Christopher Wayne Peters

Education

Ph.D.: Nuclear Engineering, University of Michigan, 2001
M.S.E.: Nuclear Engineering, University of Michigan, 1998
B.S.E.: Nuclear Engineering, University of Michigan, 1996
Other U.S. Navy Nuclear Power School, 1987
Other U.S. Navy Machinist's Mate A School, 1987

Work Experience

2008-Present *Teaching Professor*, Electrical and Computer Engineering Department, Drexel University

- Instructed 36 distinct courses
- Student advising/co-advising: 40 senior design projects, 2 master's theses, 1 freshman design, and 3 Community Based Master's Projects (School of Public Health)
- Designed and successfully implemented the nuclear engineering minor, as well as the Drexel Nuclear Engineering Education Laboratory, funded through a grant from the Nuclear Regulatory Commission
- Working relationships developed: Hope Creek and Salem Generating Stations, and Naval Research Laboratories
- Participated in a Ph. D. dissertation defense (Department of Physics)
- Participated in a Ph.D. candidacy presentation (Department of Physics)
- Awarded funding from the Department of Energy NEUP to purchase a high purity germanium detector
- Attended and presented at three conferences

2002-2008 *Adjunct Lecturer*, Burlington County College

2002-2004 *Adjunct Lecturer*, New Jersey Institute of Technology

2001-2008 *Senior Member Engineering Staff*, Lockheed Martin MS2

- Co-developed tracking algorithm for ballistic missile defense
- Phased array radar work: Developed algorithms to aligned and calibrate, optimize radome seam locations, and analyze/assess far field patternsDeveloped algorithm for optimizing radome seam locations

1997 *Summer Research Intern*, Air Force Research Lab, Phillips Site

- Assisted in the construction and analysis of a radial accelatron

1996-2000 *Graduate Student Research Assistant*, University of Michigan

- Researched the time-evolved spectra of multiple high power microwave devices

1995 *Summer Exchange Student*, ININ, Mexico City, Mexico

- Developed software to estimate contributors to peaks in gamma ray spectra

1992-1996 *Lab Technician*, Ford Nuclear Reactor, University of Michigan

- Performed neutron activation analysis on soil samples

1986-1992 Machinist's Mate Second Class, United States Navy

- Operated, maintained, and supervised the engine room and auxiliary room on board the USS BARBEY (FF-1088)

Professional Societies

Senior Member, IEEE
Member, American Nuclear Society

Patents

- "Plasma Bandpass Filter
- "Photonic Semiconductor Electromagnetic Limiter"
- "Optimal Beam Broadening Technique for Phased Array Radars Using Digital Beam Forming"
- "Radome with Optimal Beam Locations"

Awards

- ECE Department Outstanding Teaching

Publications

"Time-Frequency Analysis of Modulation of High Power Microwave by e-Beam Voltage Fluctuations," **C.W. Peters**, R.L. Jaynes, Y.Y. Lau, R.M. Gilgenbach, W.J. Williams, J.M. Hochman, W.E. Cohen, J.I. Rintamaki, D.E.Vollers, and T.A. Spencer; Physical Review E, vol. 58, no. 5, pp. 6880-3, November (1998).

"Cathode effects on a relativistic magnetron driven by a microsecond beam accelerator," M.R. Lopez, R.M. Gilgenbach, D.W. Jordan, S.A. Anderson, M.D. Johnston, M.W. Keyser, H. Miyake, **C.W. Peters**, M.C. Jones, V.B. Neculaes, Y.Y. Lau, T.A. Spencer, J.W. Luginsland, M.D. Haworth, R.W. Lemke, D. Price, IEEE Transactions on Plasma Science, Vol. 30, No. 3, June(2002).

"Application of time-frequency analysis to high-power microwave devices," **C.W. Peters**, W.J. Williams, R.M. Gilgenbach, Y.Y. Lau, R.L. Jaynes, W.E. Cohen, M.R. Lopez, and T.A. Spencer; Proc. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations X, vol. 4116, pp. 1-8, December (2000).

"Experiments on slotted coaxial high-power gyrotrons," R.M. Gilgenbach, R.L. Jaynes, W.E. Cohen, **C. W. Peters**, M.R. Lopez, Y.Y. Lau, W.J. Williams, and T.A. Spencer; Proc. SPIE Intense Microwave Pulses VIII, vol. 4031, pp. 8-18, July (2000).

"Long-Pulse, High-Power, Large-Orbit, Coaxial Gyrotron Oscillator Experiments," R.L Jaynes, R.M. Gilgenbach, **C.W. Peters**, W.E. Cohen, M.R. Lopez, Y.Y. Lau, W.J. Williams, and T.A. Spencer; IEEE Transactions on Plasma Science, Special Issue on High Power Microwave Generation, vol. 28, no. 3, pp. 945-952, June (2000).

"Radio-frequency plasma cleaning for mitigation of high-power microwave pulse shortening in a coaxial gyrotron," W.E. Cohen, R.M. Gilgenbach, R.L Jaynes, **C.W. Peters**, M.R. Lopez, Y.Y. Lau, S.A. Anderson, and M.L. Brake; Applied Physics Letters, vol. 77, no. 3, pp. 3725-3727, December (2000).

"Velocity Ratio Measurement Diagnostics and Simulations of a Relativistic Electron Beam in an Axis Encircling Gyrotron," R.L. Jaynes, R.M. Gilgenbach, J.M. Hochman, N. Eidietis, J.I. Rintamaki, W.E. Cohen, **C.W. Peters**,Y.Y. Lau and T.A. Spencer; IEEE Transactions on Plasma Science, Special Issue on Images in Plasma Science, vol. 27, no. 1, pp. 136-137, February (1999).

"Optical Spectroscopy of Plasma in High Power Microwave Pulse Shortening Experiments Driven by a μs e-Beam," R.M. Gilgenbach, J.M. Hochman, R.L. Jaynes, W.E. Cohen, J.I. Rintamaki, **C.W. Peters**, D.E. Vollers, Y.Y. Lau, and T.A. Spencer; IEEE Transactions on Plasma Science, Special Issue on High Power Microwave Generation, vol. 26, pp. 282-289, June (1998).

"Polarization Control of Microwave Emission From High Power Rectangular Cross Section Gyrotron Devices," J.M. Hochman, R.L. Jaynes, J.I. Rintamaki, Y.Y. Lau, W.E. Cohen, **C.W. Peters**, and T.A. Spencer; IEEE Transactions on Plasma Science, Special Issue on High Power Microwave Generation, vol. 26, pp. 383-392, June (1998).

Conference Presentations

"Analysis and Diagnostics of the MERCURY Pulsed Power System," E. Nachtigall, C. Peters, 2017 IEEE International Conference on Plasma Science, Atlantic City, NJ, 2017.

"Automated Health Monitoring of a Pulsed Power System," **C. Peters**, B. Huhman, C. Breuninger, J. Carto, C. Child, C. Green, J. Stanley, 2014 IEEE International Conference on Plasma Science, Washington, D.C., 2014.

"Novel Reactor Simulator Using Natural Interfacing," **C.Peters**, J. Waldman, P. Martin, P. Rua, M. Lui, 2012 American Nuclear Society Annual Meeting, Chicago, IL, June 24-28, 2012.

"The Application of Time-Frequency Analysis to High Power Microwave Devices," **C.W. Peters**, et. al.; oral presentation at the 45th Annual SPIE Meeting International Symposium on Optical Science and Technology, San Diego, CA, July 30-Aug 4, 2000.

"Time-Frequency Analysis of High Power Microwaves Using Discrete Prolate Spherical Sequences," **C.W. Peters**, et.al.; poster presentation at the Fifteenth Annual Meeting of the Division of Plasma Physics, Seattle, WA, November 15-19, 1999.

"Time-Frequency Analysis of High Power Microwave Devices Utilizing Reduced Interference Distributions," **C.W. Peters**, et. al.; poster presentation at the Fourteenth Annual Meeting of the Division of Plasma Physics, New Orleans, LA, November 16-20, 1998.

Senior Design Projects Advised

1. Indoor Radiation Detection UAV (co-advised with Dr. M. Ani Hsieh)
    a. Nuclear power plants periodically shut down for maintenance and refueling. Before maintenance workers can enter a radiation area to conduct repairs and upgrades, the site health physicists must conduct surveys to determine the local dose rates the worker is expected to experience. Hence, the health physicists are being exposed to ionizing radiation. This project, a proof-of-principle concept, in collaboration with the Mechanical Engineering and Mechanics department at Drexel University, utilizes a quadcopter with a Geiger counter mounted on it to monitor and assess the count rate at various locations, transmit the location and counts remotely, and display the results on a computer using MATLAB.
    b. Article about project in MATLAB Newsletter

2. PROBEE Safety Firefighter Monitoring Project
    a. PROBEE Safety is a firefighter accountability and rescue tool developed by three senior electrical engineering students at Drexel University for their Senior Design Project. The project began in the summer of 2013 with research in the fire industry delving into the resources available to firefighters and the causes of fatalities during structural firefighting operations. Using their research and experience the team developed a combination hardware and software system capable of recognizing life-threatening situations for firefighters wearing the PROBEE hardware, and alerting fire officers by providing them with crucial information necessary for launching effective rescues. The prototype consisted of a sensor network, rapid prototyped hardware cases, MATLAB data collection interface, Android user interface, PCB board design, signal filter design, and much more. Throughout the course of the nine month sequence, the PROBEE team continued to develop and test their prototype alongside fire officers and firefighting instructors with the use of county-wide surveys, one-on-one interviews, and testing in live-fire training structures.
    b. Awarded College of COE Best Senior Design Project

3. Tabletop Nuclear Reactor Simulator
    a. Nuclear engineering education has, for the most part, been very stagnant in the direction of utilizing new technologies to facilitate learning. Meanwhile, many other engineering fields use modern tools in the classroom. This senior design project developed an interactive nuclear reactor simulator using an Arduino microcontroller, and inputs provided by Three Mile Island Generating Station.
    b. YouTube Video Link: https://www.youtube.com/watch?v=DD6rSt6ZYoY
    c. Article about project in MATLAB Newsletter
    d. Awarded ECE Department best multidisciplinary project

4. Kinect Reactor Simulator (KReS)
    a. Nuclear engineering education has, for the most part, been very stagnant in the direction of utilizing new technologies to facilitate learning. Meanwhile, many other engineering fields use modern tools in the classroom. This senior design project developed an interactive nuclear reactor simulator using the Microsoft Kinect. This senior design project was presented at the 2012 Annual American Nuclear Society conference, and was featured in the January 2013 issue of Nuclear News.
    b. YouTube Video Link: https://www.youtube.com/watch?v=uIEPfK537U8

c. **Made front cover and feature article of January 2013 Nuclear News Magazine**

5. Outdoor Radiation Detection UAV
    a. Periodic outdoor maintenance of nuclear power plants require health physicists to conduct surveys for dose rates, used to determine the maximum time workers can be in the local area of interest. Hence, these health physicists are exposed to ionizing radiation. Additionally, in the (rare) case of a large radioactive release to the atmosphere, the emergency response team must enter the plume to conduct dose rate readings, and are also exposed. This project uses a quadcopter with a Geiger counter mounted on it to assess outdoor count readings. A NVIDIA Shield is used to control the quadcopter, receive/display video streams, and present the trajectory readings on Google Maps.

6. Health Management System for a Pulsed Power Device (Co-advised with Mr. Brett Huhmann, Naval Research Labs)
    a. Pulsed power is a field that has existed for many decades. Pulsed power technology uses the concept of storing (charging) large quantities of energy in a storage device, such as capacitors or batteries, and discharge over a small duration (typically microseconds to milliseconds). Usually the charging of the storage device requires a large charging duration (30 seconds to 2 minutes). However, recent technological advances in storage devices have significantly reduced the charging time required. This project developed a system in LabVIEW to rapidly process data from numerous sensors, and determine if the system is behaving properly. This project was presented at the 2014 International Conference on Plasma Science.
    b. **This effort will lead to a system that is eventually placed on board a U.S. Naval Vessel**

7. Shaft Seal Design
    a. A ship's propulsion shaft penetrates the hull, leaving a gateway for flooding. Usually, a stern tube is used under normal operation to minimize water entering the ship. However, when the stern tube fails, an inflatable shaft seal is used. On one currently used U.S. Naval vessel, the inflatable shaft seal has been determined faulty. The mission of this project was to design a new shaft seal. **The project was very successful, and will be used on U.S. Naval vessels.**

8. UAV Command and Control Center
    a. The recent development of quadcopters has expanded the capabilities in various fields of engineering and science. The purpose of this senior design project is to develop a SMART-board controlled quadcopter for nuclear power plant use. The quadcopter will perform various flight patterns, transmitting video and Geiger counter results to the SMART-board for live-time viewing.

9. Rapid Response Scanning System for Nuclear Power Plants
    a. The accidental release of radioactive material from a nuclear power plant into the atmosphere is of concern. In these events, a rapid response team is required to enter the plume for analysis. The purpose of this project is to develop remotely launched rockets, equipped with sensors, to help aid in assessment of said plumes. The data and location will be transmitted to the home station for live time mapping. Additionally, this will allow for the rapid determination of evacuation routes and population evacuation.

10. Autonomous dosimetry
    a. Scheduled and emergency maintenance at nuclear power plants require the use of health physicists to estimate the dose rates workers will receive. The health physicist must enter these radiation areas to conduct these estimates. Thus, the health physicist receives a dose themselves. The purpose of this project is to create a robot which autonomously maps the dose rate of a room.

11. Use of UAVs to gather data for power lines and poles
    a. The health of power line poles is extremely important for operation of modern civilizations. Currently, helicopters are used to fly over power lines for images (both visual and IR) for inspection. However, the use of helicopters become costly. This project explores the use of quadcopters for power line inspection. Data will be stored for future use, and will be displayed using Google Maps.

12. Pipe Analysis project (Co-Advised with Mr. Brett Huhmann, Naval Research Labs)
    a. Piping on board U.S. Naval vessels experience extreme environments. The piping of the Contaminated Holding Tank (CHT) transfers the human waste to the CHT. Often is the case where the piping has to experience acidic environments. The purpose of this senior design is to construct a camera delivery system to inspect the small diameter piping.

13. Transmutation of Spent Nuclear Fuel (co-advised with Mr. John Speidel)
    a. Spent nuclear fuel from nuclear power plants eventually are stored in dry casket storage. The issue with spent nuclear fuel are the isotopes that have long half-lives, often the thousands of years. The process of transmutation utilizes protons to change the isotopes to lower-lived isotopes, on the order of hundreds of years. This senior design project develops and analyzes the transmutation process.

14. Virtual Radiation Detection Lab
    a. Radiation detection equipment is costly and can often require repairs. The purpose of this lab is to develop virtual Geiger counter and Sodium Iodide instrumentation to conduct various experiments.

15. Water Conservation Project for Limerick Generating Station
    a. Limerick Generating Station was in the process of pursuing an uprate in power. With an uprate, the consumption of water increases. The goal of this senior design project was to assess alternative cooling techniques to supplement current evaporation towers, such that no additional water was evaporated. The use of GateCycle, a power plant design and analysis software, was utilized to assess the technologies.

16. Uranium Enrichment Plant (Co-advised with Dr. Richard Cairncross)
    a. Most commercial nuclear power plants require enriched uranium as fuel. The process often requires the use of chemical process and centrifuges to separate uranium-235 from natural

uranium. This senior design project, in a collaboration with the Chemical, Biological, and Environmental Engineering Department at Drexel University, is to develop the process flow, energy balance, and system layout/requirements for a uranium enrichment plant.

17. Baseball Bat Health Monitoring
    a. The inception of maple baseball bats into Major League Baseball has incurred some criticism, as catastrophic destruction of the bat has been known to injure players. The purpose of this senior design was to develop an automatic system to analyze the fracture kinetics of maple and ash baseball bats. This project was successful, able to develop quasi 3-D images of the baseball bat. The future hopes is to develop a system to rapidly determine baseball bat health between uses.

18. Heat Recovery System for Tractor Trailers
    a. The mission of this senior design project was to develop and analyze a heat recovery system to improve the thermal efficiency of tractor trailers.

19. Liquid Fluoride Thorium Reactor (co-advised with Mr. John Spiedel)
    a. Modern commercial nuclear reactors utilize uranium as the fuel source. A concern with this fuel is the long-lived waste. One possible way to alleviate this concern is develop nuclear power plants fueled by thorium. This senior design project, in a collaboration with the Chemical, Biological, and Environmental Engineering Department at Drexel University, is to develop the process flow, energy balance, and system layout/requirements for a liquid fluoride thorium reactor.

20. Removing Uranium From Seawater (Co-advised with Mr. John Spiedel)
    a. Uranium is used in commercial nuclear power plants as the fuel. Normally, the uranium is mined. However, the uranium resources are very limited, and are expected to be available for less than a century. Conversely, the sea has some particulate uranium in its waters. Research has been, and is still being conducted, to develop sponges to remove the uranium from the sea. This senior design project, in a collaboration with the Chemical, Biological, and Environmental Engineering Department at Drexel University, is to develop the process flow, energy balance, and system layout/requirements for a process plant to remove the uranium from the sponges, as well as prepare the sponges for reuse.

21. Traveling Wave Reactor Plant Design (Co-advised with Mr. John Spiedel)
    a. The next generation of nuclear power plants is expected to address the nuclear waste produced by current nuclear power plants through the reuse of spent fuel. One possible method is the traveling wave reactor. This senior design project, in a collaboration with the Chemical, Biological, and Environmental Engineering Department at Drexel University, is to develop the process flow, energy balance, and system layout/requirements for traveling wave reactor plant.

22. Rocket/Glider Project for Nuclear Release Evaluation
    a. The accidental release of radioactive material from a nuclear power plant into the atmosphere is of concern. In these events, a rapid response team is required to enter the plume for analysis. The purpose of this project is to develop a remotely launched rocket-glider equipped with sensors, to help aid in assessment of said plumes. The data and location will be transmitted to the home station for live time mapping. Additionally, this will allow for the rapid determination of evacuation routes and population evacuation.

23. Weather Balloon Project for Nuclear Release Evaluation
    a. The accidental release of radioactive material from a nuclear power plant into the atmosphere is of concern. In these events, a rapid response team is required to enter the plume for analysis. The purpose of this project is to develop a remotely launched weather balloon equipped with sensors, to help aid in assessment of said plumes. The data and location will be transmitted to the home station for live time mapping. Additionally, this will allow for the rapid determination of evacuation routes and population evacuation

24. Software development for Nuclear Release Evaluation
    a. This senior design project is concerned with the development and implementation of software used to remotely launch and monitor the rocket/glider and weather balloon projects (Projects 22 and 23).

25. Geographical Information System (GIS) for Environmental Assessment of Overturned Cargo Trains (collaboration with School of Public Health)
    a. Cargo trains often carry chemicals which can be harmful for human consumption. The purpose of this senior design project is to develop a GIS which displays location of the overturned train, as well as the serial numbers, inventory, and safety requirements of the chemicals on the train. This project is a collaboration with a capstone project in the School of Public Health.

26. Heads up Display (HUD) for Paintball Use
    a. The industry of paintball is very successful, with annual revenues of over $1 billion. Participation in a paintball game requires the use of a mask. However, this mask is simple, used only for protecting the player. The purpose of this project is to program and implement a currently existing heads up display into the paintball mask. The HUD will display the topographical map of the paintball area, display the location of team members, and alert the user of low compressed air and paintball count.

27. Ballistic Curtain Cordoning System
    a. Schools are very easy targets for active shooters. The purpose of this project is to develop a cordoning system to provide a means to give people time to escape the situation.

28. Supercritical Nuclear Reactor Plant Design (Co-advised with Mr. John Spiedel)
    a. An attractive goal for the next generation of nuclear power plants is to increase thermal efficiency. One possible method is the supercritical fluid reactor. This senior design project, in a collaboration with the Chemical, Biological, and Environmental Engineering Department at Drexel University, is to develop the process flow, energy balance, and system layout/requirements for a supercritical nuclear reactor plant.

29. Advanced Pattern Recognition for Vibrational Analysis
    a. One goal of the nuclear power plant industry is to reduce cost by 30% in order to remain competitive. Part of this goal is to switch from a time-based maintenance approach to a situation-based style. This project uses advanced pattern recognition techniques to monitor pumps, in an attempt to determine the degradation of pumps.

30. First response tool after the detonation of a radiological dispersal device
    a. A radiological dispersal device (RDD), also called a "dirty bomb", is a device that releases radioactive materials to scare the public and damage local economies. The purpose of this device is to provide a hands-free system that will assess the area post detonation, and increase the situational awareness of the event.

31. Radiation Detection Course Lab Upgrade
    a. The current software in the Drexel University Nuclear Engineering Education Laboratory causes the computers to randomly reboot while acquiring data from radiation detectors. The purpose of this project is to create a Python version of the software, adding advanced analysis features, and potentially providing other universities with the software.

32. Modernizing the model rocket
    a. Many children and adults have enjoyed launching model rockets. However, the model rocket industry has not significantly followed modern technology. The purpose of this project is to develop an after-school program to each students the science, technology, engineering, and mathematics of model rockets. Students will learn a method to launch model rockets via a smart phone.

33. Fluid Laboratory
    a. This project is focused on developing a lab for students to study pumps and valves

34. Weather Balloon Project for Nuclear Release Evaluation-Version2
    a. The accidental release of radioactive material from a nuclear power plant into the atmosphere is of concern. In these events, a rapid response team is required to enter the plume for analysis. The purpose of this project is to develop a remotely launched weather balloon equipped with sensors, to help aid in assessment of said plumes. The data and location will be transmitted to the home station for live time mapping. Additionally, this will allow for the rapid determination of evacuation routes and population evacuation

35. Hi-Tech Football
    a. This project is focused on developing a football with an electronics suite capable of transmitting position, velocity, and rotation information to the user. The goal is to fuse modern technology with a sport to increase time children are outside

36. R-DACT
    a. This project focuses on developing the helium filling system for a weather balloon inside a model rocket for radiological dispersal evaluation

Freshman Design Advising

Advised a Freshman Design group, with a goal to characterize the vibrational characteristics of a baseball bat, including the location of the "sweet spot." Louisville Slugger donated the wood stock for the students to create the baseball bat on a lathe. The students successfully developed an algorithm and procedure for characterization.

Master's Thesis Advising

Advised a BS/MS student on their Master's thesis. The topic is on the development of a health monitoring system for the 2.2 TW MERCURY Pulsed Power System. This project acknowledges Naval Research Labs for their assistance.

Collaboration with School of Public Health

1. Co-advised a Community-Based Masters Project with Dr. Igor Burstyn from the School of Public Health. The project entails quantifying the usefulness of robots at nuclear power plants during maintenance and surveying.
2. Co-advised a Community-Based Masters Project with Dr. Igor Burstyn from the School of Public Health. The project entails assessing the exposure of employees at the Hope Creek Nuclear Generating Station.
3. Advised a graduate on their Community-Based Masters Project. The topic was the evaluation, modeling, and risk assessment of eating sushi post Fukushima nuclear reactor accident.

Notable Recognition

Recognized for senior design results in the following:

1. "Video Games in the Classroom" – January 2013 Nuclear News Magazine. Discussed the Kinect Reactor Simulator senior design project
2. "Using MATLAB to Complete Undergraduate Capstone Design Projects in Nuclear Engineering," MATLAB Newsletter. Website: http://www.mathworks.com/company/newsletters/articles/using-matlab-to-complete-undergraduate-capstone-design-projects-in-nuclear-engineering.html

Courses Instructed

1. ENGR 210 – Introduction to Thermodynamics
   Introduces thermodynamics from a classical point of view. Covers work, heat, entropy, thermodynamic properties, equations of state, and first and second law analysis of closed systems, control volumes, and selected thermodynamic cycles.

2. ECEL 302 – ECE Laboratory II
   Offers laboratory experiences in each of the five ECE tracks: computers, controls/robotics, electronics, power and energy, and telecommunications. Each lab consists of a stand-alone module containing: lecture material providing basic theory, references, and laboratory experiments. Some or all pre-requisites may be taken as either a pre-requisite or co-requisite. Please see the department for more information.

3. ECEL 303 – ECE Laboratory III
   Covers basic digital signal processing concepts, an introduction to analog-to-digital and digital-to-analog converters, and power supply design using analog IC devices.

4. ECES 306 – Analog and Digital Communications
   Covers signal sampling and reconstruction; modulation, angle modulation; digital communications systems, digital transmission.

5. ENGR 201 – Evaluation and Presentation of Experimental Data I
   Provide a comprehensive introduction to analysis, presentation, and communication of data collected by the engineer. Requires students to conduct experiments on engineering systems, then process and evaluate the collected data. Required presentation of research, results, conclusions, and conjectures from a technical and ethical viewpoint.

6. ECEE 490 – ST: MATLAB and Complex Numbers

7. ECEL 304 – ECE Laboratory IV
   This course offers laboratory experience, using both modeling software and digital and analog hardware relevant to both electrical and computer engineers. Multi-week design projects and design teams are used to prepare students for Senior Design work.

8. ECES 352 – Introduction to Digital Signal Processing
   Covers discrete-time signals, analog-digital conversion, time and frequency domain analysis of discrete-time systems, analysis using Z-transform, introduction to digital filters, discrete-time Fourier transform, Discrete Fourier Transform (DFT), and Fast Fourier Transform (FFT).

9. ENGR 202 – Evaluation and Presentation of Experimental Data II
   A continuation of ENGR 201

10. ECEL 301 – ECE Laboratory I
    Offers laboratory experiences in each of the five ECE tracks: computers, controls/robotics, electronics, power and energy, and telecommunications. Each lab consists of a stand-alone module containing:

lecture material providing basic theory, references, and laboratory experiments. This is a writing intensive course.

11. ECE 491 – Senior Design Project I
    Introduces the design process, including information retrieval, problem definition, proposal writing, patents, and design notebooks. Includes presentations on problem areas by experts from industry, government, and education. This is a writing intensive course.

12. ECES 434 – Deterministic Signal Processing
    This course explores digital signal processing (DSP) concepts through the context of current applications, which range from video encoding to human genome analysis. Topics such as sampling, aliasing, and quantization, are considered in terms of the constraints of particular applications. Discrete-time linear systems, frequency-domain analysis, and digital filtering using Discrete Fourier Transform are examined in-depth and realized through application-specific lab projects.

13. ECE 492 – Senior Design Project II
    Continues ECE 491. Requires written and oral progress reports. This is a writing intensive course.

14. ECEP 372 – Radiation and Detection and Measurements
    Introduces students to the fundamentals of radiation detection, and applications of radiation detection equipment.

15. ECE 493 – Senior Design Project III
    Continues ECE 492. Requires written and oral final reports, including oral presentations by each design team at a formal Design Conference open to the public and conducted in the style of a professional conference.

16. ECEP 402 – Theory of Nuclear Reactors
    Introduces students to atomic and nuclear physics, radiation interaction with matter, components of nuclear reactors, neutron diffusion and moderation, nuclear reactor theory, and heat removal from nuclear reactors.

17. ECEP 406 – Introduction to Radiation Health Principles
    This course is intended to impart radiation safety knowledge to the nuclear engineering student. A fundamental knowledge of radiation safety is critical for all nuclear engineers.

18. ECEP 371 – Introduction to Nuclear Engineering
    This course introduces the student to the fundamental topic of nuclear engineering. This course should be the first course for students interested in the nuclear engineering minor, as all of the topics will be discussed in greater detail in other courses. Topics include atomic and nuclear structure, binding energy, reaction kinetics and energetics, and radioactive decay.

19. ECEP 403 – Nuclear Power Plant Design and Operation
    Introduces students to the design of nuclear power plants. Topics covered include electrical transmission, non-nuclear related equipment, fluid flow, heat transfer, thermodynamics, heat

exchangers, pump, valves, piping and nuclear reactor design. Course includes a final project which is the design of a nuclear power plant.

20. ENGR 232 – Dynamic Engineering Systems
    Provides an overview of dynamic systems and modeling; specifically using differential equations as a model. Specific emphasis will be placed on developing models of dynamic systems and the use of computational tools for solutions of the problems. The focus of the lab will be the use of MATLAB for solution of contemporary engineering

21. ENGR 231 – Linear Engineering Systems
    Provides an overview of systems and modeling; specifically using linear algebra as the model. Specific emphasis will be placed on developing models of engineering systems and the use of computational tools for solutions of the problems. The focus of the lab will be the use of MATLAB for solution of contemporary engineering problems.

22. ECEP 490 – Numerical Methods for Radiation Transport

23. ECE 203 – Programming for Engineers
    Fundamentals of computer organization; rudiments of programming including data types, arithmetic and logical expressions, conditional statements, control structures; problem solving techniques for engineers using programming; object-oriented programming; arrays; simulation of engineering systems; principles of good programming practice.

24. ENGR 361/ECE 361 – Statistical Analysis of Engineering Systems
    This course will cover topics related to probability and statistics. Probability topics include sample space and probability, discrete and continuous random variables, expectation, variance, covariance, correlation, conditional expectation, conditional variance, the weak and strong law of large numbers and the central limit theorem. Statistics topics include properties of a random sample, principles of data reduction, and point estimation.

25. ECES 390 – ST: Data Analysis

26. ECEP 390 – ST: Motors and Generators
    Introduces machinery principles, magnetic circuits, three-phase circuits, the electrical and economic structure of the power industry, ac and dc machine fundamentals

27. ECES 303 – Transforms Methods II
    This course covers the engineering related concepts of signals and systems, their modeling and analysis. We discuss the problem of formulation of physical systems, plus mathematical solution of models (equations). Continuous-time signals and systems, discrete-time signals and systems, linear time-invariant systems, convolution integrals and sums, Fourier series, Fourier, Laplace and Z-transforms, and system functions will be studied.

28. ECES 301 – Transforms Methods and Filtering
    This course covers the engineering related concepts of signals and systems, their modeling and analysis. We discuss the problem of formulation of physical systems, plus mathematical solution of models

(equations). Continuous-time signals and systems, discrete-time signals and systems, linear time-invariant systems, convolution integrals and sums, Fourier series, Fourier, Laplace and Z-transforms, and system functions will be studied.

29. ENGR 121-Computation Lab I
    This course covers introduction programming in MATLAB to freshmen

30. ECEP 352-Motor and Control Principles
    This course covers topics such as magnetic circuits, transformers, induction motors, and DC motors