

# ELE 491

## Senior Design Project Proposal

These slides are loosely based on the book Design for Electrical and Computer Engineers by Ford and Coulston. I have used the sources referenced in the book freely and without re-attribution. Please see the book for full source attribution



# ELE 491

# Senior Design Project Proposal

Class 1 – Introduction

# Introduction

- **Dr. Johnson**
- I enjoyed a thirty year career in the high technology industry spanning the military, industrial, commercial and consumer markets. I have been involved in basic and applied research, product development, engineering management, and business management. I have designed or been responsible for the design of over 250 integrated circuits and was responsible for as much as \$4B of integrated circuits on an annual basis. I worked directly for Motorola, Harris Corporation, IBM and RCA and indirectly with nearly every major semiconductor company around the world.
- **Major Programs and Projects**
  - Motorola: Phones, tablets, set-top boxes, police/fire radios, Iridium
  - [AMRAAM](#) - Advance Medium Range Air-to-Air Missile
  - [BAT](#) - Brilliant Anti-Tank Munitions System
  - 100s of smaller programs
- **General Technology Expertise**
  - Integrated Circuit (IC) Design
  - IC Process Technology
  - Computer System Architecture
  - Wireless System Architecture
- **IC Specific Technology Expertise**
  - Bipolar (JI & DI), NMOS, CMOS, BiCMOS
  - Analog, Mixed Signal, Digital (IIL, TTL, ECL, NMOS, CMOS)
  - Low Power, Sub-threshold
  - Sampled Data (switched capacitor)
  - Radiation Hardened
  - Low Temperature (77K)
  - RF, IF, Baseband, Power Management
  - Microcontrollers, Microprocessors, Multi-Processors, DSP, FPGA
- **Odds and Ends (Misc things I've done over the years)**
  - Research at Oak Ridge National Laboratory
  - Particle Detector design at [Rutherford-Appleton Laboratories](#)
  - LINAC / Gamma Radiation work at [White Sands Missile Range](#)
  - Unix system administrator
  - Co-developed a switched capacitor simulator
  - Developed a thermal fusing simulator

# Introduction

## Syllabus

- ELE 491 - NIU Course Description
  - Discussion of educational programs, career opportunities, and modern topics in electrical engineering.
  - Select and write proposal for senior design project.
  - For electrical engineering students only.
  - Team project required.
- Prerequisites:
  - Consent of department

# Introduction

## Syllabus

- Primary Goal
  - This course will introduce students to many of the processes used to conceive, plan, develop and validate projects commonly undertaken by Electrical Engineers in modern engineering roles.

# Introduction

## Syllabus

- Course Outline
  - The lecture/discussion portion of the course will consist of four major sections:
    - Concept and Design Processes
    - Design Tools
    - Professional Tools
    - Project Proposals – outside normal class hours

# Introduction

## Syllabus

- Learning outcomes and objectives
  - A student who successfully fulfills the course requirements will have demonstrated the ability to:
    - Develop a plan to solve a complex open ended problem
      - ABET Outcomes [a-1, b-1, c-1, e-3, k-1]
    - Exercise skills required to be a successful engineer
      - ABET Outcomes [f-1, h-1, i-1, j-2]
    - Operate within a team environment
      - ABET Outcomes [d-3]
    - Create and present oral and written presentations and documents
      - ABET Outcomes [g-3]
  - For details on ABET standards see [www.abet.org](http://www.abet.org).

# Introduction

## Syllabus

- Mechanics
  - Class Details:
    - Room - EB 209
    - Days - Mondays
    - Time - 2:00 – 2:50
  - Attendance is expected



# Introduction

## Syllabus

- Instructor
  - Dr. Johnson
    - EB 350
    - tjohnson11@niu.edu
      - preferred method of contact
      - (prepend all email subjects with ELE491 - subject...)
    - Website – <http://www.ceet.niu.edu/faculty/tjohnson>
    - Office phone - (815) 753-9967
    - Office hours: T/TH 2:00 – 4:00

# Introduction

## Syllabus

- Resources
  - Text book
    - Design for Electrical and Computer Engineers  
By: Ford and Coulston  
ISBN: 978-0-07-338035-3
  - Class website:
    - [http://www.ceet.niu.edu/faculty/tjohnson/ele491S15/index-niu-  
ele491.html](http://www.ceet.niu.edu/faculty/tjohnson/ele491S15/index-niu-<br/>ele491.html)
    - Notes, Handouts and readings will be available on the website

# Introduction

## Syllabus

- Support outside of class
- If you are struggling it is ALWAYS better to ask for help early since concepts build upon each other. In addition, office hours will be more crowded prior to the test and you may not get the kind of time needed to clarify your understanding.

# Introduction

## Syllabus

- **Americans with Disabilities Statement & Non-Discrimination Statement:**
  - NIU abides by Section 504 of the Rehabilitation Act of 1973 which mandates reasonable accommodations be provided for qualified students with disabilities. The NIU Center for Access-Ability Resources (CAAR), located on the 4th floor of the University Health Service (815.753.1303) is the designated office on campus to provide services and accommodations to students with diagnosed disabilities. You need to provide documentation of your disability to CAAR if you seek accommodations in this course.
  - Your success as a student is of utmost importance to me. If you have a disability or any other special circumstance that may have some impact on your work in this class, and for which you may require special accommodations, please contact me early in the semester so that accommodations can be made in a timely manner.

# Introduction

## Syllabus

- Class Notes / Additional Reading
  - I will make every attempt to put the class notes and additional readings on the web page two weeks in advance of the lecture but worse case these will be available one week in advance of class.
  - It is critical that you read these over before class. They are not intended to include all the class material but will jump start the learning process. In addition, all the material in the notes may not be covered in class – but you are still responsible for it.
  - *See the notes on Effective Learning Concepts.*

# Introduction

## Syllabus

- HW Assignments
  - The web page will be used for scheduling and distributing assignments.
  - Due to the nature of the material, assignments will be handed-in in hard copy form.
  - Blackboard will be used for grades and announcements
  - All assignments will be due at the beginning of the class on the assigned day.
  - No late assignments accepted
- Tests
  - The Mid-term will be administered during normal class hours. The Final will be administered at the university assigned final time/location.

# Introduction

## Syllabus

- Class Attendance
- Attendance is critical

# Introduction

## Syllabus

- In Class Behavior
  - You are young professionals and I expect you to act accordingly. Disruptive behavior of any kind will be referred to the appropriate administrative office.
  - I expect your focus in class to be on the course material. Cell phones, MP3 players, laptops, tablets, ... are not allowed during the lecture portion of the class. If you must use one of these devices you are welcome to leave the room.
    - Research shows that taking notes on a laptop or tablet is less effective than taking them long-hand, so please do not ask for an exception.
  - No video or audio recording is allowed in class. Failure to follow this rule will be treated as academic dishonesty and dealt with accordingly.



# Introduction

## Syllabus

- Professionalism and Academic Honesty

***A professional does not take credit for the work of someone else.***

- A major component of your education is learning how to learn and perform. Now is the time you must develop the discipline, mindset, and ethics to contribute in the technical society. I can assure you; those who claim the work of others in the workplace are dealt with rather harshly. They may not even know they are being penalized, but those around them will make sure justice is served.
- **Any** documented case of “cheating” will result in a **FAILING GRADE** for the course as well as possible disciplinary action. All cases of academic dishonesty will be reported to the ELE Chair as well as to the Dean of Students.

# Introduction

## Syllabus

- Examples of Cheating include **(but are not limited to)** the following:
  - Testing
    - copying the work of another student (past or present) during a test
    - providing test information to students who have not yet taken it
    - obtaining information about a test prior to taking it
    - having someone else take a test for you
    - bringing “cheat sheets” in any form with you to a test
    - using a cell phone or other electronic device during a test
  - Homework
    - modifying a graded lab or homework paper and submitting it for reevaluation
    - turning in work that was done by someone else
    - using another student’s (past or present) homework files
    - posting solutions to homework problems or lab experiments

# Introduction

## Syllabus

- Collaboration
  - Working collaboratively on homework assignments is allowed, encouraged, and often required. **The work you turn in however must be your own.** If you short circuit this process and let someone else do the work for you, you will be cheating yourself.
  - This will be obvious when you do well on homework and fail the tests.

# Introduction

## Syllabus

- Participation

- Participation in class is valuable to the student, the instructor, and others in the class.
- Students must learn to ask questions when they don't understand, provide input where they believe it adds to the discussion, and become comfortable speaking in various settings. An engineer who is not able to provide appropriate input in a meeting or group discussion is a waste of a seat.
- Most instructors know their course material very well. The key to conveying that information is constant feedback. The pace, approach and content can usually be modified to enhance the student's learning process, IF, the students provide feedback. Where the opportunity to change the lesson has passed, consider your feedback as a form of "paying it forward" to future students.
- When someone asks a question there are almost always others with a similar question. In some cases the question or answer may clarify the concept for a student who thought they understood but now realize they did not.
- Participation will not be officially graded. I reserve the right to use participation as the "borderline" determining factor as outlined in the *Grading* section.

# Introduction

## Syllabus

- Grading

- Your “overall score” will be calculated based on the following weights:

- |                        |     |  |
|------------------------|-----|--|
| • Participation        | 5%  | I should recognize you by name and face by the end of the semester |
| • Homework             | 10% | 5 sets at 2% each  |
| • In Class Assignments | 10% |  |
| • Tests                | 20% | 2 tests at 10% each  |
| • Project Proposal     | 55% | Rubric to be provided  |

# Introduction

## Syllabus

- Grading
  - On the total of all HWs, In Class Assignments, and each Test you will receive a “raw score”. This will reflect your un-weighted performance. Your “raw score” will be shifted with respect to the **upper percentile** of the class to obtain a “weighted score”. It is these weighted scores that will be used in your “overall score” calculation.
  - For example, if the top student has a raw score of 93% average on all the HWs combined, everyone’s raw HW score will be multiplied by 1.075 ( $1.00/0.93$ ) to obtain their corresponding weighted score.
  - The Project Proposal will not be weighted

# Introduction

## Syllabus

- Grading
  - For the final grade, equal-width cutoffs will be applied based on a cutoff width of 10 (i.e., the nominal cutoffs for A-B-C-D will be 90-80-70-60, respectively).
  - Letter grades in the upper 33% of each range will have a “+” designation, and those that fall in the lower 33% of each range will have a “-” designation.
  - Subject to the official university limits (No A+, C-, D+ or D-)

# Introduction

## Syllabus

- Grading
  - Individual assignments and tests will be graded and returned to the student. These grades are unofficial.
  - The official grades will be kept in Blackboard and updated on a regular basis.
  - Any errors in grading must be brought to the attention of the instructor within one week of posting to Blackboard.
  - Blackboard will contain the raw score for each assessment, and the current overall score.



# Introduction

## Syllabus

As an engineer you most likely consider yourself a scientist also. A critical piece of being a scientist is believing in the scientific method and not ignoring the results. Here are some key learning and learning behavior results.

- Multi-tasking reduces competency in each task undertaken
- <5% of the population can multi-task and the odds are high that you are not one of them
- Repetition is a key factor in long term retention
- Your brain tosses out anything it thinks is irrelevant each night – review material the same day to help make it relevant to your brain
- Sleep is not an option – it is critical to learning (7 hours min – no exceptions)
- Connect new concepts to concepts you already know
- Taking notes by hand increases understanding – not true for typing
- Study as you go and review in the days before the test – then sleep the night before
- Hear – Do – Teach      Teaching others solidifies learning
- Cramming has no long term learning value
- Cramming works for a few hours – if you do it – do it the morning of the test

# Introduction

## Syllabus

- 7 things to make you a better learner
  1. Make connections. Use analogies or mnemonic devices to build upon your existing knowledge. Not only do these help you remember – but the act of creating these helps you learn.
  2. Never read anything without a purpose and stop once you have accomplished it.
  3. When you read – stop after every major section or chapter and write down a few key notes. Review the summary within 24hrs to help transition it from short term to long term memory.
  4. 20-30 min maximum at any task – then take a short stretch break (30-60sec) and get the blood flowing – review what you have been doing in your mind.
  5. 2 hours total without a long break (10 - 15 minutes). Do something that stimulates other parts of your brain – music, exercise, food – when you return – review your short notes from earlier.
  6. Plan your time – keep a record – modify your schedule accordingly – Stress reduces learning and being overloaded with no time left is very stressful.
  7. Ask – when you don't get it, and have tried a few times - ASK

# Introduction

## Syllabus

- **Course Calendar**

*SUBJECT TO CHANGE – depending on overall class progress and any unforeseen natural phenomena.*

2/2	Project Concept and Team Makeup
2/9	HW 1
2/16	Initial Proposal
2/23	HW 2
3/2	Mid Term
3/16	Requirements Specification
3/23	HW 3
3/30	Functional Decomposition
4/6	HW 4
4/13	WBS
4/20	HW 5
4/27	Final Project Proposal
TBD	Final

# Project Proposal

## Infrastructure

- I strongly suggest you keep an open mind on project team makeup.
- In industry – project teams are built-up by expertise

## In Class Activity