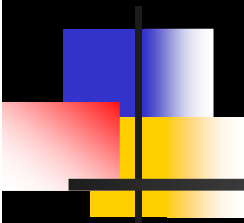




UNIVERSITY  
of GUELPH



School  
of  
Engineering



# ENG2410

# Digital Design

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General Information  
Handout

Fall 2010, September 10<sup>th</sup>

ENG2410 Fall 2010

# Shawki Areibi



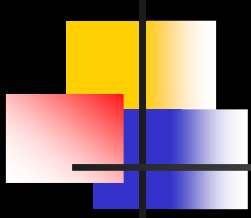
## Office, Email, Phone

- Office: 2335, EXT 53819
- Email: [sareibi@uoguelph.ca](mailto:sareibi@uoguelph.ca)
- Web: <http://www.uoguelph.ca/~sareibi>
- Office Hours: Thur 10:00-12:00 PM

PhD, Waterloo 1995

## Research Interests

- VLSI Physical Design Automation (CAD Tools)
- Reconfigurable Computing Systems
- Embedded Systems



# Outline

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- Info about Staff (TAs, LabTech)
- Lecture and Lab Schedule.
- Course Text and References.
- **Course contents, Tentative Schedule.**
- Assignments, Labs, Exams.
- Evaluation
- Important Information



# Lab Coordinator

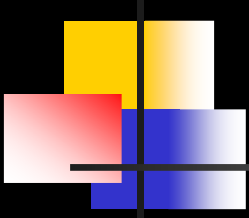
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- Nate Groendyk
- Room 2308, ext 53873
- Email: [groendyk@uoguelph.ca](mailto:groendyk@uoguelph.ca)

# Teaching Assistants

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- Ahmed Alwattar, PhD Student
- Room THORN 304, ext 56493
- Email: [aalwatta@uoguelph.ca](mailto:aalwatta@uoguelph.ca)





# Lecture & Lab Schedule

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➤ **Lectures**

1. 9:30–10:20, MACK226 (M,W,F)

➤ **Tutorials**

1. 2:30-3:30, ROZH 109 (Thur)

➤ **LABS**

1. 3:30-5:30, THRN2307, (Thur)



# Text Book and References

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- **Text Book:** Logic and Computer Design Fundamentals, 4<sup>th</sup> ed, 2008, Mano.
- **References**
  1. VHDL for Engineers by Short.
  2. VHDL Tutorial by S. Areibi on the web.
  3. Tutorials on Using Xilinx Foundation Tools.
  4. Fundamentals of Digital Logic with VHDL Design by Brown and Vranesic



# Resources & Communication

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- <http://www.uoguelph.ca/~sareibi>
- Communications
  1. E-mail, listserv
  2. Eng2410 Web Page (Announcement)



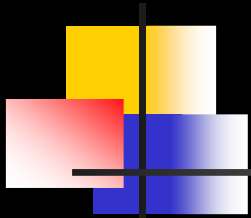


# Course Objectives

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- This is a basic course in most electrical and computer engineering programs.
- Achieves the following goals:
  1. Teaches you the fundamental concepts in digital design (combinational logic, sequential logic).
  2. Teaches you concepts of designing arithmetic circuits (data path) and algorithmic state machines (control).
  3. Teaches you how digital circuits are designed today using advanced CAD tools and HDLs.

# Acquiring Skills



Essential  
Foundation

Number Systems, Basic Gates  
Such as And, Or, Not,  
Minimizing logic, Boolean Algebra

Combinational  
& Sequential  
Logic Design

Design of Adders  
State machines, memory  
Registers, Counters

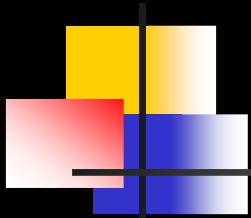
Data Path  
& Control

Design of Arithmetic Logic  
Units, Busses, Algorithmic  
State Machines

Hardware Descriptive  
Languages

VHDL

# Relationship to Other Courses



**ENG338**  
Embedded Arch  
Design

After learning the basic Elements of data path and Control, you will design a Complete CPU

**ENG364**  
Micro Comp  
Interfacing

You will learn how to attach Several modules to an MCU Such as memory, LCDs, LEDs 7-Seg. Keyboards

Will help you with these Courses since you might Use skills acquired in developing A digital system.

**ENG354**  
Electrical  
Devices

Helps understand issues About Transistors, ICs, Operational Amplifiers

**ENG340**  
**ENG442**



# Tentative Schedule

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1. Week #1, Introduction to Digital Design
2. Week #2, #3, #4, #5, Comb Logic Circuits & Design
3. Week #6, #7, Sequential Logic Design
4. Week #8, Registers and Counters
5. Week #9, RTL & Data Path
6. Week #10, Control and Algorithmic State Machines
7. Week #11, Memory
8. Week #12, Programmable Logic Devices



# Assignments

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1. **Assignment#1**, (Week#1) Number Systems
2. **Assignment#2**, (Week#2) Boolean Algebra
3. **Assignment#3**, (Week#3) K-Map Simplification
4. **Assignment#4**, (Week#4) Combinational Logic
5. **Assignment#5**, (Week#5) Arithmetic Circuits
6. **Assignment#6**, (Week#6) Sequential Circuits
7. **Assignment#7**, (Week#7) Counters, registers
8. **Assignment#8**, (Week#8) Data Path
9. **Assignment#9**, ( Week#9) Algorithmic State Machines
10. **Assignment#10**, ( Week#10) Memory & Programmable

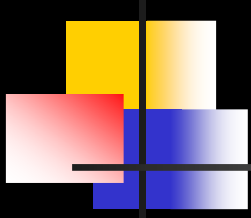


# LABS

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- Labs are an integral part of the course.  
The objectives of the labs are:
  1. Understand and assimilate lecture material
  2. Give practical experience using small scale integrated circuits and FPGAs
  3. Teach you Hardware Descriptive Language
  4. To give you hands on experience with CAD tools for digital hardware development.

# Labs: Reports, Preparation ..



1. **Lab#0**, Week#2, Intro -> Equipment and CAD Tools
2. **Lab#1**, Week#3, Combinational Logic & TTL.
3. **Lab#2**, Week#4, ISE Schematic Capture "Tutorial"
4. **Lab#3**, Week#5, ISE VHDL Design Entry "Tutorial"
5. **Lab#4**, Week#6 Combinational Logic Design
6. **Lab#5**, Week#7, Design with VHDL
7. **Lab#6**, Week#8, Sequential Logic Design
8. **Lab#7**, Week#9, Data Path Design
9. **Lab#8**, Week#10, Algorithmic State Machines



# Exam Schedule

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1. **Quizzes**, 2 quizzes (any time)
2. **Midterm**
  - Week#8, (material Week 1-7)
3. **Final Exam**, Week#13, Dec 8th,  
Where? (TBA) Covers weeks 1-12

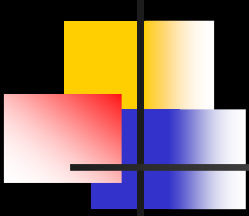




# Evaluation

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Topic	Weight	Details
Assignments	5%	Every Week
Quizzes	5%	Any time
Labs	15%	8 Labs
Midterm	25%	Week 8
Final Exam	50%	Week 13



# Important Issues

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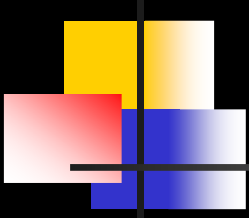
- It is important to remember that the quizzes and final exam will be based on the assignment problems, so it is in your best interest to seriously attempt all questions alone.
- In order to pass the course, you must pass both the lab and exam course portion. Students must obtain a grade of 50% or higher on the exam portion of the course.
- If a laboratory is missed due to illness or other reason, arrangements must be made with the teaching assistant to complete a make-up lab.



# Academic Misconduct

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- Please refer to the regulation outlined in the student handbook regarding academic misconduct.
- The policy for this course is zero tolerance for any form of plagiarism and academic misconduct.
- All cases will be dealt by the Dean of the College.



# Simple Advice

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- **Attend all Lectures!**
- **Attempt all assignments**
- **Make use of your Teaching Assistants**
- **Prepare for the Labs prior to lab session**
- **Study in groups (don't rely on others!)**
- **Identify your strengths and weaknesses**
- **Manage your time!!!!!!!!!!!!**