard forms.
  - Ability to design and implement combinational and sequential logic circuits.
  - Understanding of various combinational "building blocks" such as decoders, multiplexers, and encoders.
  - Ability to design and implement arithmetic logic circuits.
  - Understanding of the behavior exhibited by latches and flip-flops.
  - Ability to design and implement sequential circuits.
  - Understanding of various sequential "building blocks" such as counters and shift registers

- Cognitive skills (thinking and analysis)
  - Ability to analyze the behavior of digital circuits.
  - Ability to design and implement combinational logic circuits.
  - Understanding of various combinational "building blocks" such as decoders, multiplexers, and encoders.
  - Ability to design and implement arithmetic logic circuits.
  - Ability to design and implement sequential circuits.
  - Understanding of various sequential "building blocks" such as counters and shift registers.

- Communication skills (personal and academic).
  - Ability to search appropriate literature and other scientific resources for problem formulation, analysis and design.
  - Ability for using appropriate mathematical tools (software, hardware and mathematical algorithms) for the solution of related problems in computer systems engineering.
  - Ability for engineering thinking in analyzing the behavior of digital circuits and its design.

- Practical and subject specific skills (Transferable Skills).

  - Ability to map and minimize Boolean functions as well as represent them in various standard forms.
  - Ability to design and implement combinational logic circuits.

- Understanding of various combinational "building blocks" such as decoders, multiplexers, and encoders.
- Ability to design and implement arithmetic logic circuits.
- Ability to design and implement sequential circuits.
- Understanding of various sequential "building blocks" such as counters and shift registers.

| Course Intended Learning Outcomes | | | | | | | |
|---|---|---|---|---|---|---|---|
| **A - Knowledge and Understanding** | | | | | | | |
| A1. | A2. | A3. | A4. | A5. | A6. | A7. | A8. |
| ■ | | | | | ■ | | |
| **B - Intellectual Skills** | | | | | | | |
| B1. | B2. | B3. | B4. | B5. | B6. | B7. | B8. | B9. |
| ■ | | | | | ■ | | ■ | |
| **C - Practical Skills** | | | | | | | | | |
| C1. | C2. | C3. | C4. | C5. | C6. | C7. | C8. | C9. | C10. |
| | | | ■ | | | | | | ■ |
| **D - Transferable Skills** | | | | | | |
| D1. | D2. | D3. | D4. | D5. | D6. | D7. |
| | ■ | | | ■ | | |

**Assessment instruments**

- Short reports and/ or presentations, and/ or Short research projects
- Quizzes.
- Home works
- Final examination: 40 marks

| Allocation of Marks | |
|---|---|
| **Assessment Instruments** | **Mark** |
| First exam | **20%** |
| Second exam | **20%** |
| Final examination: | **40%** |
| Reports, research projects, Quizzes, Home works, Projects | **20%** |

**Documentation and academic honesty**

**Practical Submissions**

*The assignments that have work to be assessed will be given to the students in separate documents including the due date and appropriate reading material.*

**Documentation and Academic Honesty**

Submit your home work covered with a sheet containing your name, number, course title and number, and type and number of the home work (e.g. tutorial, assignment, and project).

Any completed homework must be handed in to my office (room 6725) by 15:00 on the due date. After the deadline "zero" will be awarded. You must keep a duplicate copy of your work because it may be needed while the original is being marked.

You should hand in with your assignments:

1- A printed listing of your test programs (if any).
2- A brief report to explain your findings.
3- Your solution of questions.

For the research report, you are required to write a report similar to a research paper. It should include:

- **Abstract**: It describes the main synopsis of your paper.
- **Introduction**: It provides background information necessary to understand the research and getting readers interested in your subject. The introduction is where you put your problem in context and is likely where the bulk of your sources will appear.
- **Methods (Algorithms and Implementation)**: Describe your methods here. Summarize the algorithms generally, highlight features relevant to your project, and refer readers to your references for further details.
- **Results and Discussion (Benchmarking and Analysis)**: This section is the most important part of your paper. It is here that you demonstrate the work you have accomplished on this project and explain its significance. The quality of your analysis will impact your final grade more than any other component on the paper. You should therefore plan to spend the bulk of your project time not just gathering data, but determining what it ultimately means and deciding how best to showcase these findings.
- **Conclusion**: The conclusion should give your reader the points to "take home" from your paper. It should state clearly what your results demonstrate about the problem you were tackling in the paper. It should also generalize your findings, putting them into a useful context that can be built upon. All generalizations should be supported by your data, however; the discussion should prove these points, so that when the reader gets to the conclusion, the statements are logical and seem self-evident.
- **Bibliography:** Refer to any reference that you used in your assignment. Citations in the body of the paper should refer to a bibliography at the end of the paper.

- **Protection by Copyright**

1. Coursework, laboratory exercises, reports, and essays submitted for assessment must be your own work, unless in the case of group projects a joint effort is expected and is indicated as such.
2. Use of quotations or data from the work of others is entirely acceptable, and is often very valuable provided that the source of the quotation or data is given. Failure to provide a source or put quotation marks around material that is taken from elsewhere gives the appearance that the comments are ostensibly your own. When quoting word-for-word from the work of another person quotation marks or indenting (setting the quotation in from the margin) must be used and the source of the quoted material must be acknowledged.
3. Sources of quotations used should be listed in full in a bibliography at the end of your piece of work.

- **Avoiding Plagiarism**.

1. Unacknowledged direct copying from the work of another person, or the close paraphrasing of somebody else's work, is called plagiarism and is a serious offence, equated with cheating in examinations. This applies to copying both from

other students' work and from published sources such as books, reports or journal articles.

2. Paraphrasing, when the original statement is still identifiable and has no acknowledgement, is plagiarism. A close paraphrase of another person's work must have an acknowledgement to the source. It is not acceptable for you to put together unacknowledged passages from the same or from different sources linking these together with a few words or sentences of your own and changing a few words from the original text: this is regarded as over-dependence on other sources, which is a form of plagiarism.
3. Direct quotations from an earlier piece of your own work, if not attributed, suggest that your work is original, when in fact it is not. The direct copying of one's own writings qualifies as plagiarism if the fact that the work has been or is to be presented elsewhere is not acknowledged.
4. Plagiarism is a serious offence and will always result in imposition of a penalty. In deciding upon the penalty the Department will take into account factors such as the year of study, the extent and proportion of the work that has been plagiarized, and the apparent intent of the student. The penalties that can be imposed range from a minimum of a zero mark for the work (without allowing resubmission) through caution to disciplinary measures (such as suspension or expulsion).

## Course/module academic calendar

| week | Basic and support material to be covered | Homework/reports and their due dates |
|---|---|---|
| **(1)** | Course Overview | |
| **(2)** | Introduction to Digital Systems.<br>Number Systems and Conversions | |
| **(3)** | Boolean Algebra and Logic Gates | |
| **(4)** | Minimization Methods and Don't care conditions | |
| **(5)** | Representation and implementation of Boolean circuits using other logic gates. | Assignment 1<br>Week 8 |
| **(6)** | Tutorials, review and study guide of first exam material | **Quiz 1**<br>*First exam* |
| **(7)** | Analysis Procedure of combinational circuits | |
| **(8)** | Combinational Circuits design, BCD Display | |
| **(9)** | Adder and Subtractor, Magnitude comparators, | |
| **(10)** | Multiplexers, Encoders, and Decoders. | |
| **(11)** | Tutorials, review and study guide of second exam material | Assignment 2<br>Week 14<br>**Quiz 2** |

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| **(12)** | Sequential Circuits: Latches and Flip flops | *Second exam* |
| **(13)** | Analyzing Sequential Circuits, Finite State Machine Design Procedure**.** State Reduction and Assignment | |
| **(14)** | Shift Registers, Counters, And Timing Analysis. | **Quiz 3** |
| **(15)** | Tutorials, review and study guide of final exam material | Final Exam |
| **(16)** | | |

**Expected workload:**

**On average students need to spend 2 hours of study and preparation for each 50-minute lecture/tutorial.**

**Attendance policy:**

**Absence from lectures and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.**

**Module references**

**Books**


1. Introduction to Logic Design, Alan B. Marcovitz, Third Edition, McGraw-Hill, 2010.
2. Logic and computer design fundamentals, M. Morris Mano, Charles R. Kime , Pearson Prentice Hall, 4th ed., 2008
3. Digital Design, 4th Edition, M. Morris Mano and Michael D. Ciletti, Prentice Hall, 2007.
4. Digital Electronics: Principles and Applications, R. L. Tokheim, 5th Edition, McGraw-Hill, 2000.
5. Practical Digital Logic Design and Testing, P. K. Lala, Prentice Hall, 1996.
6. Introduction to Digital Logic Design, J. P. Hayes, Addison-Wesley, 1996.


**Web sites**

**http://www.digikey.com**
**http://www.edaboard.com/forums.html**