

# Eta Kappa Nu, HKN

The Pennsylvania State University Epsilon Chapter  
Electives Night

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# Overview

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## 1. Introduction

<http://sites.psu.edu/hkneecs/electives-night/>

## 2. Electrical Engineering

## 3. Computer Engineering

## 4. Computer Science

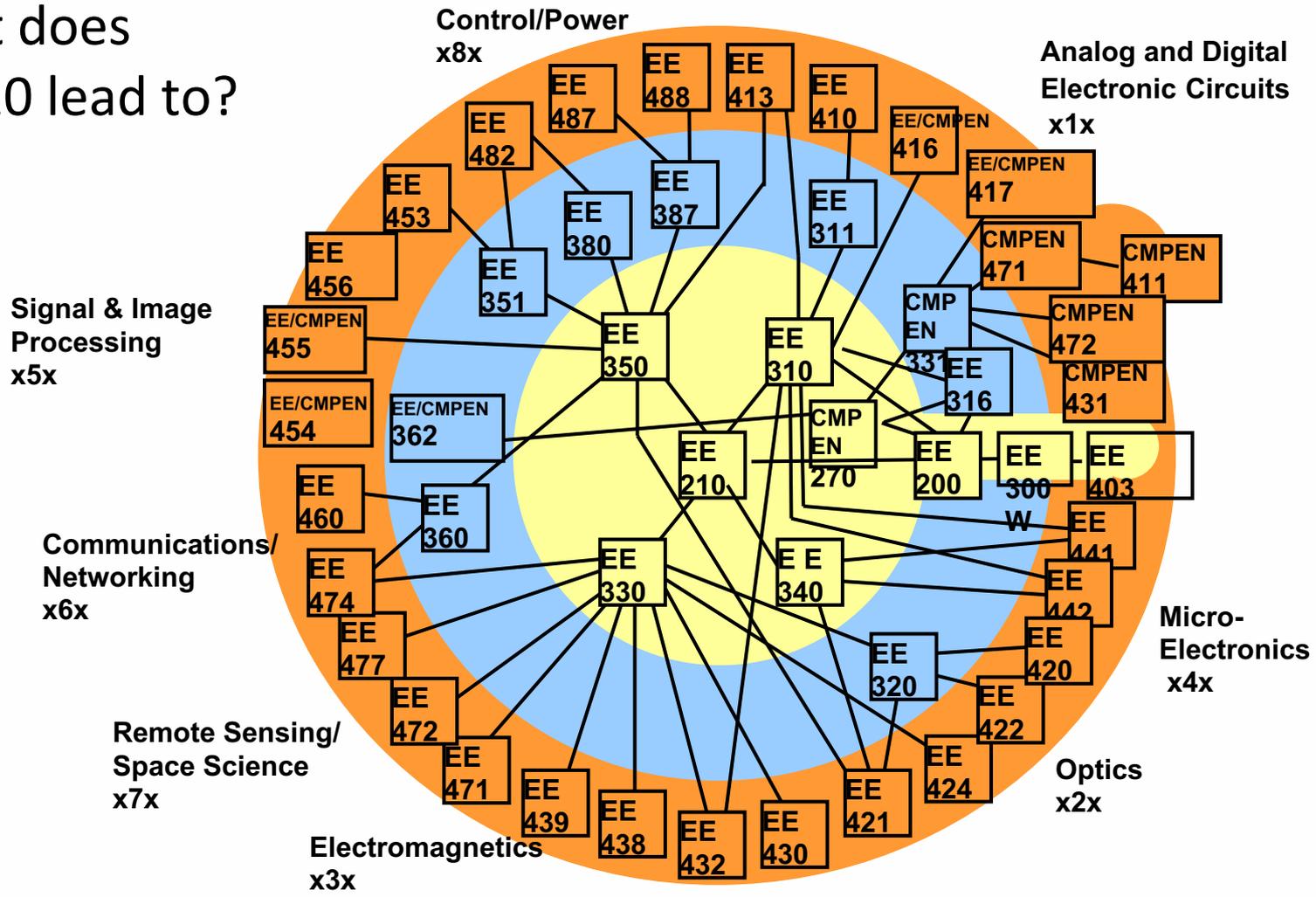
# **Eta Kappa Nu, HKN**

**The Pennsylvania State University Epsilon Chapter  
Electives Night**

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# **Electrical Engineering**

# What does EE 210 lead to?



## Course Numbering

▪Electronic Design .....	x1x
▪Optics .....	x2x
▪Electromagnetics .....	x3x
▪Semiconductor Devices .....	x4x
▪Signal and Image Processing .....	x5x
▪Communications .....	x6x
▪Space Systems and Remote Sensing .....	x7x
▪Power Systems and Control Systems .....	x8x

[Course Descriptions](#)

[When/What Course are offered](#)

[EE Handbook \(2017\)](#)

# Electronic Design

# EE 311

## Electronic Circuit Design II

## Student Opinions

### Course Description

Electronic circuit design with consideration to single and multi-device subcircuits, frequency response characteristics, feedback, stability, efficiency, and IC techniques.

### Skills/Prerequisites needed for the course?

- Prerequisites: EE 310 & EE 350/353
- Strong understanding of EE 310 material

### What will you learn?

- More advanced microelectronic transistor circuits covering topics like MOSFETS, BJTs, current sources, operational amplifiers, etc
- More advanced analysis techniques like feedback, stability, frequency response characteristics and others

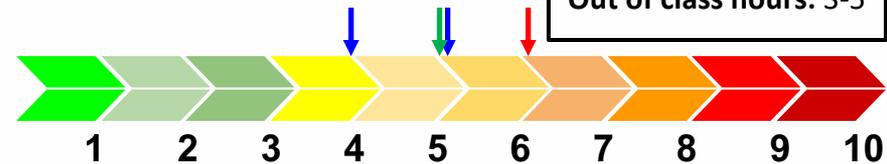
### Who teaches it?

Eli Hughes Swaroop Ghosh Mark Bregar

Fall/Spring  
Course

### Class Difficulty?

The test were partially take home but very difficult. The circuits can also be complex and tedious to solve.



### What was best about the class?

- Tests were unique and taught you real practical design skills
- Great intro to larger more practical circuits
- The exams were very fair
- You learn how the internals of an op amp work, and how they are actually designed
- Bregar is funny

### What was worst about the class?

- The lectures could be hard to follow
- Covers a lot of topics in not enough detail
- Homework was difficult

# EE 410

## Linear Electronic Design

### Course Description

Linear circuit design via integrated circuit processes. Design focused course. **Course contains a significant laboratory component.**

### Skills/Prerequisites needed for the course?

- Prerequisites EE 311
- Strong background in transistor circuits
- EE 340 is not a prerequisite but some knowledge of semiconductor physics is helpful.

### What will you learn?

- Analog transistor circuit design done in the context of IC
- Cadence simulation software
- Design of multiple operational amplifiers & basic layout

### Who teaches it?

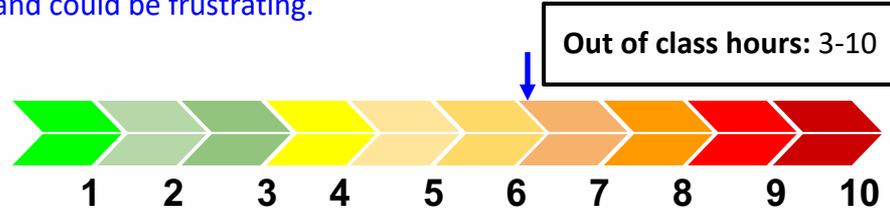
Mehdi Kiani

Spring  
Course

## Student Opinions

### Class difficulty?

The biweekly cadence project was challenging and could be very time consuming. The homeworks were typically design questions and could be frustrating.



### What was best about the class?

- The lectures were fantastic and very well prepared
- Learning Cadence is a fantastic skill
- Real design experience

### What was worst about the class?

- Lab assignments could be very frustrating

# EE 413

## Power Electronics

### Course Description

Switch-mode electrical power converters. Electrical characteristics and thermal limits of semiconductor switches.

### Skills/Prerequisites needed for the course?

- Prerequisites EE 310 & EE 350
- Basic knowledge of transformers, transistors & diodes helps

### What will you learn?

- Analysis, design & application of switch mode power converters (Buck, Boost, Buck-Boost, CUK)
- Power device characteristics, the design of gate drive and feedback circuits, and the analysis/design of elementary controllers

### Who teaches it?

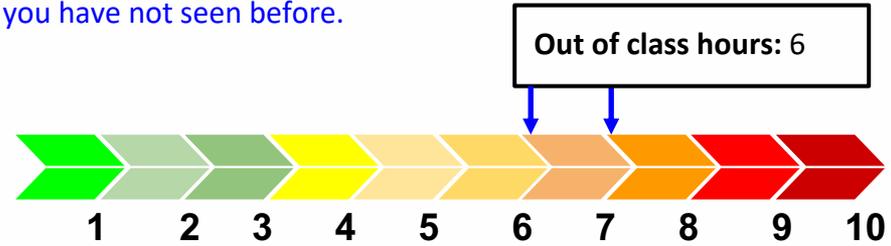
Terrance Lovell Arash Khoshkbar-Sadigh

Fall  
Course

## Student Opinions

### Class difficulty?

The lecture can be incredibly difficult to follow. The homework is more of an extension of the lecture and requires you do problems you have not seen before.



### What was best about the class?

- The content is incredibly useful in the field of circuits

### What was worst about the class?

- Lecture & homework can be frustrating
- Tests are difficult and ask questions you have not encountered

# EE/CMPEN 416

## Digital Integrated Circuits/VLSI Design

### Course Description

Design and analysis of digital integrated circuits employed in very large scale integrated (VLSI) chips. **Course contains a significant laboratory component.**

### Skills/Prerequisites needed for the course?

- Prerequisites: EE 310 & CMPEN 270
- EE 340 is not a prerequisite but some knowledge of semiconductor physics is helpful.

### What will you learn?

- Insight into the design of modern VLSI chips, especially CMOS approaches to design.
- Digital integrated circuit design, layout, simulation, and fabrication.
- Cadence circuit simulation software

### Who teaches it?

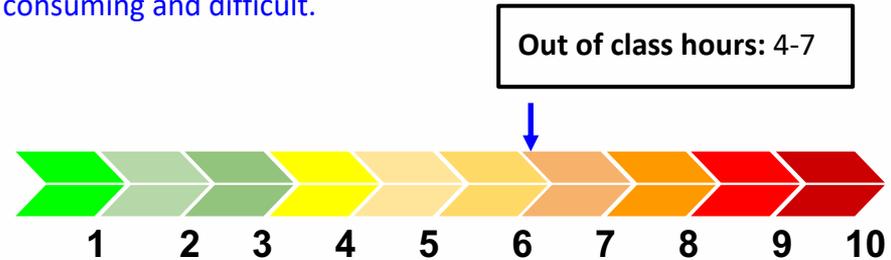
Swaroop Ghosh

Fall  
Course

## Student Opinions

### Class difficulty?

The exams are tough. The class's final project can be both very time consuming and difficult.



### What was best about the class?

- The lectures are very well done
- Learning cadence is a very useful skill
- Real design experience

### What was worst about the class?

- The Cadence assignments could be very challenging

# EE/CMPEN 417

## Digital Design Using Field Prog. Devices

### Course Description

Field programmable device architectures and technologies; rapid prototyping using top down design techniques; quick response systems. **Course contains a significant laboratory component.**

### Skills/Prerequisites needed for the course?

- Prerequisites: CMPEN 331
- Strong basics in software/hardware programming

### What will you learn?

- Real world applicable knowledge in how to use FPGAs
- Steps in designing a PCB board which has an FPGA, process for selecting the best FPGA for a design
- How to program in System Verilog

### Who teaches it?

Vijay Narayanan

Spring  
Course

## Student Opinions

### Class difficulty?

The lab component is difficult



### What was best about the class?

- The labs give really useful skills in the world of FPGAs

### What was worst about the class?

- N/A

# Optics

# EE 320

## Introduction to Electro-Optic Engineering

### Course Description

An introduction covering several fundamental areas of modern optics, optical processes, and devices.

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 330
- Physics 214 is extremely useful

### What will you learn?

- Several fundamental areas of modern optics, optical processes, and devices
- Covers lenses, lasers, diffraction, and other types of interference
- The course covers the basics of optical systems, focusing on the interaction of waves with materials

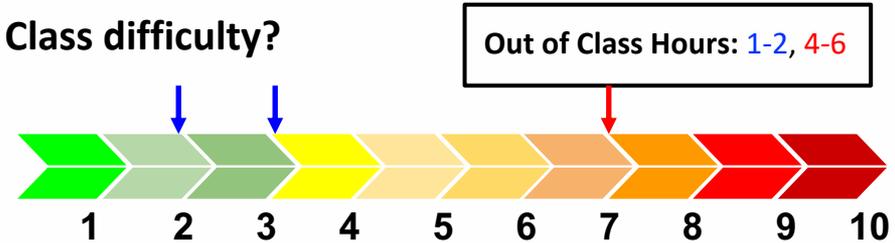
### Who teaches it?

Qiming Zhang Xingjie Ni Stuart Yin Zhiwen Liu

Fall/Spring  
Course

## Student Opinions

### Class difficulty?



### What was best about the class?

- Class was very easy and required very little out of class work

### What was worst about the class?

- The exams were challenging but not unreasonable
- The grading scale changed halfway through the semester which threw me off but there was a curve at the end.

# EE 420

## Electro-Optics - Principles & Devices

### Course Description

Spatially linear system and transform. Diffraction theory, partial coherence theory, optical image detection, storage and display, holography.

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 320
- Knowledge of EE 350 is helpful

### What will you learn?

- Spatially linear systems and transforms
- Diffraction theory, partial coherence theory
- Optical image detection, storage, and display; holography

### Who teaches it?

Xingjie Ni   Zhiwen Liu   Stuart Yin

Fall  
Course

## Student Opinions

### Class difficulty?

Math can get very complicated

Out of class hours: N/A



### What was best about the class?

- N/A

### What was worst about the class?

- N/A

# EE 422

## Optical Engineering Laboratory

### Course Description

Hands-on experience covering areas of optical transforms, electro-optics devices, signal processing, fiber optics transmission, and holography. **Course contains a significant laboratory component.**

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 320

### What will you learn?

- Applications in fiber optics communication, sensing, holography, optical switching and processing
- Optical transforms, electro-optics devices, and signal processing
- Fiber optics transmission and holography
- Learn to replicate theoretical principles in the laboratory

### Who teaches it?

[Iam-Choon Khoo](#) Zhiwen Liu Stuart Yin

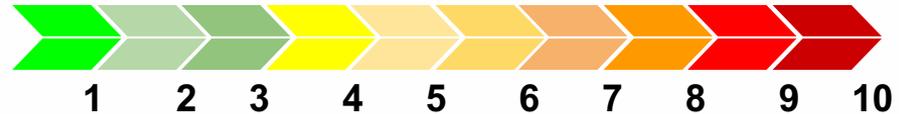
Fall  
Course

## Student Opinions

### Class difficulty?

The instructor is straightforward and the homeworks & exams are consistent with each other, some material is tricky.

Out of class hours: N/A



### What was best about the class?

- Lab experience

### What was worst about the class?

- N/A

# EE 424

## Principles & Applications of Lasers

### Course Description

Principles of lasers--generation, propagation, detection and modulation; applications in fiber optics communication, remote sensing, holography, optical switching and processing.

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 330
- Maxwell's equations, wave theory, and complex analysis

### What will you learn?

- Basic principles of lasers, how they're generated, how they propagate, how they're detected and modulated
- Common applications for lasers, e.g. fiber optics, holographic, optical switching

### Who teaches it?

Iam-Choon Khoo

Spring  
Course

## Student Opinions

### Class difficulty?

N/A

Out of class hours: N/A



### What was best about the class?

- N/A

### What was worst about the class?

- N/A

# Electromagnetism

# EE 430

## Principles of Electromagnetic Fields

### Course Description

Laws of electrodynamics, boundary value problems, relativistic effects, waves in dielectrics and ferrites, diffraction and equivalence theorems.

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 330
- Extends heavily from EE 330 a very strong understanding of the material is recommended

### What will you learn?

- Understand sources of electric and magnetic fields and coupling between them.
- Boundary conditions, energy and power associated with electromagnetic fields, understand and design transmission lines and waveguides.
- Understand radiation from antennas.

### Who teaches it?

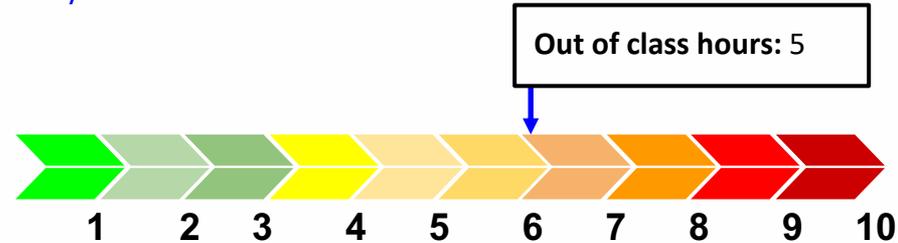
Victor Pasko Ram Narayanan

Spring  
Course

## Student Opinions

### Class difficulty?

Changes in notation from EE 330 made things challenging. A lot of heavy math and derivations.



### What was best about the class?

- Homeworks provide really good MATLAB experience. It's a great way to see theory in practice

### What was worst about the class?

- Theory based course can make for a dry lecture

# EE 432

## UHF & Microwave Engineering

### Course Description

Transmission line and wave guide characteristics and components; design of UHF-microwave amplifiers, oscillators, and filters; measurement techniques; design projects. **Course contains a significant laboratory component.**

### Skills/Prerequisites needed for the course?

- Prerequisites: EE 330 & EE 310
- Strong background in EE 330 recommended

### What will you learn?

- ADS software
- Real practical skills with microwave equipment and microstrip circuit design
- Design of UHF-microwave circuits

### Who teaches it?

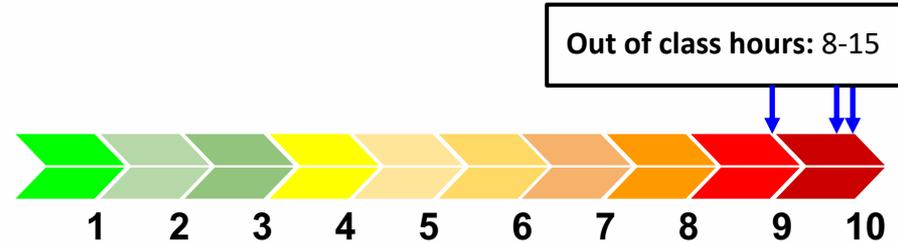
Julio Urbina

Fall  
Course

## Student Opinions

### Class difficulty?

Content can be very challenging to approach. The lab is very independent and difficult. The range of content covered in this class is huge and the workload can feel like a lot.



### What was best about the class?

- The lab teaches you a ton of practical skills
- You will receive a lot of useable skills from ADS software, theory and hands on experience.
- Exams are extremely fair

### What was worst about the class?

- Class work load can feel like too much
- So much material is covered it can feel unfocused

# EE 438

## Antenna Engineering

### Course Description

Radiation from small antennas, linear antenna characteristics, arrays of antennas, impedance concepts and measurements, multifrequency antennas, and aperture antennas

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 330

### What will you learn?

- How and why antennas radiate
- How to produce radiation patterns of various antennas
- Parameters of antennas: input impedance, directivity gain, beam width, polarization and efficiency

### Who teaches it?

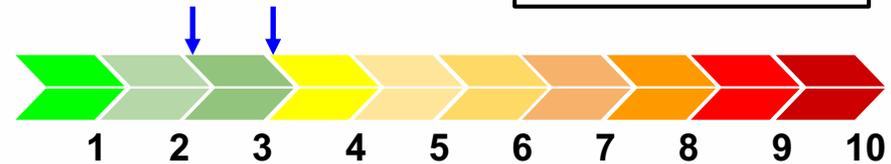
James Breakall   Micah Gregory   Doug Werner

Fall  
Course

## Student Opinions

### Class difficulty?

Out of class hours: 0-1



### What was best about the class?

- Learning FEKO

### What was worst about the class?

- Lectures are dry and not much material is covered

# Semiconductor Devices

# EE 441

## Semiconductor IC Technology

### Course Description

The fundamentals of device technology, including oxidation, diffusion, photoresist, metallization, epitaxy, and material preparation. **Course contains a significant laboratory component.**

### Skills/Prerequisites needed for the course?

- Prerequisites: EE 310, E SC 314 or EE 340

### What will you learn?

- Lots of important processing techniques, and the various advantages and disadvantages
- Hands-on experience in the cleanroom—handling wafers, spinning photo-resist, operating the mask aligner and performing lithography

### Who teaches it?

Jerzy Ruzyllo    Aida Ebrahimi

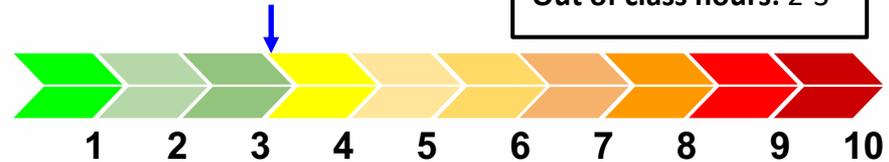
Fall/Spring  
Course

## Student Opinions

### Class difficulty?

Writing lab reports. The course is memorization and clean room experience; calculations are typically minimal.

Out of class hours: 2-3



### What was best about the class?

- If you are interested in nanofabrication it is good lab experience
- The course engages students unlike a traditional lecture setting.

### What was worst about the class?

- Sometimes there's a waiting period during lab sessions.

# EE 442

## Semiconductor IC Technology

### Course Description

The physics of semiconductors as related to the characteristics and design of solid state electronic devices.

### Skills/Prerequisites needed for the course?

- Prerequisites: EE 310, E SC 314 or EE 340

### What will you learn?

- Solid state physics, with a particular focus on devices (MOSFETs, diodes, LEDs, solar cells, etc.)
- Device characterization (band diagrams, p-n junction, MS-junction, MOS capacitor, I-V curves, etc.)

### Who teaches it?

Weihua Guan Qiming Zhang Shengxi Huang

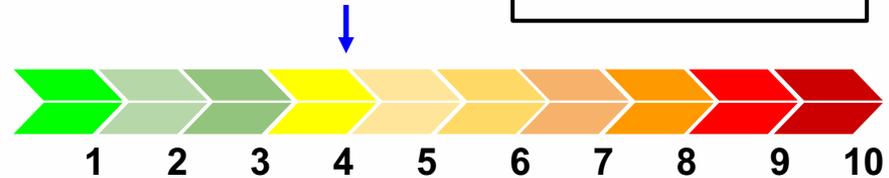
Fall  
Course

## Student Opinions

### Class difficulty?

The concepts could be difficult to grasp.

Out of class hours: 4



### What was best about the class?

- The instructor is explaining every detail very straightforward and some concepts in EE 340 became clearer.

### What was worst about the class?

- Roll-call is not taken consistently every lecture, but the instructor picks unexpected times to check attendance (Friday lectures or when people are missing).

# Signal & Image Processing

# EE 351

## Discrete Time Linear Systems

### Course Description

Introduction to discrete-time signal processing: sampling, linear time-invariant systems, discrete time fourier transform and discrete fourier transform, Z transform.

### Skills/Prerequisites needed for the course?

- Prerequisites: EE 350

### What will you learn?

- Discrete Time Fourier Transform (DTFT)
- Discrete Time Fourier Series (DTFS)
- Z-transform and its region of convergence

### Who teaches it?

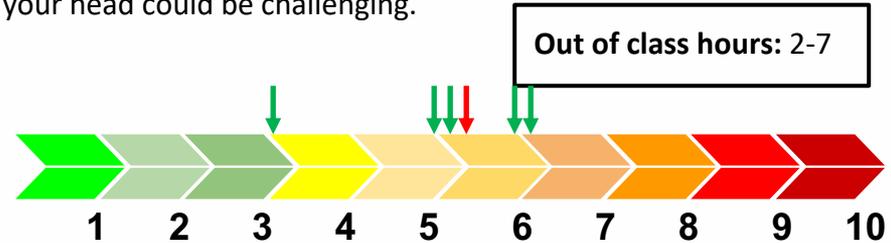
Minghui Zhu Vishal Monga John Doherty David Miller

Fall/Spring  
Course

## Student Opinions

### Class difficulty?

The tests were challenging. Putting all of the material together in your head could be challenging.



### What was best about the class?

- The homeworks could be really insightful
- The exams closely resemble the homework

### What was worst about the class?

- Information is more focused on theory than practice

# EE 453

## Fundamentals of Digital Signals Processing

### Course Description

Design of FIR and IIR filters; DFT and its computation via FFT; applications of DFT; filter implementation, finite arithmetic effects.

### Occasional Lab

### Skills/Prerequisites needed for the course?

- Prerequisites: EE 351
- Basic MATLAB knowledge

### What will you learn?

- Learn how to design and implement actual finite impulse response (FIR) and infinite impulse response (IIR) filters analytically and in practice using MATLAB
- Computation of DTFS via the Fast Fourier Transform (FFT)

### Who teaches it?

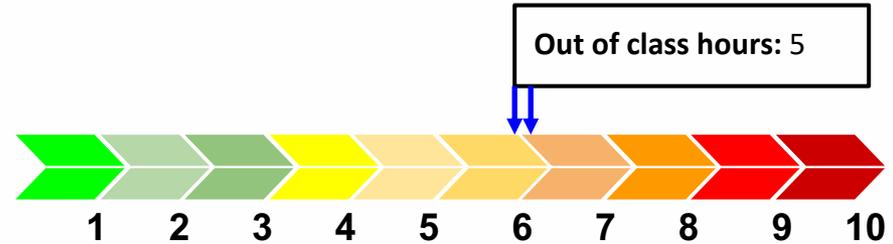
Vishal Monga John Doherty David Miller

Fall/Spring  
Course

## Student Opinions

### Class difficulty?

The concepts can be fairly difficult to grasp conceptually. A lot of derivations are not shown which can make the material confusing.



### What was best about the class?

- Finally applying digital signals processing knowledge

### What was worst about the class?

- The labs are not great. The equipment is old and they become redundant

# EE/CMPEN 454

## Fundamentals of Computer Vision

### Course Description

Introduction to topics such as image formation, segmentation, feature extraction, shape recovery, object recognition, and dynamic scene analysis. **Course contains a significant programming component.**

### Skills/Prerequisites needed for the course?

- Prerequisites: MATH 230, CMPSC 201 or CMPSC 121
- Basic MATLAB knowledge

### What will you learn?

- Binary vision systems: Identify basic objects based on segmentation, contours, and physical dimensions
- Depth from vision: Emphasis on stereo imaging, algorithms based on distances from points on the object
- Computer vision: Sequence of images over time, based on spatial or temporal changes in an image
- 3D object recognition: Object identification and localization

### Who teaches it?

Robert Collins

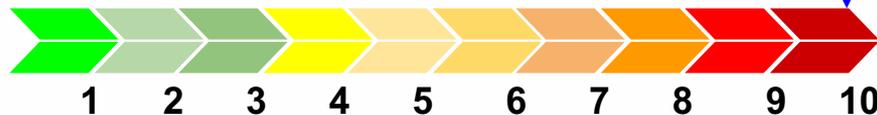
Fall  
Course

## Student Opinions

### Class difficulty?

The class projects can be very challenging and keeping up with the content can require some extra time.

Out of class hours: 10



### What was best about the class?

- The material is appealing for ones that interested in computer vision and using neural networks

### What was worst about the class?

- Programming component requires significant time, but the instructor gives 2 weeks to finish.

# EE/CMPEN 455

## Introduction to Digital Image Processing

### Course Description

Overview of digital image processing techniques and their applications; image sampling, enhancement, restoration, and analysis; computer projects. **Course contains a significant programming component.**

### Skills/Prerequisites needed for the course?

- Prerequisites: EE 350, CMPSC 201 or CMPSC 121
- Basic MATLAB knowledge

### What will you learn?

- Digital image processing techniques: Applications, image sampling, enhancement, and analyses
- One/Two Dimensional Fourier Transform analyses
- Discrete Cosine Transform: Used in JPEG and MPEG
- Techniques for image encoding and decoding

### Who teaches it?

William Higgins

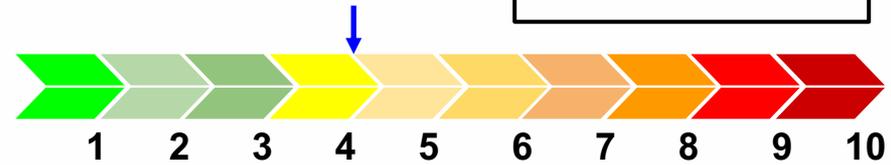
Fall  
Course

## Student Opinions

### Class difficulty?

Understanding how to do the projects can be challenging, but overall the class is not difficult

Out of class hours: 3



### What was best about the class?

- Teacher is very reasonable with workload and exams

### What was worst about the class?

- Heavy math, strong knowledge of Fourier transforms needed.

# Communications

# EE 360

## Communication Systems I

### Course Description

Generic communication system; signal transmission; digital communication systems; amplitude modulation; angle modulation.

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 350 or EE 353
- Strong understanding of Fourier Transform
- Basic MATLAB

### What will you learn?

- Analog Communications – AM (amplitude modulation), FM/PM (angle modulation)
- Types of digital/analog communication systems, and their schematic drawings
- Understanding the sampling theorem, quantization, and bit rates associated with digital communication

### Who teaches it?

Jing Yang   Viveck Cadambe   John Doherty   Aylin Yener

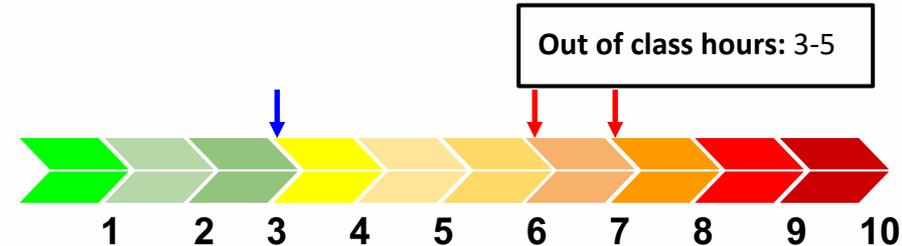
Fall/Spring  
Course

## Student Opinions

### Class difficulty?

The lectures can be difficult to follow and the homeworks/exams were hard.

Without attendance, homework questions and exams may be hard.



### What was best about the class

- Workload was not bad
- Exams stick very close to what is covered in class and on homeworks

### What was worst about the class?

- The lecture was difficult to follow
- Mostly math, some concepts may go unnoticed.
- Some homeworks were very time consuming

# EE/CMPEN 362

## Communication Networks

### Course Description

Data transmission, encoding, link control techniques; communication network architecture, design; computer communication system architecture, protocols.

### Skills/Prerequisites needed for the course?

- Prerequisite: CMPEN 270, STAT 401 or 418

### What will you learn?

- Protocol stack for communication networks; particularly the internet
- Detailed understanding of the different layers of Communication Networks

### Who teaches it?

Mark Mahon    Gouhong Cao

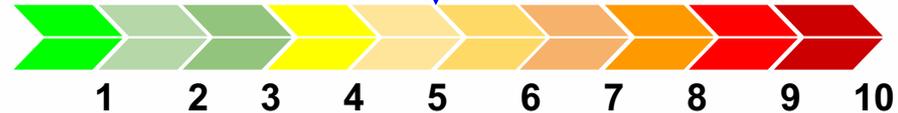
Fall/Spring  
Course

## Student Opinions

### Class difficulty?

Attendance is important for pop quizzes, for those that don't have experience with computer networking, weekly review is needed.

Out of class hours: 5



### What was best about the class

- The instructor makes sure you understand the material, no coding required and the course content is more theory based.

### What was worst about the class?

- Quizzes play a huge role on the overall grade.

# EE 460

## Communication Systems II

### Course Description

Probability fundamentals, digital/analog modulation/demodulation, system noise analysis, SSNR and BER calculations, optimal receiver design concepts, introductory information theory.

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 360
- Highly recommended that you take a stat 414/418 class prior

### What will you learn?

- Brief introduction to probability (2-3 weeks)
- Types of communication schemes, and the probability associated with transmitting signals
- How to treat “white-noise” as a Gaussian distribution, and introduces Information Theory

### Who teaches it?

Jing Yang   Viveck Cadambe   John Doherty   Aylin Yener

Fall  
Course

## Student Opinions

Out of class hours: 5

### Class difficulty?

Be sure to attend lecture. Some homework, quiz, and exam problems come straight from the notes.



### What was best about the class

- In class quizzes are open note
- Exams are challenging, but if you regularly attend lecture they are fair

### What was worst about the class?

- Certain homeworks are long
- Very STAT heavy for the first third of the class

# **Space Systems & Remote Sensing**

# EE/AERSP/NUC E 471

## Introduction to Plasma Physics and Cold Fusion

### Course Description

Plasma oscillations; collisional phenomena; transport properties; orbit theory, typical electric discharge phenomena.

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 330
- Basic MATLAB
- Strong understanding of electromagnetism

### What will you learn?

- Plasma Oscillations
- Collision Phenomena
- Transport Properties
- Orbit Theory
- Typical Electric Discharge Phenomena

### Who teaches it?

Victor Pasko

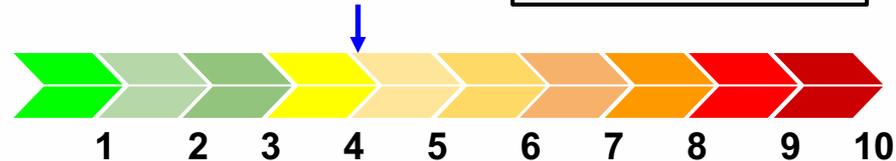
Fall  
Course

## Student Opinions

### Class difficulty?

Although class material is interesting, homework assignments are very creative that require time to do.

Out of class hours: 4



### What was best about the class

- Overall the material is interesting if the students wants to learn about plasma.
- Easy quizzes, no midterms; projects made on Mathematica play huge role on grade.

### What was worst about the class?

- Homework assignments.

# EE 472

## Space Astronomy & Intro to Space Science

### Course Description

The physical nature of the objects in the solar system; the earth's atmosphere, ionosphere, radiation belts, magnetosphere, and orbital mechanics.

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 330
- Basic Mathematica
- Strong understanding of maxwell's equations

### What will you learn?

- How the Sun produces large currents in space
- Physics involved in earth orbits
- Particle motion, plasma physics, and ionosphere topics

### Who teaches it?

Tim Kane

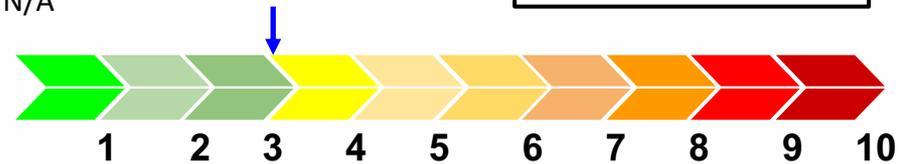
Spring  
Course

## Student Opinions

### Class difficulty?

N/A

Out of class hours: N/A



### What was best about the class

- Learning to use Mathematica

### What was worst about the class?

- Grading was done by class ranking so an A could actually end up a B

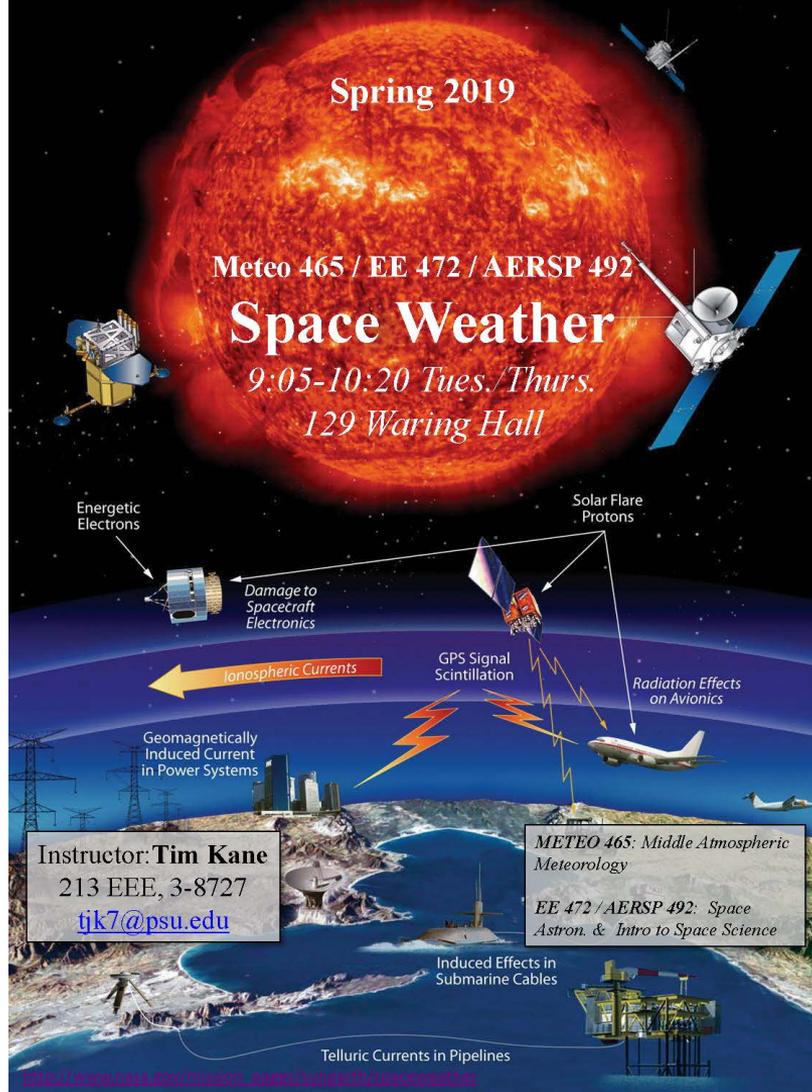
Spring 2019

Meteo 465 / EE 472 / AERSP 492

# Space Weather

9:05-10:20 Tues./Thurs.

129 Waring Hall



Instructor: **Tim Kane**  
213 EEE, 3-8727  
[tjk7@psu.edu](mailto:tjk7@psu.edu)

*METE0 465: Middle Atmospheric Meteorology*  
*EE 472 / AERSP 492: Space Astron. & Intro to Space Science*

# EE 474

## Satellite Communications

### Course Description

Overview of satellite communications systems, principles, space platforms, orbital mechanics, up/down links and link budgets, modulation techniques.

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 330, EE 360

### What will you learn?

- How to use STK. (program that models satellites)
- Digital and analog transmission properties.
- Satellites, antennas and transmitting schemes.

### Who teaches it?

James Breakall Julio Urbina

Spring  
Course

## Student Opinions

### Class difficulty?

N/A

Out of class hours: N/A



### What was best about the class

- N/A

### What was worst about the class?

- N/A

# EE/METEO 477

## Fundamentals of Remote Sensing

### Course Description

The review of fundamental physical properties leads into discussions of various techniques, including imaging, spectroscopy, radiometry, and active sensing.

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 330

### What will you learn?

- General Remote Sensing Applications
- Involves optics, space science, geography, and meteorology

### Who teaches it?

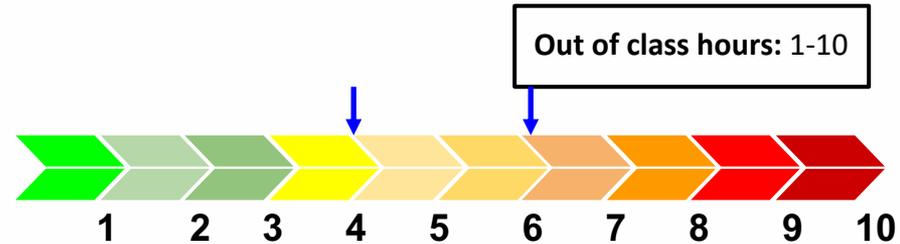
Tim Kane

Fall  
Course

## Student Opinions

### Class difficulty?

The homework is very time consuming and hard.



### What was best about the class

- Class is very unstructured and content is geared towards class interests /professors whims
- Open ended project allows you to learn something you have an interest in

### What was worst about the class?

- Class is very unstructured and content is geared towards class interests /professors whims

# **Power Systems & Control Systems**

# EE 380

## Linear Control Systems

### Course Description

State variables; time-domain and frequency-domain design and analysis; design of feedback control systems; root locus. **Course contains a significant laboratory component.**

### Skills/Prerequisites needed for the course?

- Prerequisite: MATH 220, EE 350
- Strong understanding of Fourier and Laplace analyses
- Basic MATLAB

### What will you learn?

- State space representation of transfer systems
- Uses and Implementation of feedback for systems
- Stability and performance analysis using Bode plots and the Nyquist criterion
- Design/tuning of controllers to ensure system stability and minimize error.

### Who teaches it?

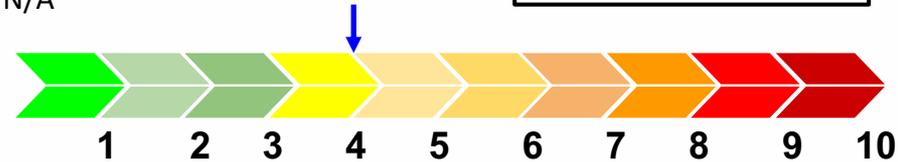
Jeffrey Schiano   Constantino Lagoa   Minghui Zhu

## Student Opinions

### Class difficulty?

N/A

Out of class hours: 6



### What was best about the class

- Exams are fair
- Lectures were very helpful

### What was worst about the class?

- Homework took several hours each week

Fall  
Course

# EE 387

## Energy Conversion

### Course Description

Electromechanical energy conversion; magnetic circuits; transformers; transducers; commutators; synchronous, induction, and D.C. machines.

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 350
- Basic MATLAB

### What will you learn?

- Methods of determining electromagnetic forces and torques using quasi-static electromagnetics
- Development of models for electromagnetic and electromechanical systems
- Fundamental concepts of inductors, transformers, and rotating machines.

### Who teaches it?

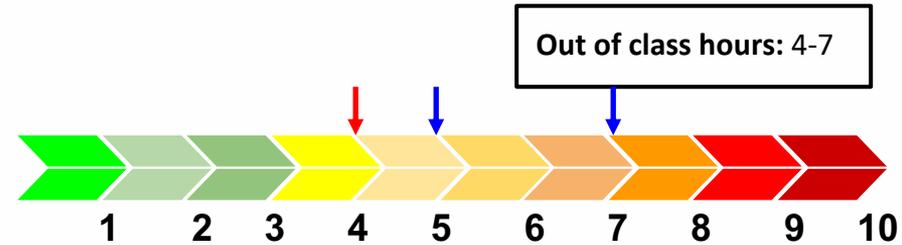
Bregar (ARL) Nilanjan Chaudhuri

Fall/Spring  
Course

## Student Opinions

### Class difficulty?

Test could be challenging but overall very reasonable.



### What was best about the class

- [Learn about 3 phase power](#)

### What was worst about the class?

- [Tests were very challenging](#)
- [Homework](#)

# EE 482

## Introduction to Digital Control Systems

### Course Description

Sampling and hold operations; A/D and D/A conversions; modeling of digital systems; response evaluation; stability; basis of digital control; examples. **Course contains a significant laboratory component.**

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 380, EE 351

### What will you learn?

- Discrete-time analysis in frequency domain
- Sampling and hold operations; general A/D and D/A conversion techniques
- Stability and performance analysis

### Who teaches it?

Minghui Zhu   Constantino Lagoa   Jeffrey Schiano

Spring  
Course

## Student Opinions

### Class difficulty?

N/A

Out of class hours: N/A



### What was best about the class

- N/A

### What was worst about the class?

- N/A

# EE 487

## Electric Machinery & Drives

### Course Description

Analysis of variable-speed drives comprised of AC electric machines, power converters, and control systems. **Course contains a significant laboratory component.**

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 387
- Basic MATLAB

### What will you learn?

- Inverter implementation and design
- Induction Machine under V/Hz and field-oriented Control
- Permanent Magnet Synchronous Machine under “Brushless dc Machine” and Field-Oriented Control
- Field-Oriented Control & Stator Current Regulation

### Who teaches it:

Weichel (AF) Austin (AFRL)

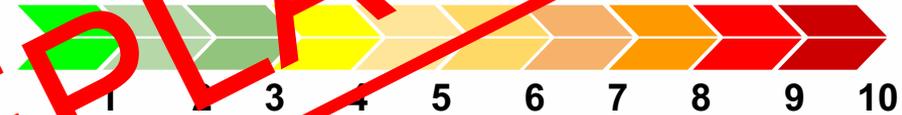
Spring  
Course

## Student Opinions

### Class difficulty?

N/A

Out of class hours: N/A



### What was best about the class

- N/A

### What was worst about the class?

- N/A

# EE 497-003 (EE 487 Replacement)

## INDUSTRIAL APPLICATIONS OF POWER ELECTRONICS

### Course Description

- Design of power electronics circuits such as **dc-dc, ac-dc and dc-ac converters** that are used in power supplies, motor and actuator drives, and the interface between power distribution systems and emerging energy sources such as fuel cells, photovoltaics, and superconducting magnetic energy storage systems.
- Single-phase and three-phase diode rectifiers, phase controlled rectifiers, power factor correction, dc-ac Inverters, transformer and inductor design, power and harmonics in non-sinusoidal power systems

### Who teaches it?

Arash Khoshkbar-Sadigh

- ZVS/ZCS Soft switching
- Resonant power converters
- Power electronics application in renewable energy harvesting and integration and motor drive
- Thermal management of power electronics circuit
- Design consideration for practical converters
- EMI filter and application of power electronics converters in power grid.
- Students will see how and why power electronics are enabling technology in today's power industry. EE 310 and EE 350 are prerequisite for this course.

# EE 488

## Power Systems Analysis I

### Course Description

Fundamentals, power transformers, transmission lines, power flow, fault calculations, power system controls.

### Skills/Prerequisites needed for the course?

- Prerequisite: EE 387
- Basic MATLAB

### What will you learn?

- Poly-phase Networks –Unbalanced Operation
- Transmission Line Parameters and Steady State Operation
- Power Flow, Symmetrical Faults, and Unsymmetrical Faults
- System Protection and Controls

### Who teaches it?

[Nilanjan Chaudhuri](#)

Spring  
Course

## Student Opinions

### Class difficulty?

N/A

Out of class hours: N/A



### What was best about the class

- N/A

### What was worst about the class?

- N/A

# Independent Studies

# EE 496

## Independent Studies

### Course Description

Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.

### Skills/Prerequisites needed for the course?

- N/A

### What will you learn?

- Varies based on one's interests

### Who teaches it?

Any professor who performs research

Fall/Spring  
Course

## Student Opinions

### Class difficulty?

N/A

Out of class hours: N/A



### What was best about the class

- N/A

### What was worst about the class?

- N/A

# **Eta Kappa Nu, HKN**

**The Pennsylvania State University Epsilon Chapter  
Electives Night**

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# **Computer Engineering**

# Computer Engineering Handbook

[Computer Engineering Handbook Fall 2016](#)

# CMPEN 331

## Computer Organization and Design

## Student Opinions

### Course Description

Introduction to major components of a computer system, how they function together in executing a program, how they are designed

### Skills/Prerequisites needed for the course?

- Prerequisites CMPEN 270, CMPSC 121 or 201

### What will you learn?

- How to program in Verilog and assembly language.
- Design MIPS pipeline
- Memory layout

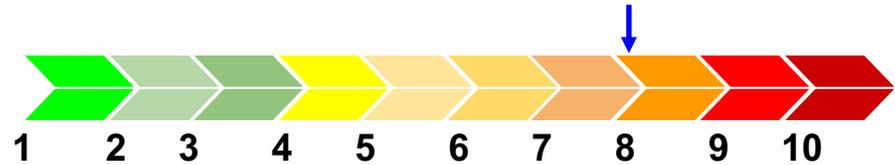
### Who teaches it?

- [Mohamed Almekkawy](#)

Fall /Spring  
Course

### Class Difficulty?

The labs were very difficult and built off each other. Previous lab solutions were not given, which made completing the next lab very difficult. E.g. if you didn't understand lab 3, you were in a terrible position for lab 4.



Out of class hours: 10

### What was best about the class?

- [Content](#)

### What was worst about the class?

- [Labs](#)

# EE/CMPEN 362

## Communication Networks

### Course Description

Data transmission, encoding, link control techniques; communication network architecture, design; computer communication system architecture, protocols.

### Skills/Prerequisites needed for the course?

- Prerequisite: CMPEN 270, STAT 401 or 418

### What will you learn?

- Protocol stack for communication networks; particularly the internet
- Detailed understanding of the different layers of Communication Networks

### Who teaches it?

Mark Mahon

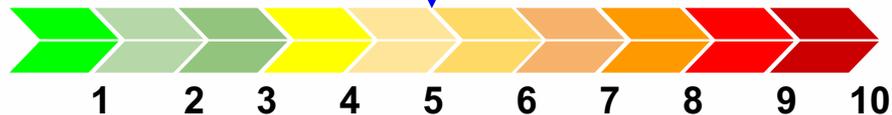
Fall/Spring  
Course

## Student Opinions

### Class difficulty?

Attendance is important for pop quizzes, for those that don't have experience with computer networking, weekly review is needed.

Out of class hours: 5



### What was best about the class

- The instructor makes sure you understand the material, no coding required and the course content is more theory based.

### What was worst about the class?

- Quizzes play a huge role on the overall grade.

# EE/CMPEN 416

## Digital Integrated Circuits/VLSI Design

### Course Description

Design and analysis of digital integrated circuits employed in very large scale integrated (VLSI) chips. **Course contains a significant laboratory component.**

### Skills/Prerequisites needed for the course?

- Prerequisites: EE 310 & CMPEN 270
- EE 340 is not a prerequisite but some knowledge of semiconductor physics is helpful.

### What will you learn?

- Insight into the design of modern VLSI chips, especially CMOS approaches to design.
- Digital integrated circuit design, layout, simulation, and fabrication.
- Cadence circuit simulation software

### Who teaches it?

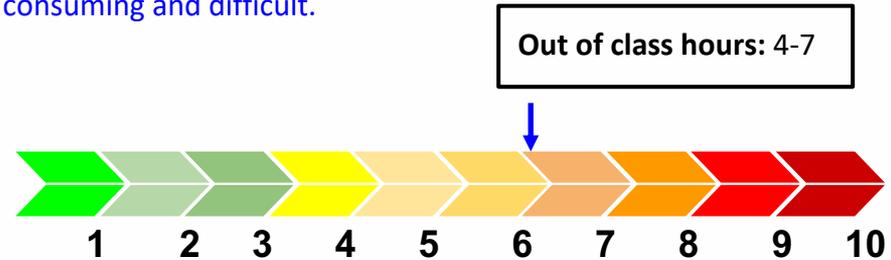
Swaroop Ghosh

Fall  
Course

## Student Opinions

### Class difficulty?

The exams are tough. The class's final project can be both very time consuming and difficult.



### What was best about the class?

- The lectures are very well done
- Learning cadence is a very useful skill
- Real design experience

### What was worst about the class?

- The Cadence assignments could be very challenging

# EE/CMPEN 417

## Digital Design Using Field Prog. Devices

### Course Description

Field programmable device architectures and technologies; rapid prototyping using top down design techniques; quick response systems. **Course contains a significant laboratory component.**

### Skills/Prerequisites needed for the course?

- Prerequisites: CMPEN 331
- Strong basics in software/hardware programming

### What will you learn?

- Real world applicable knowledge in how to use FPGAs
- Steps in designing a PCB board which has an FPGA, process for selecting the best FPGA for a design
- How to program in System Verilog

### Who teaches it?

- [Vijay Narayanan](#), [John Sustersic](#)

Spring  
Course

## Student Opinions

### Class difficulty?

The lab component is difficult



### What was best about the class?

- The labs give really useful skills in the world of FPGAs

### What was worst about the class?

- N/A

# CMPEN 431

## Introduction to Computer Architecture

### Course Description

Introduction to computer architecture. Memory hierarchy and design, CPU design, pipelining, multiprocessor architecture.

### Skills/Prerequisites needed for the course?

- Prerequisite CMPEN 331

### What will you learn?

- Pipelining, multiple processors, IO systems, memory/cache hierarchy, and other topics not previously covered in CMPEN 331 or in more depth

### Who teaches it?

- **Mary Jane Irwin**   **Mahmut Kandemir**   Jack Sampson

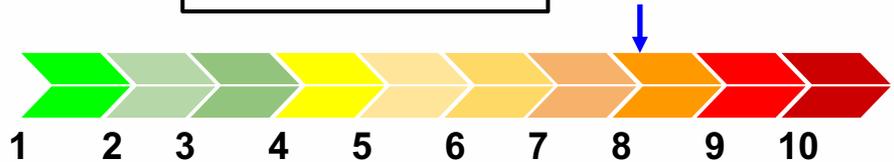
Fall / Spring  
Course

## Student Opinions

### Class Difficulty?

The class is difficult because Sampson's explanation of the concepts is very high level and he does not do many examples in class.

Out of class hours: 10



### What was best about the class?

- Content

### What was worst about the class?

- Homework
- Exams

# EE/CMPEN 454

## Fundamentals of Computer Vision

### Course Description

Introduction to topics such as image formation, segmentation, feature extraction, shape recovery, object recognition, and dynamic scene analysis. **Course contains a significant programming component.**

### Skills/Prerequisites needed for the course?

- Prerequisites: MATH 230, CMPSC 201 or CMPSC 121
- Basic MATLAB knowledge

### What will you learn?

- Binary vision systems: Identify basic objects based on segmentation, contours, and physical dimensions
- Depth from vision: Emphasis on stereo imaging, algorithms based on distances from points on the object
- Computer vision: Sequence of images over time, based on spatial or temporal changes in an image
- 3D object recognition: Object identification and localization

### Who teaches it?

Robert Collins

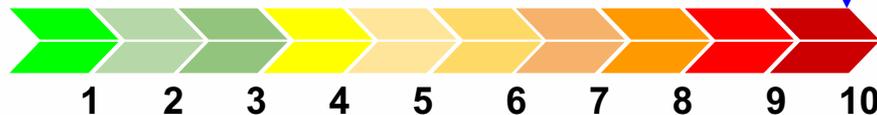
Fall  
Course

## Student Opinions

### Class difficulty?

The class projects can be very challenging and keeping up with the content can require some extra time.

Out of class hours: 10



### What was best about the class?

- The material is appealing for ones that interested in computer vision and using neural networks

### What was worst about the class?

- Programming component requires significant time, but the instructor gives 2 weeks to finish.

# CMPEN 462

## Wireless Communications Systems and Security

### Course Description

Explores the fundamental concepts and engineering processes of wireless communication systems, sensors, and security algorithms through the design, implementation, and evaluation of next generation wireless network architectures, and network and cryptographic protocols.

### Skills/Prerequisites needed for the course?

- Prerequisites: EE/CMPEN 362
- MATLAB knowledge

### What will you learn?

- Time Domain and Frequency Domain Signals
- Wireless Modulation Techniques
- Physical Layer Properties
- Synchronization
- Multiple Access Techniques
- PN Sequences
- Security Models
- 5G Wireless Systems
- Cryptography

### Who teaches it?

Mark Mahon

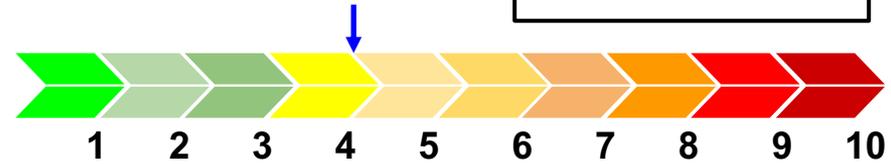
Spring  
Course

## Student Opinions

### Class difficulty?

Overall not a difficult class if you are familiar with Fourier concepts and CMPEN 270.

Out of class hours: 5



### What was best about the class?

- Teacher is very reasonable with workload and exams
- Students created their own semester long project

### What was worst about the class?

- Spent too much time on PN sequence generation.

# EE/CMPEN 455

## Introduction to Digital Image Processing

### Course Description

Overview of digital image processing techniques and their applications; image sampling, enhancement, restoration, and analysis; computer projects. **Course contains a significant programming component.**

### Skills/Prerequisites needed for the course?

- Prerequisites: EE 350, CMPSC 201 or CMPSC 121
- Basic MATLAB knowledge

### What will you learn?

- Digital image processing techniques: Applications, image sampling, enhancement, and analyses
- One/Two Dimensional Fourier Transform analyses
- Discrete Cosine Transform: Used in JPEG and MPEG
- Techniques for image encoding and decoding

### Who teaches it?

William Higgins

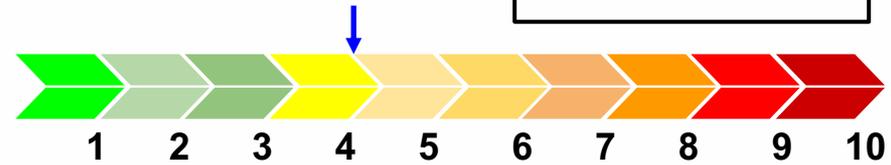
Fall  
Course

## Student Opinions

### Class difficulty?

Understanding how to do the projects can be challenging, but overall the class is not difficult

Out of class hours: 3



### What was best about the class?

- Teacher is very reasonable with workload and exams

### What was worst about the class?

- Heavy math, strong knowledge of Fourier transforms needed.

# CMPEN 472

## Microprocessors and Embedded Systems

### Course Description

Microprocessors: architecture, design, assembly language, programming, interfacing, bus structure, and interface circuits and their use in embedded systems

### Skills/Prerequisites needed for the course?

- Prerequisite CMPEN 331

### What will you learn?

- Develop, write and debug programs in assembly language
- Use of general department computing facilities consisting of UNIX workstations running the appropriate program development tools

### Who teaches it?

- Kyusun Choi

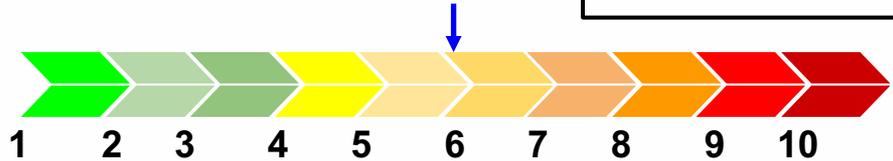
Fall and Spring  
Course

## Student Opinions

### Class Difficulty?

Coding Assembly was difficult

Out of class hours: 7



### What was best about the class?

- His tests are very straight forward if you attend/pay attention to lectures.

### What was worst about the class?

- Some homeworks were a breeze, and some kept me up all night.

# CMPEN 473

## Microcomputer Laboratory

### Course Description

Design of digital systems using microprocessors

### Skills/Prerequisites needed for the course?

- Prerequisites CMPEN 472

### What will you learn?

- Processor architecture, memory structure, real-time software for embedded systems, power electronics interface, wireless data communications.
- How to take a project from proposal through design and implementation to final review and documentation.
- Industrial project practices

### Who teaches it?

- [Kyun Choi](#)

Spring  
Course

## Student Opinions

### Class Difficulty?

Out of class hours: N/A



### What was best about the class?

- N/A

### What was worst about the class?

- N/A

# CMPEN 475

## Functional Verification

### Course Description

Introduce concepts, methods, and technology for effective functional verification of modern electronic systems

### Skills/Prerequisites needed for the course?

- Prerequisite CMPEN 331

### What will you learn?

- The industrial issues surrounding functional verification
- Descriptions of techniques used in functional verification

### Who teaches it?

- [Vijay Narayanan](#)

Fall Course

## Student Opinions

### Class Difficulty?

Out of class hours: N/A



### What was best about the class?

- N/A

### What was worst about the class?

- N/A

# **Eta Kappa Nu, HKN**

**The Pennsylvania State University Epsilon Chapter  
Electives Night**

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# **Computer Science**

# Computer Science Handbook

[Computer Science Handbook Fall 2016](#)

# Computer Security

# CMPSC 443

## General Information

### What is this course about?

- Introduction to Computer and Network Security

### Skills/Prerequisites needed for the course?

- Prerequisites CMPSC 473, CMPEN 362

### What will you learn?

- Introduction to theory and practice of computer security with an emphasis on Internet and operating system applications

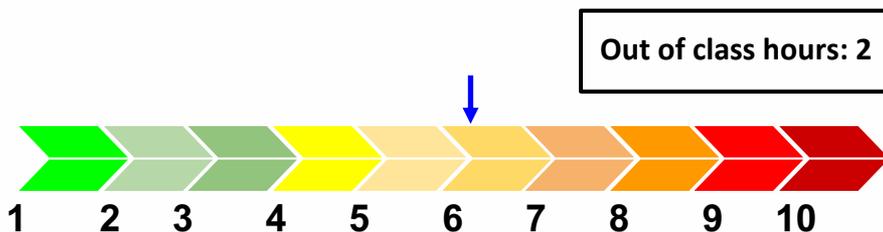
### Who teaches it?

- Patrick McDaniel and Sencun Zhu

Fall / Spring  
Course

## Student Opinions

### Class Difficulty?



### What was best about the class?

- Professor and interesting content

### What was worst about the class?

- n/a

# Artificial Intelligence

# CMPSC 442

## General Information

### What is this course about?

- Artificial Intelligence

### Skills/Prerequisites needed for the course?

- Prerequisite CMPSC 122 or equivalent
- Concurrent CMPSC 465

### What will you learn?

- Introduction to the theory, research paradigms, implementation techniques, and philosophies of artificial intelligence

### Who teaches it?

- [Athar Sefid](#) and [Rebecca Passonneau](#)

Fall Course

## Student Opinions

### Class Difficulty?

Out of class hours: 20



### What was best about the class?

Assignments are hard, but good for learning

### What was worst about the class?

The teacher is fairly boring, and 50% of the class dropped the last assignment

# CMPSC 448

## General Information

### What is this course about?

- Evaluation and use of machine learning models; algorithmic elements of artificial intelligence.

### Skills/Prerequisites needed for the course?

- STAT 319 or STAT 415
- CMPSC 122 and junior level programming experience

### What will you learn?

- Introduction to the theory, research paradigms, implementation techniques, and philosophies of artificial intelligence

### Who teaches it?

- [Mehrdad Mahdavi](#)

Spring Course

## Student Opinions

### Class Difficulty?

Out of class hours: N/A



### What was best about the class?

N/A

### What was worst about the class?

N/A

**Numerical / Scientific**

# CMPSC 450

## General Information

### What is this course about?

- Concurrent Scientific Programming

### Skills/Prerequisites needed for the course?

- Prerequisites CMPSC 121, CMPSC 201 or 202, Math 220, Math 230 or 231

### What will you learn?

- Problems of synchronization, concurrent execution, design and implementation of concurrent software in a distributed system

### Who teaches it?

- [Hongyuan Zhan](#), William Seisler, and [Madduri](#)

Fall / Spring  
Course

## Student Opinions

### Class Difficulty?

Out of class hours: N/A



### What was best about the class?

N/A

### What was worst about the class?

N/A

# CMPS 451

## General Information

### What is this course about?

- Introduction to Numerical Analysis I

### Skills/Prerequisites needed for the course?

- Prerequisites Math 220, Math 230 or 231

### What will you learn?

- Floating point computation, numerical rootfinding, interpolation, numerical quadrature, direct methods for linear systems

### Who teaches it?

- [Xiantao Li](#) Jesse Barlow Wenrui Hao

Fall / Spring  
Course

## Student Opinions

### Class Difficulty?

Out of class hours: N/A



### What was best about the class?

N/A

### What was worst about the class?

N/A

# CMPSC 455

## General Information

### What is this course about?

- Numerical Computations

### Skills/Prerequisites needed for the course?

- Prerequisites 3 credits of programming, Math 230 or 231

### What will you learn?

- Algorithms for interpolation, approximation, integration, nonlinear equations, linear systems, fast FOURIER transform, and differential equations emphasizing computational properties and implementation

### Who teaches it?

- [Jesse Barlow](#), Xiantao Li and Madduri

Fall / Spring  
Course

## Student Opinions

### Class Difficulty?

Out of class hours: N/A



### What was best about the class?

N/A

### What was worst about the class?

N/A

# CMPSC 456

## General Information

### What is this course about?

- Introduction to Numerical Analysis II

### Skills/Prerequisites needed for the course?

- Prerequisite CMPSC 455

### What will you learn?

- Polynomials and piecewise polynomial approximation; matrix least square problems; numerical solution of eigenvalue problems; numerical solutions of ordinary differential equations.

### Who teaches it?

- [Jesse Barlow](#)

Spring  
Course

## Student Opinions

### Class Difficulty?

Out of class hours: N/A



### What was best about the class?

N/A

### What was worst about the class?

N/A

**Miscellaneous**

# CMPSC 458

## General Information

### What is this course about?

- Fundamentals of Computer Graphics

### Skills/Prerequisites needed for the course?

- Prerequisites CMPSC 311, Math 220, Math 230 or 231

### What will you learn?

- Fundamentals of computer graphics: input/output devices, transformation, projection, clipping, hidden line/surface elimination

### Who teaches it?

- [Yanxi Liu](#)

Fall Course

## Student Opinions

### Class Difficulty?

Out of class hours: N/A



### What was best about the class?

N/A

### What was worst about the class?

N/A

**Theoretical**

# CMPSC 467

## General Information

### What is this course about?

- Factorization and Primality Testing

### Skills/Prerequisites needed for the course?

- Prerequisites CMPSC 360 or Math 311W

### What will you learn?

- Prime sieves, factoring, computer numeration systems, congruences, multiplicative functions, primitive roots, cryptography, quadratic residues

### Who teaches it?

- [Robert Vaughan](#)

Fall Course

## Student Opinions

### Class Difficulty?

Out of class hours: N/A



### What was best about the class?

- N/A

### What was worst about the class?

- N/A

# Software Design / Programming

# CMPSC 471

## General Information

### What is this course about?

- Introduction to Compiler Construction

### Skills/Prerequisites needed for the course?

- CMPSC 461

### What will you learn?

- Design and implementation of compilers; lexical analysis, parsing, semantic actions, optimization, and code generation.

### Who teaches it?

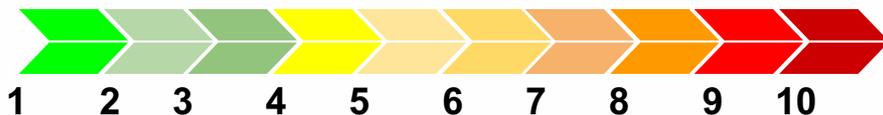
- [Mahmut Kandemir](#)

Fall Course

## Student Opinions

### Class Difficulty?

Out of class hours: N/A



### What was best about the class?

N/A

### What was worst about the class?

N/A

# CMPSC 475

## General Information

### What is this course about?

- Applications Programming

### Skills/Prerequisites needed for the course?

- CMPSC 221 or 425, CMPSC 311 or 312, CMPSC 462 or 465

### What will you learn?

- Development of software for devices including smart phones, tablets, handheld units, and other general purpose computing platforms

### Who teaches it?

John Hannan

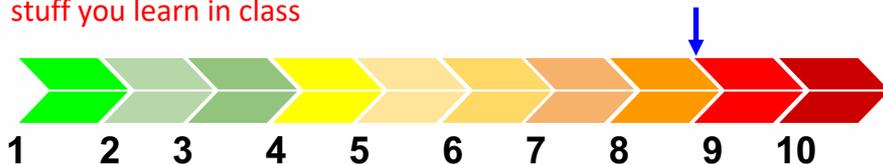
Fall Course

## Student Opinions

### Class Difficulty?

There was one project every week  
Projects are much harder than the  
stuff you learn in class

Out of class hours: 7-11



### What was best about the class?

- Projects will force you to learn a lot
- You'll be a decent iOS developer by the end of the class.

### What was worst about the class?

- Takes a lot of hours to complete the programming assignments.