



University of Dayton

The Department of Electrical And Computer Engineering

Graduate Handbook *Programs, Facilities, Faculty*



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Fall 2020

From the Departmental Chair

Dear Colleagues and Friends of the Department:

This brochure serves as an academic guide to our students in the graduate programs in electrical and computer engineering. Contained herein are details relating to the requirements, specializations and milestones for the Master of Science degrees and Doctoral degree offered by the faculty in the Department of Electrical and Computer Engineering. In addition, information about our facilities, laboratories and faculty are included.



Our program provides students with the tools needed to produce cutting-edge technologies in the electronics and computer systems industries. Our students learn to use state-of-the-art computational and engineering tools and are prepared to work in diverse settings with evolving technologies. Students have access to facilities offering top-of-the-line equipment with industry specific software such as MATLAB, FPGA development tools from Altera, and software development tools like Microsoft Visual Studio Pro. Additionally, students have access to real-time control tools from dSPACE, industrial robots from Yaskawa Motoman, and design tools for mixed signal ICs, such as Agilent's EESof, AWR Suite.

Generally, for new students who do not already have an academic adviser, the department chair serves as the interim adviser until the student selects one who will be the student's mentor. A few teaching assistants are awarded as available by the department chair, and research assistantships are awarded by the faculty members who have funded research projects. There are several competitively awarded fellowships and scholarships available. Other financial aid is available through our Financial Aid office.

As you can see from the brochure, we have world class faculty members and research laboratories. Our faculty excel in teaching, research and service to students and the community. We welcome you to enjoy the ECE graduate experience.

Sincerely,
Eric J. Balster

OUR MISSION OF GRADUATE EDUCATION

Graduate education at the University of Dayton:

- Advances learning, knowledge, and skills, and prepares students for immediate and ethically-grounded leadership and service to their professions, intellectual disciplines, and communities.
- Promotes significant, focused, and programmatic research and scholarship.
- Reflects and advances the unique Catholic and Marianist identity of the University.
- Responds to the needs of the region, the larger society, and the Catholic Church
- Contributes to the academic excellence and reputation of the University as a Catholic leader in higher education.
- Strengthens the academic excellence of undergraduate programs.

Programs

The UD School of Engineering, through its Department of Electrical and Computer Engineering (ECE), offers programs of study leading to the following degrees:

*Master of Science in Electrical Engineering (MSEE),
Master of Science in Computer Engineering (MSCPE),
Doctor of Philosophy in Engineering (Ph.D.).*

The M.S. degree has an instructional and a research component (where students can pursue a thesis option). Students receiving any type of assistantship (teaching or research) are required to take the thesis option. The Ph.D. is granted in recognition of superior achievement in independent research and course work. The research must demonstrate that the student possesses capacity for original thought, talent for research, and ability to organize and present findings.

Admission Requirements

To be considered for admission to a master's degree program in Electrical and Computer Engineering (ECE), a student should have received an undergraduate degree from an accredited program in electrical and/or computer engineering equivalent to a Bachelor of Science (B.S.). Students who have degrees in other engineering areas or related sciences are encouraged to apply, but they may be required to take a limited amount of undergraduate course work to complete their preparation for graduate studies in ECE. For students with a B.S. or equivalent degree, a grade point average of 3.2 or above, based on a 4.0 scale, is required (3.5 or above is required for students with an Engineering Technology degree). Students with lower grade point averages may be considered for acceptance on a conditional basis, in which case particular attention will be given to their last 60 semester hours of undergraduate course work, professional experience and recommendations. In some cases, a limited number of undergraduate courses are required. Although not mandatory, we encourage submission of GRE scores to assess a candidate's potential.

To be considered for admission to the doctoral program in ECE, a student must have received the equivalent of a Master's degree in ECE, with a minimum grade point average of 3.4/4.0, in addition to having a GPA of 3.2 or above in their undergraduate degree. In each case, particular attention is given to prior academic preparation, research experience (in the form of publications and M.S. Thesis) and interests (which should be clearly specified, and aligned with one of the main research areas of the ECE department), and recommendations. All international students are required to have a minimum score of 560 in traditional TOEFL, 87 in the internet-based TOEFL, or 6.5 in the IELTS test for admission to the ECE graduate program at the University of Dayton.

Application Deadlines

To be considered for admission to the graduate programs in ECE, applications must be received by

- March 15 for fall admission
- Sept. 15 for spring admission

Financial Assistance

A substantial amount of financial aid, in the form of teaching and research assistantships and fellowships, is available to students with appropriate academic background. Through a host of available programs, ECE offers competitive monthly stipends for assistantships, based on half-time employment during the academic year and up to three months of summer employment. For instance, from the department's MUMMA foundation, we offer tuition scholarships and assistantships to exceptional incoming candidates. Graduate students can also receive teaching assistantships from the department for helping professors with undergraduate courses and laboratories. In addition, student-faculty research fellowships are available through the Dayton Area Graduate Studies Institute (DAGSI), a state-funded consortium of Ohio universities. As DAGSI participants, students have the added benefit of tuition free course work, using the libraries, computational and research resources (including the Ohio Super Computer System) from any DAGSI institution. More information is available at <http://www.dagsi.org>.

Master of Science Programs Advising

In case of a graduate research assistant (RA), the research supervisor shall serve as the academic adviser. For all other students, the graduate student adviser or the ECE chairperson will serve as the temporary adviser until the student has identified his/her adviser from among the ECE faculty members. The adviser will assist the student in the preparation of a plan of study.

Plan of Study

The individual plan of study will include the specific courses the student is expected to complete and reflect all other requirements of the M.S. degree. *It must be filed with the Office of Graduate Engineering Programs & Research prior to registration for the 10th semester hour or before registration for the third semester.* The proper form may be obtained from the Office of Graduate Engineering Programs and Research.

<https://porches.udayton.edu/web/porches/engineering>

The plan of study and any amendment thereof must be approved by the adviser, the ECE department chair, and the associate dean of graduate engineering programs and research.

Master of Science in Electrical Engineering

The M.S. in Electrical Engineering (MSEE) program of study must include a minimum of 30 semester hours consisting of the following:

1. The zero-credit hour class ECE 500, to be taken within the first year at UD.
2. Nine semester hours of core courses selected from ECE 501, 503, 505, 506, 507, 509, 532, 533, and 547.
3. Nine semester hours in an electrical engineering specialization area, such as Computing Systems, Sensors and Devices, Signals and Systems, or any other interdisciplinary area approved by the adviser/department chair.
4. Six semester hours in approved basic and engineering science, which may include ECE courses approved by the adviser/department chair.
5. Six semester hours of an approved thesis or six semester hours of electrical engineering graduate courses.

Only up to six semester hours of graduate courses can be included as transfer credits. Only six semester hours of graduate courses can be taken outside ECE as technical electives.

Thesis

While all students are encouraged to do a thesis, students supported by an assistantship (teaching or research) are required to complete a thesis. Each student whose plan of study requires a thesis must register for a total of six semester hours of thesis and prepare it in accordance with the general format guidelines found online at:

<http://libguides.udayton.edu/etd>

Students completing a thesis for their M.S. degree are examined by a thesis committee consisting of three members, at least two of whom, including the committee chair, must be members of the graduate faculty. Two of the committee members must be ECE faculty members with graduate faculty status. Exceptions may be granted by the department chair and reviewed by the Graduate Council and the Dean of the Graduate School. The thesis examination requires an oral presentation, given only after the final draft of the written thesis has been adequately reviewed by all members of the thesis committee, and the thesis adviser has approved the draft. A student who fails to successfully defend his/her thesis cannot be given another examination in the same semester. No student shall be allowed to take this examination more than twice.

A pass/fail grade will be assigned upon completion of the thesis.

Master of Science in Computer Engineering

The program of study leading to the Master of Science in Computer Engineering (MSCPE) must include a minimum of 30 semester hours of credit consisting of the following:

1. The zero-credit hour class ECE 500, to be taken within the first year at UD.
2. Nine semester hours of core courses selected from ECE 501, 505, 530, 532, 533, 586 and CPS 510, 536 and 570.
3. At least nine semester hours in a concentration area such as Programming Systems, or Computing and Networking Systems, or as approved by the adviser/advisory committee. At least twelve semester hours are required in the concentration area for the non-thesis option.
4. At least six semester hours of selected technical electives. Selected courses must be approved by the adviser. At least nine semester hours of technical electives are required for the non-thesis option.
5. Six semester hours on an approved thesis for the thesis option. Students receiving 50 percent assistantship/stipend over one academic year or more will be required to pursue the thesis option.

Additionally, the MSCPE degree requires a culminating academic experience through completion of one of three possible options. These options are:

1. Successful completion of a master's thesis. Currently, ECE department policy requires a thesis for students who are supported as research or teaching assistants.
2. Successful completion of a non-thesis research or design project, including submission of a written report of suitable length and a seminar presentation to interested faculty and students. All such projects will be supervised by a faculty member with similar research interests.
3. Successful completion of two approved 3 semester hour courses requiring extensive project-based learning.

Extensive project-based learning courses are given below, by concentration area:

1. Embedded Systems: ECE531 and ECE536.
2. Software Engineering: ECE537, ECE538, CPS512, CPS543 and CPS542/562.
3. Operating Systems and Computer Architecture: ECE536, ECE636, and CPS544.
4. Communications and Networking: ECE505, ECE537, and CPS572.

Doctoral Programs

Doctoral Advisory Committee (DAC)

Before the end of the first enrolled semester, the student, in consultation with the ECE department chair, selects an ECE faculty member to serve as the chair of the DAC. The chair of the DAC must be a member of the graduate faculty. The advisory committee of at least four members, consisting of the chair and at least two other graduate faculty members, requires concurrence by the ECE department chair and the engineering dean (or designate), and approval by the dean of the Graduate School. One of the members must be an external member whose primary appointment is outside the candidate's department or outside the University. The external member must be familiar with the standards of doctoral research and should be in a collateral field supportive of the dissertation topic. The duties of the DAC shall include advising the student, assisting the student in preparing the program of study, administering and reporting the candidacy examination, assisting in planning and conducting research, approving the dissertation, and reporting the results of the dissertation defense. A dissertation adviser other than the chair of the DAC may be appointed by the DAC.

Semester-Hour Requirements

The minimum semester-hour requirement for the doctoral degree is 90 semester hours beyond the bachelor's degree, or 60 semester hours beyond the master's degree. This includes the credits for the doctoral dissertation. Of the 60 semester hours beyond the M.S., a minimum of 48 semester hours must be taken at the University of Dayton. Doctoral candidates must be registered for a minimum of two semester hours every semester during their candidacy, including the semester in which the final examination is taken.

Plan of Study

The plan of study shall include all courses beyond the master's degree that the student is required to complete. *It must be filed with the Office of Graduate Engineering Programs and Research prior to registration for the 13th semester hour.* The plan shall indicate the time and manner in which these requirements are to be met. It is to be completed and approved by the DAC, the ECE department chair, and the associate dean of graduate engineering programs and research, before the end of the second semester of the student's enrollment. The proper form may be obtained from the Office of Graduate Engineering Programs and Research.

<https://porches.udayton.edu/web/porches/engineering>

The plan of study of a student seeking a Ph.D. degree in electrical engineering requires a minimum of 60 semester hours beyond the Master's degree and must include the following:

1. The zero-credit hour class ECE 500, to be taken within the first year at UD.
2. Thirty semester hours of graduate course work, comprised of:
 - a. Nine semester hours from an approved concentration area such as Computing Systems,

Sensors and Devices, Signals and Systems, Aerospace Electronics, or any other interdisciplinary area approved by the adviser/department chair (excludes ECE 695-699).

- b. At least six semester hours of approved graduate mathematics courses. Math classes beyond the B.S. degree taken at UD may be used to satisfy this requirement (although in this case they need to be replaced with other relevant coursework). Graduate level math classes taken at another institution beyond the B.S. degree are evaluated and approved by the dissertation adviser on a case by case basis.
 - c. At least three semester hours of Graduate Seminar (ECE 696).
 - d. The remaining twelve credit hours can be any combination of advanced graded course work, Guided Research Leading to Conference Publication (ECE 695-P1), and Guided Research Leading to Journal Publication (ECE 695-P2)
3. Thirty semester hours of Ph.D. dissertation in electrical engineering.

Preliminary Examination

The Preliminary Examination (PE) is a diagnostic test to assess the baseline background of the student based on questions drawn from four Preliminary Exam Courses (PEC). Before PE is taken, student must have earned at least twelve graduate credit hours beyond the M.S. degree and completed at least four PECs. The approved PECs are: ECE 501, 503, 505, 506, 507, 509, 521, 531, 533, 536, 547, 572, and 581. PE is a requirement for every student who does not apply for a waiver. The PE consists of questions drawn from four PECs chosen by the student. The ECE graduate program committee (GPC) coordinates with the appropriate faculty to put together the set of questions. The exam is a four-hour period and takes place only once per semester, at a time determined by the ECE department. The student has two chances to pass the PE. If the second attempt is also failed, the student is dismissed from the Ph.D. program. The PE requirement may be waived for students with overall GPA greater than or equal to 3.5 in four PECs taken at UD. Students who have taken PEC-equivalent courses at another institution may apply for a waiver of the PE, which may be granted if the student has a UD GPA of 3.5 or higher, and the combined GPA of four PECs (taken at UD or elsewhere) is 3.5 or higher. Students will only be permitted to proceed with the Ph.D. Candidacy Examination if they have passed the PE or a waiver has been granted.

ECE Ph.D. Candidacy Examination

The purpose of the Ph.D. candidacy exam is to determine the student's preparedness for carrying out advanced studies at the doctoral level, and to assess the student's ability to perform independent research. The student must have a DAC in place before the candidacy exam can be attempted. The DAC consists of three ECE faculty members (including the dissertation adviser) in the student's research area and an external member. The external member may be a faculty member in a related department at UD holding graduate faculty status, or a qualified expert in the student's research area from outside the university holding a Ph.D.. The student

must have filed a plan of study, and the DAC must be in place, before the candidacy exam can be attempted. The candidacy exam can only be attempted after the student has earned at least 12 ECE graduate credit hours beyond the M.S. degree, and the PE has been passed or a waiver been granted.

The candidacy examination consists of two parts:

1. Qualifying Examination (QE): a written and an oral examination on a research question (or set of questions) formulated by the dissertation adviser with input from the DAC members. The objective of the QE is to assess the student's ability to carry out independent, unsupervised research leading to a well-written report. The student is given no more than a month to submit the report, after which the oral examination takes place. The oral presentation is open to the public. After the public dismissal following the presentation, the DAC members pose questions related to the written report, or any other relevant areas. The student cannot take more than 12 dissertation credit hours before passing the QE. The student has two chances to pass the QE. If the second attempt is also failed, the student is dismissed from the Ph.D. program.

2. Dissertation proposal defense (DPD): a written proposal and an oral examination on the research topic the student intends to pursue. The objective of the DPD is to assess the student's qualification for delivering a meaningful and publishable Ph.D. dissertation, and for defending a research idea before a critical audience. The DPD can only be attempted after QE has been passed; after all coursework requirements have been completed; and at least six dissertation credit hours have been completed. The student must take at least 12 dissertation credits after successful completion of the DPD. The student will submit the written proposal to the DAC detailing the area of dissertation research at least one week prior to the oral examination. The proposal must present a clear problem definition, a review of the literature in the area, the justification and the uniqueness of the research, the methodology, preliminary work performed and expected results, the laboratories and/or other facilities needed, and a schedule of work. The proposal must also show preliminary evidence of doctoral level research work commensurate with rigors of a journal submission. The student will make an oral presentation open to the public summarizing the written proposal. After the public dismissal following the presentation, the student will be asked by the DAC questions related to the proposal.

The timeline and milestones for the Ph.D. program are shown on page 16. For more details about the QE and DPD, please visit ECE's website at https://www.udayton.edu/engineering/departments/electrical_and_computer/index.php

Dissertation

A dissertation is required of each doctoral candidate who has passed the candidacy examination. The student, in consultation with the adviser and the DAC, selects the dissertation topic. The dissertation topic must be approved by the DAC. The dissertation must be prepared in accordance

with the instructions outlined on the Thesis and Dissertation guidelines, which can be found on the library website: <http://libguides.udayton.edu/content.php?pid=65891&sid=486730>.

Instructions on the electronic submission of the completed dissertation can also be found on this website. The student must obtain approval from the DAC to undertake all or part of the dissertation in absentia. A letter requesting such permission, signed by the chair of the DAC, must be submitted to the associate dean of graduate engineering programs and research. This letter should outline in detail the relationship between the adviser and the candidate and the name and background of the person who will directly advise the candidate during the accomplishment of this independent research. This person will be added to the committee.

Journal Paper Submission Requirement

The Ph.D. dissertation must either add to the fundamental knowledge of the field or provide a new and better interpretation of facts that are already known. It is expected to result in one or more papers suitable for publication in a refereed journal. A proof of publication or manuscript prepared for an appropriate journal and an acknowledgement of receipt by the editor must also be submitted along with the dissertation. Journal paper submissions resulting from ECE695-P2 are considered coursework and do not count towards this requirement.

Dissertation Defense

No earlier than six months after the successful candidacy examination, the candidate shall defend the doctoral dissertation in a public forum to demonstrate to the committee that all the preparation for which the doctoral degree is awarded has been met. The defense is open to all members of the University of Dayton faculty, student body, and interested outside parties. The members of the DAC, with the adviser acting as chair, will conduct this dissertation defense. Students are expected to complete the requirements for the doctoral degree within five years after the candidacy examination has been passed.

Before the announcement of this defense, the DAC must agree that the dissertation is ready for public defense. At least two weeks prior to the date of the defense, the candidate must provide the committee with copies of the nearly final version of the dissertation and submit to the chair the request to schedule the defense. For the defense to be satisfactory, the committee members must agree that the dissertation defense has been successfully completed. If the candidate's defense is deemed unsatisfactory by at least one member, the case will be referred to the associate dean of graduate engineering programs and research for appropriate action.

Academic Standards

Graduate students are expected to do high-caliber work at all times and demonstrate continuing progress toward the degree. This requires that students maintain a minimum average grade of B in course work. The M.S. students are allowed to have no more than two grades of C. Students who fail to meet these

requirements are either placed on academic probation or dismissed from the program. For Ph.D. students, one grade of F, or more than one grade of C may be grounds for dismissal from the program pending recommendation of the DAC. All students are expected to adhere to the established university policies on *Attendance, Academic Dishonesty, Computing Ethics, Misconduct in Research and Scholarship, and Software Audit*.

Courses of Instruction

Refer to the Academic Catalog website for the latest offering http://catalog.udayton.edu/graduate/schoolofengineering/programsofstudy/electricalandcomputerengineering/#ms_elec

Departmental and Computing Facilities

Students have access to facilities offering top-of-the-line equipment with industry specific software including FPGA development tools from Altera, real-time control tools from dSPACE and industrial robots from Yaskawa Motoman, among others. Many software tools are available for design and simulation such as MATLAB, NI Multisim, Silvaco, CoventorWare and MEMS+, FEKO, Keysight EESof and NI AWR Suite for Analog, RF and Microwave design.

Graduate Student Research PC Room – KL 272

The School of Engineering hosts a computer lab in KL 272 that offers 48 student workstations, a network printer and scanner, plus an instructor workstation with projector for presentations. These workstations provide access to both standard student software tools and advanced engineering software programs. Students must present a valid UD ID card to have an SoE account created through UDit, and this account will be used to login to the workstations in KL 272.

The Innovation Corridor – KL 351

The Department of Electrical and Computer Engineering at the University of Dayton is starting an exciting new initiative to bolster collaborative research and increase undergraduate student participation in research activities. The three key areas that have been selected are physically placed in the newly-developed Innovation Corridor (IC), where collaboration, interchange of ideas and innovative research take place in a fertile environment.

The Corridor is located in the Kettering Labs complex 351, and contains four main laboratories corresponding to rapidly growing areas of research considered key in the development of the department:

1. Embedded Data Processing Laboratory
2. Parallel Cognitive Systems Laboratory
3. Signal and Image Processing Laboratory
4. Advanced Communications Network and Security Laboratory

Broadly speaking, the areas covered by these laboratories are embedded computing, parallel computing, control and automation, robotics, digital and optical image processing, and nonlinear adaptive optics. The ECE department strongly

believes that there exist connections between these areas, which, if recognized and brought to the forefront, will lead to a wealth of opportunities for collaborative research and will provide a means to attract not only highly qualified graduate students to the University of Dayton, but also motivated undergraduates willing to get involved in research early in their careers.

Signal and Image Processing Laboratory – KL351A – Director: Dr. Russell Hardie

The Signal and Image Processing Laboratory has received some upgrades in spring 2017. It is equipped with several high-performance workstations, and a new multimedia wall with a 65-inch 3D video display and powered studio-quality audio monitors. The lab also has a small conference area and researcher desks. We have several camera systems available including a FLIR systems infrared camera, and high-quality color and grayscale USB cameras. We also have a Directed Perception pan-and-tilt camera mount. For audio, the lab has a Mackie mixer and professional quality microphones for sound recording. The workstations are equipped with the standard engineering software packages such as MATLAB with many toolboxes including the data and image acquisition toolboxes. Using MATLAB, we are able to rapidly develop and test audio and video processing algorithms and apply them using the available audio and camera systems. The lab primarily supports research in image and video processing, with an emphasis on medical image processing.

Embedded Data Processing Laboratory – KL 351E – Director: Dr. Eric Balster

Research is performed in the areas of signal and image processing for real-time systems. Hard execution time thresholds required by real-time signal processing and imaging systems provide research challenges in both algorithm development and algorithm implementation. The Embedded Data Processing Lab is acquiring differing computational resources such as advanced computing servers, embedded data processing cards with Field Programmable Gate Arrays (FPGAs) and other computing platforms to allow for advanced research to be conducted in signal and image processing focused on technology transfer to real-time signal and image processing applications.

Parallel Cognitive Systems Laboratory – KL 351G – Director: Dr. Tarek Taha

Research is performed in the areas of hardware, algorithm design, and software applications for artificial intelligence systems and high performance computing systems. Algorithm and application projects include deep learning algorithm and applications (medical imaging, image understanding and enhancement, cyber security), parallel algorithms and spiking neural network algorithms for cognitive agents, and application development for neuromorphic processors. Hardware projects include multicore processor design for AI systems, memristor device based circuits and systems, and Field Programmable Gate Arrays (FPGAs) based acceleration.

Advanced Communications Network and Security Laboratory – KL 351F – Director: Dr. Feng Ye

The Advanced Communications Network and Security (ACNS) Laboratory is equipped with a host of networking devices, computing systems, embedded systems and other platforms from vendors such as Ettus Research (NI), Cisco, Linksys, D-Link, and HP. The ACNS lab provides a highly flexible research network environment suitable for advanced research work in the fields of wireless communications and network security. Wireless device characteristics, such as throughput, power consumption, robustness to multipath propagation, noise, interference, etc., can be evaluated in the ACNS laboratory environment. The lab also supports research in Internet of Things (IoT), with an emphasis on wireless IoT device connection and security.

Other Specialized Facilities

Sustainable Power Electronics & Electric Drive Laboratory (SPEED) – KL 231 – Director: Dr. Dong Cao

The Sustainable Power Electronics & Electric Drive (SPEED) Lab (KL231) was established in the Department of Electrical and Computer Engineering at the University of Dayton in August of 2019 supported by General Electric Aviation EPIS Center. The main focus of SPEED lab is to develop advanced power electronics technologies including control, simulation, hardware prototyping and system integration for various applications, such as electric vehicle/airplane, photovoltaic, fuel cell, thermoelectric, data-center, LED driver, power supplies, wireless charging etc. The specific focus area will include the next generation power semiconductor materials application, e.g. SiC, GaN, newpower electronics circuit topologies, high density power converter design and development etc. SPEED Lab is equipped with the state-of-the-art facility for high voltage and high power applications that includes 3-phase 480V/200A power input, high current /high voltage power supplies, battery simulator, 8 channel high bandwidth scopes/probes, and high bandwidth electronic loads.

Intelligent Signal and Systems Laboratory – KL 243 – Director: Dr. Keigo Hirakawa

Research at Intelligent Signal Systems Laboratory is aimed at understanding the increasingly large role that signal systems play in the real-world. We connect the applied design efforts with the first principle ideas of mathematics, statistics, signal processing and psychophysical models to enable new capabilities in image processing, computer vision, biomedical imaging and sensors.

Nonlinear Control Laboratory – KL 233 – Director: Dr. Raul Ordonez

The Nonlinear Control Laboratory in KL 233 houses a variety of experiments dedicated to research in advanced control methods, including nonlinear and adaptive control. Experiments in the laboratory include a single rotational inverted pendulum, a double inverted pendulum, a 3 DOF helicopter, a magnetic levitation experiment, a reaction wheel pendulum, a 9 DOF hyper-redundant robotic arm, a set of five table-top mobile robots and an upper-arm exo-skeleton. These

experiments serve as test beds for advanced nonlinear control methods and provide students with an excellent opportunity to face challenging control problems. The computers in the lab are outfitted with dSPACE real-time control cards, which allow control design and development to be carried out in MATLAB and then compiled into a real-time executable. These control cards are widely used in industry, and therefore, provide students with knowledge of great practical value. The laboratory also has stations dedicated to prototyping and development.

Motoman Robotics Laboratory – KL 232 – Director: Dr. Raul Ordonez

The Motoman Robotics Laboratory in KL 232 was established in the Department of Electrical and Computer Engineering at the University of Dayton in August of 2008 with a generous donation from Motoman, Inc. End-of-arm tools for the robots have been donated by SAS Automation. The lab is located in Kettering Labs 232. It houses six state-of-the-art industrial robots, including a revolutionary seven-axis, actuator-driven IA20 robot; a revolutionary 15-axis, actuator-driven and human-like dual-arm DIA10 robot; a four-axis YS450 high-speed SCARA robot; two six-axis MH5S articulated robots and one HP3C six-axis, articulated robot with a compact controller. The lab focuses on visual servoing and other advanced robotics research. It also functions as the centerpiece of the undergraduate Robotics Concentration in the electrical and computer engineering curriculum.

Microfabrication Laboratory – KL 331 – Director: Dr. Guru Subramanyam

KL 331 houses a Microelectronics Fabrication laboratory, a modular, class 1000 clean room, primarily designed for photolithography processes and thin-film depositions. The lab is equipped with a wet bench, a photoresist spinner, a mask aligner and a microscope. The laboratory is also equipped with a Torr International DC/RF sputtering system, capable of depositing conducting or dielectric thin-films. A Neocera / Pioneer 180 large area pulsed laser deposition (PLD) system is also housed in the clean room. The Nano Engineering Science and Technology (NEST) clean room located in the Science Center currently contains the state-of-the-art microelectronic equipment including lithography, inductively coupled plasma etching system, sputtering and electron-beam evaporation system.

Mumma Radar Laboratory – KL 251 – Director: Dr. Mike Wicks

Funded by the Ohio Research Scholar Program, the Mumma Radar Laboratory is a unique spatially and spectrally diverse RF chamber, with the ability to very precisely and rapidly position transmit and receive antennas using high precision industrial robots. The chamber provides a capability to RF-illuminate articles under test and then collect radio frequency (RF) scattering data using a variety of waveforms (from short pulse to narrowband continuous wave, from stepped FM to OFDM, and beyond). In addition to spectral diversity, a variety of widely spaced transmit and receive antennas permits real-time spatial diversity measurements. While not an anechoic chamber, this new Center of Excellence in Distributed Sensing also supports characterization of antennas

and canonical targets in a controlled environment. Mumba Radar Laboratory researchers are also working on using radar to improve sensing for medical imaging, aerospace and manufacturing, including the detection of defects in 3-D printed objects, and in autonomous systems applications in collaboration with UDRI, AFRL and local industries.

Microwave Measurements Laboratory – KL 470 – Director: Dr. Guru Subramanyam

KL 470 has a Microwave Measurements Lab equipped with HP8720 Vector Network Analyzers (VNA), an on-wafer probe station integrated with a thermo-electric temperature controller, and other microwave accessories. The probe station can be used with DC as well RF/Microwave probes. A Precision LC Tester manufactured by Radiant Technologies is available for characterization at low frequencies up to 1 MHz. The lab also has Sonnet electromagnetic simulation tools, KeySight's EESof Tools, and Applied Wave Research's Microwave Office and Visual System Simulator Design Tools.

Vision Laboratory – KL 461 – Director: Dr. Vijayan Asari

UD Vision Lab (KL 461) is the Department of Electrical and Computer Engineering Wide Area Surveillance (WAS) research initiative established under the State of Ohio award for the Ohio Academic Research Cluster for Layered Sensing (OARCLS). The main focus of Vision Lab is to develop advanced algorithms and architectures for real-time applications in the areas of signal/image processing, computer vision, pattern recognition and artificial neural systems. Specific concentration areas in Vision Lab are wide area surveillance for situational awareness, biometrics for human identification, vision guidance and navigation for intelligent robots, brain wave analysis for emotion/intention recognition, and high performance and low power architecture design for real-time systems. Vision Lab is equipped with state-of-the-art facilities for long range and wide area surveillance data acquisition, brain wave data acquisition, advanced robotics, and high-performance computing.

Integrated Microsystems Laboratory – Director: Dr. Vamsy Chodavarapu

Integrated Microsystems Laboratory conducts research and development of high value system-on-chip and system-in-package technologies that reach beyond the boundaries of conventional semiconductor technologies by combining technologies that process information with those that interact with people and environment. The research areas of interest include CMOS Sensor Microsystems, RF/Analog Circuits, Neuro/Biomedical-, Prosthetics and Wearables, Bio-/Neuro/RF-MEMS, Biological/Chemical Sensing, and Nano-/Bio- Materials. The lab has gained international recognition for several contributions including (i) development of integrated circuits and sensors that operate under high-temperature and extreme environments, (ii) ultra-clean wafer-level vacuum packaging of microdevices and (iii) miniaturized optical chemical and biological sensors. The lab has been financially supported by various government, industry and non-profit institutions including National Science Foundation and U.S. Air Force.

Biomedical Engineering & Additive Mechatronics Laboratory (BEAM) – KL 474 – Director: Dr. Amy Doll

The Biomedical Engineering & Additive Mechatronics (BEAM) Laboratory housed in KL 474 is dedicated to research in biomedical engineering, medical imaging/healthcare electronics, and additive manufacturing techniques for medicine and 3D printed electronics. The lab features a variety of bioinstrumentation and equipment utilized for patient diagnostics in healthcare, including a telehealth virtual patient care platform received from Premier Health Network for collaborative clinical telemetry research. The lab also features a Fusion3 F410 Fused Deposition Modeling (FDM) 3D Printer, a FormLabs Form2 stereolithography (SLA) 3D Printer, benchtop test and measurement electronics, Bantam Tools Othermill Pro PCB milling machine, desktop computers, and associated computer software for circuit design/analysis, medical imaging, and 3D CAD design. In addition, the BEAM Lab has access to both commercial grade EOS M290 selective laser melting (SLM) and open architecture SLM metal 3D printers through collaborative research efforts with the University of Dayton Research Institute (UDRI).

Applied Sensing Laboratory (ASL) – KL 332 – Director: Dr. Bradley Ratliff

The Applied Sensing Laboratory (ASL), located in KL 332, is dedicated to research and development of signal and image processing, computer vision, and pattern recognition algorithms for remote sensing applications. The ASL is particularly concerned with applied remote sensing in the electro-optical and infrared (EO-IR) regions of the electromagnetic spectrum, with a particular focus on applied student research in the areas of hyperspectral, polarimetric, spectro-polarimetric, 3D imaging and data fusion for phenomenological studies, remote sensing, vision-aided navigation, and target detection, identification, and characterization tasks. The ASL's resources currently include visible polarimetric ground truthing and tactical cameras, an optical table and associated mounts, a hand-held 3D scanner, student workstations and a high-performance GPU-based workstation, as well as various other equipment and instrumentation. The Applied Sensing Laboratory mission of applied research emphasizes well-principled science, preparing students for impactful research using relevant sensors to solve real-world problems. Core concepts include designing and executing scientific data collections, understanding the complexities associated with sensor calibration in remote sensing applications, and developing successful data processing approaches based upon the difficulties encountered with real-world data. Such skills are highly desirable within industry and will particularly impact engineering students who seek employment within the local Dayton Air Force community at Wright Patterson Air Force Base and Department of Defense in general.

Faculty and Staff



Vijayan K. Asari

Professor

Ph.D., Indian Institute of Technology, Madras, 1994

Areas of research interest:

Signal Processing, Image Processing, Computer Vision, Pattern Recognition, Machine Learning,

Artificial Neural Networks, High Performance and Low-Power Digital Architectures

Biography: Dr. Vijayan Asari is the Ohio Research Scholars Chair in Wide Area Surveillance and Professor in Electrical and Computer Engineering at University of Dayton. Dr. Asari received his Bachelor's degree in Electronics and Communication Engineering from the University of Kerala, India in 1978, the M.Tech. and Ph.D. degrees in Electrical Engineering from the Indian Institute of Technology, Madras in 1984 and 1994 respectively. He had been working as a Professor in Electrical and Computer Engineering at Old Dominion University, Virginia and joined UD in February 2010. Dr. Asari has so far published more than 260 articles including 55 journal papers in the fields of image processing, computer vision, pattern recognition, artificial neural networks, and high performance and low power digital architectures for image and video processing applications. His current research focus areas are wide area surveillance, biometrics, vision guided robotic navigation, brain wave analysis, and high performance and low power architecture design.



Eric J. Balster

Professor, Chair.

Ph.D., The Ohio State University, 2004

Areas of research interest:

Image and Video processing, Software Engineering, Digital Systems

Biography: Eric Balster graduated from the University of Dayton in 1998 with a B.S. and in 2000 with an M.S., both in Electrical Engineering. He received his Ph.D. in Electrical Engineering from The Ohio State University in June of 2004. His research area was in the field of image and video processing, specifically in compression and pre-processing algorithm development. From 2002 to 2006, Dr. Balster worked in the Information Directorate, Air Force Research Laboratory (AFRL), continuing his work in image and video processing research. From 2006 to 2008, he worked in the AFRL's Sensor's Directorate, serving as the lead aircraft software development and support engineer for a wide-area persistent surveillance program. Since August 2008, Dr. Balster has worked as a Professor at the University of Dayton where he continues research in image processing and aerial surveillance processing research.



Dong Cao

Associate Professor

Ph.D., Michigan State University, 2012

Areas of research interest:

Aerospace Electric Power System, power Electronics Emerging applications utilizing high power or high frequency

wide bandgap devices e.g. SiC or GaN, high density power conversion using innovative topologies for data center and transportation electrification, health monitoring and lifetime prediction of power converters using AI and Deep Learning.

Biography: received his B.S. degree from Zhejiang University, Hangzhou China, in 2005, and his M.S. and Ph.D. degrees in electrical engineering from Michigan State University, East Lansing USA, in 2010 and 2012, respectively. He worked at Ford Motor Company as a core power electronics engineer for hybrid electric vehicle electrified driveline hardware development from 2012-2014. He was an assistant professor at North Dakota State University from Aug. 2014 to Aug. 2019. Dr. Cao joined the University of Dayton as GE EPIS Center Professor in Aerospace Electric Power Systems and Associate Professor in Aug. 2019. His research has been supported by NSF, NASA, NASA-EPSCoR, MNDOT, ND-DOC, ND-EPSCoR, Google, Ford, John Deere, Navitas Semiconductor, Tranphorm, OFRN, etc. He has published over 70 IEEE journal and conference proceedings as first or correspondence author with 2500+ citations. He received early career researcher of the year award from NDSU in 2019. He received three prize paper awards from IEEE. He also received a couple of presentation and poster awards from IEEE conferences. He is the associated editor and guest editor and reviewer for several IEEE Journal and Transactions.



Monish Chatterjee

Professor

Ph.D., University of Iowa, 1985

Areas of research interest:

Acousto-optics, optical bistability and chaos, holography, nonlinear system modeling, wave propagation

Biography: Monish R. Chatterjee received the B.Tech (Hons) degree in Electronics and Communications Engineering from I.I.T., Kharagpur, India, in 1979. He received the M.S. and Ph.D. degrees, both in Electrical and Computer Engineering, from the University of Iowa, Iowa City, Iowa, in 1981 and 1985 respectively. Dr. Chatterjee served as a visiting faculty at the University of Iowa for one year before joining the ECE faculty at Binghamton University, the State University of New York, and conducted teaching and research from 1986 through 2002. In fall 2002, Dr. Chatterjee joined the University of Dayton's ECE department. Dr. Chatterjee has published numerous essays, correspondences, and three books of

translation from his native Bengali. He received the State University of New York's Chancellor's Award for Excellence in Teaching in 2000. He is a Senior Member of IEEE, and a member of OSA, ASEE and Sigma Xi.



Vamsy Chodavarapu

Professor
Ph.D., State University of New York, Buffalo, 2006

Areas of research interest: CMOS Sensor Microsystems, RF/Analog Circuits, Neuro-/Biomedical- Implants and Wearables, Bio-/Neuro-/RF-MEMS, and Biological/Chemical Sensing

Biography: Vamsy Chodavarapu joined the ECE Dept. in 2015 as an Associate Professor. He obtained his Ph.D. and M.S. degrees in Electrical Engineering from University at Buffalo, The State University of New York in 2006 and 2003, respectively. He obtained his B. Eng. Degree in Instrumentation Engineering from Osmania University, India in 2001. From 2006 to 2015, Chodavarapu was a faculty member in the Dept. of Electrical & Computer Engineering at McGill University, Montreal, Quebec, Canada. Since 2011, he is a full licensed Professional Engineer in the Province of Ontario, Canada. He has co-authored more than 90 refereed journals and conference proceedings. He has 8 approved/pending United States patents. He is a Senior Member of both SPIE and IEEE.



Malcolm Daniels

Associate Professor
Ph.D., University of Strathclyde, 1982

Areas of research interest: Automatic Control, Electrical Machines

Biography: Malcolm W. Daniels, Ph.D. holds undergraduate (1979) and graduate degrees (1982) in Electrical and Electronic Engineering from the University of Strathclyde in Glasgow, Scotland and has worked at the University of Dayton since 1985. In addition to his faculty responsibilities he has held various administrative positions include Associate Dean for Undergraduate Studies, Associate Dean for Graduate Studies and Research, Interim Dean of Engineering and Chair of the Electrical and Computer Engineering department. His professional areas of research are in electrical machines, control and automation issues on the Smart Grid. Most recently his research has focused on the optimal design of renewable energy systems and the control

of micro-grids. In addition to teaching undergraduate and graduate courses in Electrical Engineering he also teaches courses in Appropriate Technology Design.

Dr. Daniels currently serves as Director of the ETHOS Center within the School of Engineering. The Center is the focal point for all community engaged learning and service within the School of Engineering. In this capacity he directs international and domestic technical service immersion programs for undergraduate and graduate engineering students. In 2017, Dr. Daniels was appointed as the Learning Teaching Center (LTC) Fellow for Leadership Development and coordinates new chair training, the Chairs Collaborative and the Associate Deans Collaborative.



Amy Doll

Associate Professor
Ph.D., Wright State University 1993

Area of research interest: neuro-muscular rehabilitation, bio-sensors and instrumentation, wearable electronics, additive manufacturing, adaptive human computer interfaces, human performance/control engineering, medical imaging, robotics, orthopedic biomechanics, and biomaterials.

Biography: Dr. Amy Doll joined the University of Dayton in 2017. She obtained her Ph.D., M.S., and B.S. in Biomedical Engineering from Wright State University in Dayton, OH (2003, 1994, and 1993, respectively). Dr. Doll is a registered Professional Engineer in the State of Ohio in Mechanical Engineering (1998-Present), and has over 15 years of experience in biomedical engineering. She holds a certificate in Universal Design for Learning from George Washington University (2010), and Architecture and Systems Engineering from the Massachusetts Institute of Technology (2016). Prior to her appointment at the University of Dayton, Dr. Doll served as the Director of Rehabilitation Engineering & Technology at Wright State University Research Institute, where she also held a joint teaching appointment in the Department of Biomedical, Industrial and Human Factors Engineering. She has over 16 years of clinical experience in healthcare management of biomedical technology for the State of Ohio, as well as aerospace medicine through microgravity research with NASA.

**Bradley D. Duncan**

Professor
Ph.D., Virginia Tech, 1991

Areas of research interest: Ladar system analysis and design, fiber optic sensing/communications, optical waveguide transmission applications, photorefractive device and system design,

scanning and nonlinear optical image processing, non-destructive evaluation and holography.

Biography: Bradley D. Duncan received the Bachelor of Science in Electrical Engineering (BSEE) Degree in 1986 from Virginia Tech. He received the M.S. and Ph.D. degrees in Electrical Engineering, also from Virginia Tech, in 1988 and 1991 respectively. Dr. Duncan has been with the University of Dayton since August 1991. He holds a joint appointment with the Department of Electrical & Computer Engineering and the graduate Electro-Optics Program. He is a Senior Member of IEEE.

**Russell C. Hardie**

Professor
Ph.D., University of Delaware,
1992

Areas of research interest: Digital Signal and Image Processing, Statistical Signal Processing, Pattern Recognition, Medical Image Processing.

Biography: Russell C. Hardie graduated *Magna Cum Laude* from Loyola College in Baltimore Maryland in 1988 with a B.S. degree in Engineering Science. He obtained an M.S. and Ph.D. degree in Electrical Engineering from the University of Delaware in 1990 and 1992, respectively. Dr. Hardie served as a Senior Scientist at Earth Satellite Corporation in Maryland prior to his appointment at the University of Dayton in 1993. He is currently a Full Professor in the Department of Electrical and Computer Engineering and holds a joint appointment with the Electro-Optics Program. Along with several collaborators, Dr. Hardie received the Rudolf Kingslake Medal and Prize from SPIE in 1998 for work on multi-frame image resolution enhancement algorithms. Dr. Hardie recently received the University of Dayton's top university-wide teaching award, the 2006 Alumni Award in Teaching. In 1999, he received the School of Engineering Award of Excellence in Teaching at the University of Dayton and was the recipient of the first annual Professor of the Year Award in 2002 from the student chapter of the IEEE at the University of Dayton. His research interests include a wide variety of topics in the area of digital signal and image processing. His research work has focused on image enhancement and restoration, pattern recognition, and medical image processing. He is currently a senior member of IEEE.

**Keigo Hirakawa**

Associate Professor
Ph.D., Cornell University, 2005

Areas of research interest: Signal and Image Processing, Statistics, Color Image Processing, Digital Camera Processing Pipeline, 3D Image Reconstruction and Display

Biography: Prof. Hirakawa has published in the literature of engineering, computer science, and statistics. He has received a number of recognitions, including a paper award from IEEE and keynote speeches at IS&T CGIV, PCSJ-IMPSS, and CSAJ. He has strong track record of collaborating with industry partners. His book, "Digital Camera Processing Pipeline" is scheduled to be published by John Wiley & Sons Inc next year. His research focuses on algorithmic development of image processing, computer vision, biomedical imaging, and sensor designs. He is best known for his expertise in digital camera designs, and his contributions span color science, estimation theory, statistical modeling, and wavelet theory.

**John Loomis**

Emeritus Professor
Ph.D., University of Arizona,
1980

Areas of Research Interest: Image Processing, Computer Graphics, Machine vision, Optical Design and Testing, Interferometry, Ellipsometry.

Biography: Dr. Loomis obtained his B.S. in Physics from Case Institute of Technology in 1966, M.S. from University of Illinois in 1968, and M.S. and Ph.D. from the University of Arizona in 1977 and 1980, respectively. He has been a research professor in Electro-optics at the University of Dayton from 1985 to present. He is also a research optical physicist at UDRI from 1979 to present.

**Raúl Ordóñez**

Professor
Ph.D., Ohio State University, 1999

Areas of research interest: Control systems, nonlinear and adaptive control, robotics, multi-vehicle coordination, aircraft control and other control applications.

Biography: Raul Ordóñez received his M.S. and Ph.D. in electrical engineering from the Ohio State University in 1996 and 1999, respectively. He spent two years as an assistant professor in the department of electrical and computer engineering at Rowan University, and then joined the ECE department at the University of Dayton, where he has

been since 2001 and is now a full professor. He has worked with the IEEE Control Systems Society as a member of the Conference Editorial Board of the IEEE Control Systems Society since 1999; Publicity Chair for the 2001 International Symposium on Intelligent Control; member of the Program Committee and Program Chair for the 2001 Conference on Decision and Control; Publications Chair for the 2008 IEEE Multi-conference on Systems and Control. Dr. Ordonez is also serving since 2006 as Associate Editor for the international control journal *Automatica*. He is a coauthor of the textbook *Stable Adaptive Control and Estimation for Nonlinear Systems: Neural and Fuzzy Approximator Techniques*, (Wiley, 2002); he is also co-author of the research monograph *Extremum Seeking Control and Applications - A Numerical Optimization Based Approach*, (Springer, 2011). He worked between 2001 and 2007 in the research team of the Collaborative Center for Control Science (CCCS), funded by AFRL, AFOSR and DAGSI at the Ohio State University. Dr. Ordóñez received a Boeing Welliver faculty fellowship in 2008, and an AFRL Summer Faculty Fellowship in 2014. He spent the summer of 2015 as a visiting professor at the Université de Picardie Jules Verne, with the Laboratoire *M.I.S.* (Modélisation, Information et Systèmes), in Amiens, France.



Robert P. Penno

Professor
Ph.D., University of Dayton,
1987

Areas of research interest:
Antenna and Electromagnetic
Field Theory, Array Signal
Processing with applications to
Passive Direction Finding,
Simulation of Radar Signals

Biography: Robert Penno received the Bachelor of Science in Mechanical Engineering and Master of Science in Electrical Engineering from Rose Hulman Institute of Technology, Terre Haute, Indiana in 1971 and 1984 respectively and his Ph.D. at University of Dayton 1987. Prior to joining UD, he worked for the General Electric Co. He is a Senior Member of IEEE, and a member of the Sigma Xi Scientific Research Society. Dr. Penno has twice been selected as “*Engineering Professor of the Year*” by Epsilon Delta Tau, the student engineering fraternity at the University of Dayton. He has twice been a finalist for the Dr. *Samuel Burka Award*, the highest civilian award granted by the USAF for scientific research.

Robert P. Penno

Professor
Ph.D., University of Dayton, 1987

Areas of research interest: Antenna and Electromagnetic
Field Theory, Array Signal Processing with applications to
Passive Direction Finding, Simulation of Radar Signals



Bradley M. Ratliff

Associate Professor
Ph.D., University of New
Mexico, 2004

Biography: Brad Ratliff completed his B.S. and M.S. in computer and electrical engineering at the University of Dayton in 2000 and 2001, respectively. He completed his PhD degree in electrical

engineering at the University of New Mexico in 2004. Prior to his academic appointment at UD, Dr. Ratliff worked in the defense industry as a senior research engineer for nearly 20 years in support of various Air Force Research Laboratory directorates at Wright Patterson AFB and Kirtland AFB, NASIC, AFIT, AFLCMC, and Sandia National Labs. His primary focus has been in the areas of signal and image processing, pattern recognition, and machine learning for remote sensing applications with a particular focus on algorithm development for passive EO-IR, hyperspectral and polarimetric imaging systems. His areas of expertise include imaging sensor modeling and development, automatic scene-based image calibration, registration, and restoration, and detection and tracking for ISR applications. Dr. Ratliff has published over 50 papers, conference proceedings, and US patents.



Guru Subramanyam

Professor
Ph.D., University of
Cincinnati, 1993

Areas of research interest:
Electronic & Electro-optic
Materials, Devices and
Sensors, and Microwave
Circuit Design.

Biography: Guru Subramanyam received the Bachelor of Engineering Degree in Electrical and Electronics Engineering from the University of Madras in 1984, with Distinction. He received the M.S. and Ph.D. degrees in Electrical Engineering from the University of Cincinnati, in 1988 and 1993 respectively. Prior to joining UD, he served as a faculty member at the University of Northern Iowa, Cedar Falls, Iowa from August 93 to May 98. He is currently a Senior Member of IEEE. His research to date has been supported by NASA, NSF, AFRL, AFOSR, and DARPA. He received UD’s Alumni Award for Excellence in Scholarship in 2008. Dr. Subramanyam’s research in integrated ferroelectrics, integrated microsystems and energy storage have resulted in many patent filings. He had authored/co-authored over 170 publications.

**Tarek Taha**

Professor
Ph.D., Georgia Institute of
Technology, 2002

Areas of Research

Interest: Computer Architecture,
Novel Computing Systems for
Neuromorphic systems, High
Performance Computing

Biography: Dr. Tarek M. Taha received the B.S. degree in pre-engineering from Depauw University, Greencastle, in 1996, and the B.S.E.E., M.S.E.E., and Ph.D degrees in electrical engineering from the Georgia Institute of Technology, Atlanta, in 1996, 1998, and 2002, respectively. He received the NSF CAREER Award in 2007 and is a member of the IEEE Computer Society.

**Michael Wicks**

Ohio Research Scholar
Chair in Sensor
Exploitation & Fusion,
Radar Systems, Signal
Processing

Areas of Research Interest:
Remote Sensing, signal
processing, system engineering,
distributed sensing

and radio frequency technology

Biography: Dr. Michael C. Wicks, Ph.D. E.E. Syracuse University 1995, is the University of Dayton Endowed Chair and Ohio Scholar for Sensor Exploitation and Fusion, a Professor of Electrical and Computer Engineering, and a Distinguished Research Scientist at UDRI. Dr. Wicks has received many honors, including the 2013 IEEE Dennis J. Picard Medal for Radar Technologies and Applications, the 2016 IEEE AESS Pioneer Award recipient. He is an IEEE Fellow. Dr. Wicks is a leading research scientist in remote sensing, signal processing and systems engineering, with a current focus on distributed sensing and radio frequency tomographic radar, counter explosive sensor technology, cognitive radar and radio, space object sensing, deep earth probing radar, multi-dimensional adaptive processing for airborne and space based radar, ultra-wideband radio and radar, passive and active multi-static systems, and concealed weapons/contraband detection and carrier identification. He pioneered the concept of knowledge-based signal processing and waveform diversity, and has led national and international research teams on the design, development and fielding of novel algorithms, architectures and systems for remote sensing from space, air and surface platforms. Sponsored research is currently focused on advanced algorithms for the detection and track processing of airborne targets obscured by wind

farm clutter, as is research on spatially and spectrally diverse sensing for the automatic detection, identification, and feature exploitation of objects under cover, e.g. below ground, inside structures, or under foliage. Algorithms and architectures for the numerical and symbolic (heuristic) processing of sensor data is a primary focus of this research. Dr. Wicks has published many papers, reports, chapters, books and patents.

**Feng Ye**

Assistant Professor
Ph.D., University of Nebraska –
Lincoln, 2015

Areas of research interest:

Information and Network
Security, Wireless
Communications and Networks,
IoT and Smart Cities, Big Data
and Cloud Computing

Biography: Dr. Feng Ye received a Ph.D. degree from the University of Nebraska – Lincoln (UNL), Omaha, NE, USA, 2015 and a B.S. degree from Shanghai Jiao Tong University, Shanghai, China, 2011. He is an Assistant Professor at the University of Dayton (UD), USA. He serves as the Vice Chair (Americas) of the IEEE Technical Committee on Green Communications and Computing (TCGCC). He is currently a Column Editor of IEEE Wireless Communications; an Associate Editor of IEEE Transactions on Vehicular Technology, IEEE Internet of Things Journal, China Communications, and Security and Privacy (Wiley). He served as a Guest Editor of IEEE Transactions on Cognitive Communications and Networking, Wireless Communications and Mobile Computing (Hindawi), and International Journal of Distributed Sensor Networks. He serves as the Co-chair of Green Communication Systems & Networks, IEEE ICC 2021; Co-Chair of ICNC'19 Signal Processing for Communications Symposium; the Publicity Co-Chair of IEEE CBDCOM 2018; the Co-Chair of Cognitive Radio and Networking Symposium, IEEE ICC 2018. He also serves as a TPC member for numerous international conferences, including INFOCOM, GLOBECOM, VTC, ICC, etc. He is also a reviewer for multiple IEEE journals.

Staff



Julie Motz
Lab Manager
B.S. Electrical Engineering,
University of Dayton, 1993



Nancy Striebich
Senior Administrative Assistant
B.S. University of Dayton, 1983

MASTER MILESTONES

Thesis Route

Prior to the beginning of 1st semester.....	See the temporary adviser for course registration
Before the end of 2nd semester.....	File plan of study
Before registering for thesis.....	Select thesis adviser
During graduating semester	
By the 4th week.....	File application for graduation Appoint a thesis committee
No later than mid-semester.....	Complete thesis writing Have adviser approve thesis draft
2 weeks before defense.....	Submit thesis to the committee Set date and time for defense Request department for room
At final exam.....	Successful thesis defense
2 weeks prior to graduation.....	Submit electronic copy of thesis to OhioLink

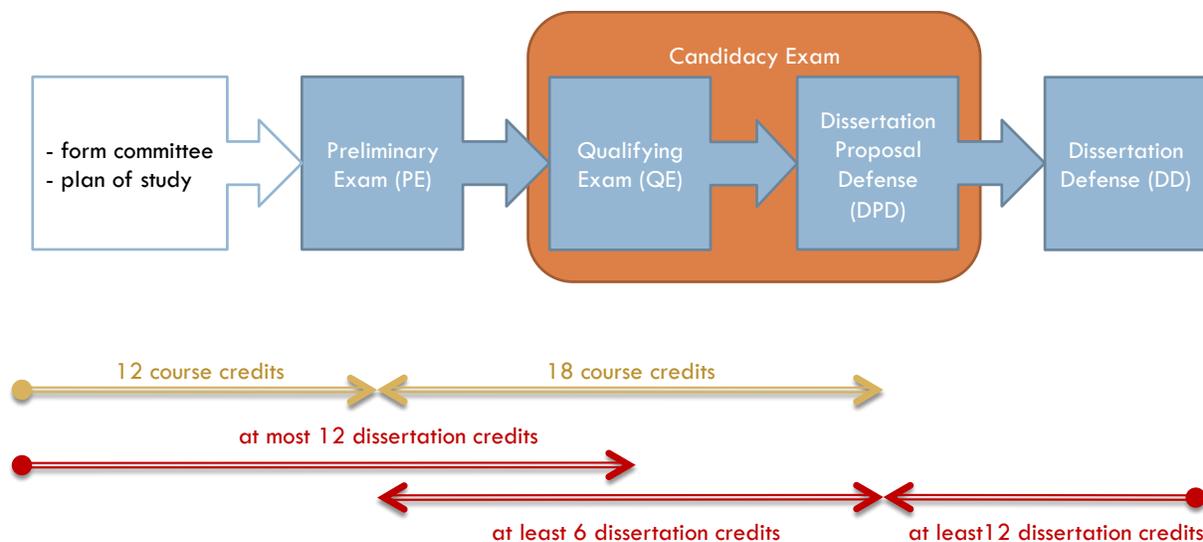
Non-Thesis Route

Prior to beginning of 1st semester.....	See the temporary adviser for course registration
Before the end of 2nd semester.....	File plan of study
During graduating semester	
By the 4th week.....	File application for graduation

DOCTORAL MILESTONES

Prior to the beginning of 1st semester.....	See the temporary adviser for course registration
By second semester.....	Select doctoral committee (DAC)
Before the end of the 2 nd semester.....	File plan of study (POS)
Before candidacy exam.....	Complete most of the courses in POS File the Candidacy Examination Report form, indicating the grades of four PECs (or substitutes)
During candidacy exam semester.....	Pass or waive the Preliminary Exam (PE) Pass the Qualifying Exam (QE)
After completing at least 6 dissertation credit hours	Complete and submit your dissertation proposal Set date and time for proposal exam Contact department for a room Pass Dissertation Proposal Defense (DPD)
After candidacy exam.....	Complete dissertation research
During the graduating semester	
By the 4th week.....	File application for graduation (on-line)
No later than mid-semester.....	Complete dissertation writing Have committee approve the draft
2 weeks before defense.....	Submit dissertation to the committee Schedule date and time for defense Request ECE department for room
At final exam.....	Successful dissertation defense
2 weeks before graduation.....	Submit electronic copy of dissertation to OhioLink

ECE Ph.D. Candidacy Exam at a Glance



Frequently Asked Questions

- I received my Master's degree from UD. Must I take more preliminary exam classes (PEC)?
 - All students are required to complete 12 course credits hours at the Ph.D. level prior to PE.
 - Students who completed 4 PECs (or equivalent) during Masters at UD may apply for a PE waiver using PECs from their M.S. degree. The ECE Graduate Program Committee evaluates the waiver application. The GPA in the four PECs used in the waiver application must be 3.5 or greater for the waiver to be granted.
- I received my Master's degree from another university. Must I take more preliminary exam classes (PEC)?
 - All students are required to complete 12 course credits hours at the Ph.D. level prior to PE.
 - Students who completed 4 PECs (or equivalent) during Masters at another university may apply for a PE waiver using PECs from their M.S. degree. The waiver is granted if the student has a UD GPA of 3.5 or higher, and the combined GPA of four PECs (taken at UD or elsewhere) is 3.5 or higher.
- I successfully completed DPD. Can I take more classes?
 - Students must prove that the course is critical for their research work.
 - Approval by the student's DAC chair is required.
- What will I need to do if I deviate from dissertation credit timeline?
 - Students may take no more than 12 dissertation credits before QE.
 - Students must complete at least 6 dissertation credits before DPD, and at least 12 dissertation credits after DPD.

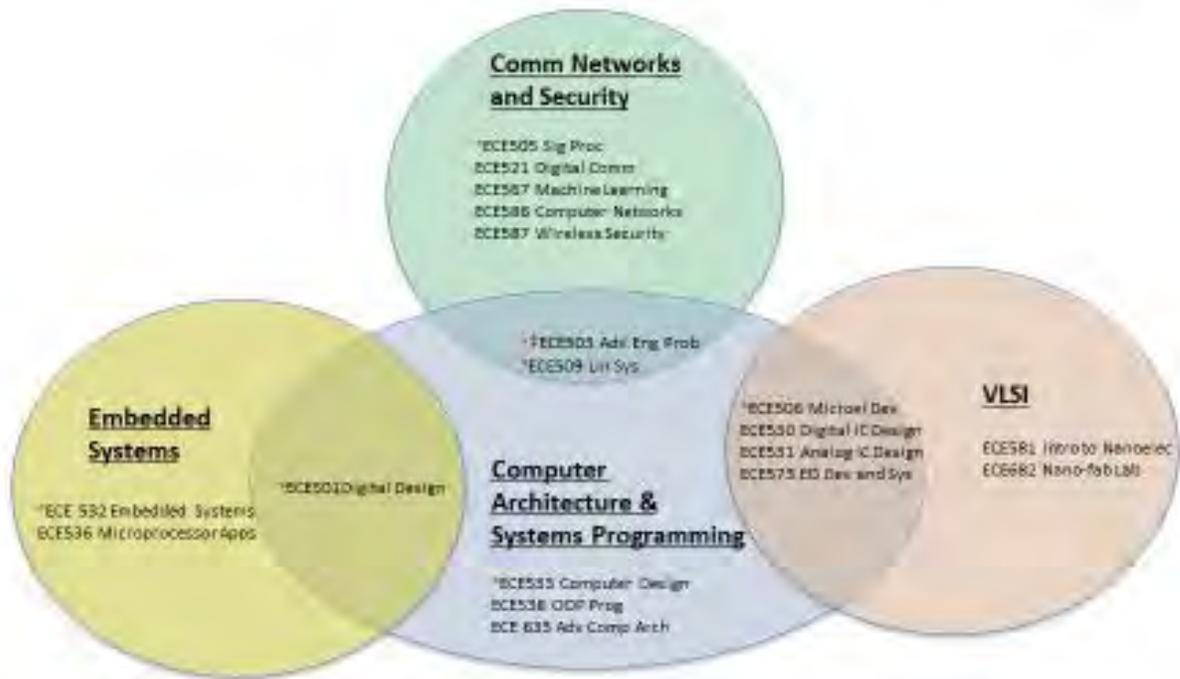
Official Ph.D. policies are detailed in documents below:

- UD Bulletin:** https://ecommons.udayton.edu/bulletin_grad/
- UD Thesis:** <http://libguides.udayton.edu/c.php?g=15209&p=82897>
- ECE Bulletin:** http://www.udayton.edu/engineering/electrical_and_computer/grad_electrical/index.php

ECE Graduate Areas at a Glance

ELE - Computing Systems

Spring 2021

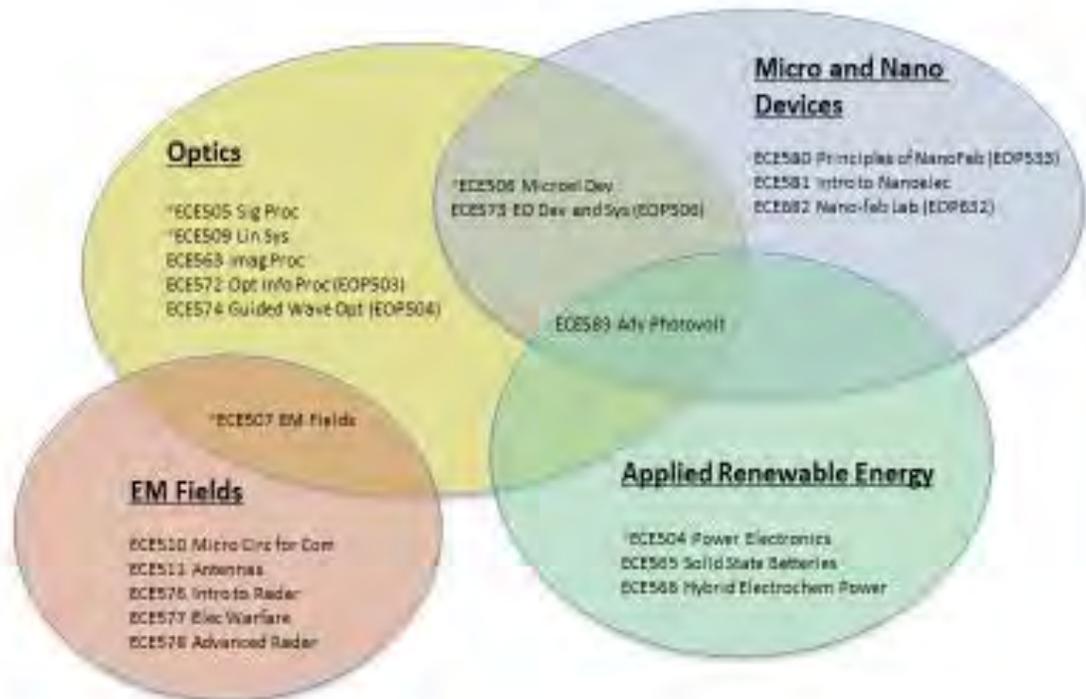


* ELZ core courses

|| PhD math courses

ELE - Sensors and Devices

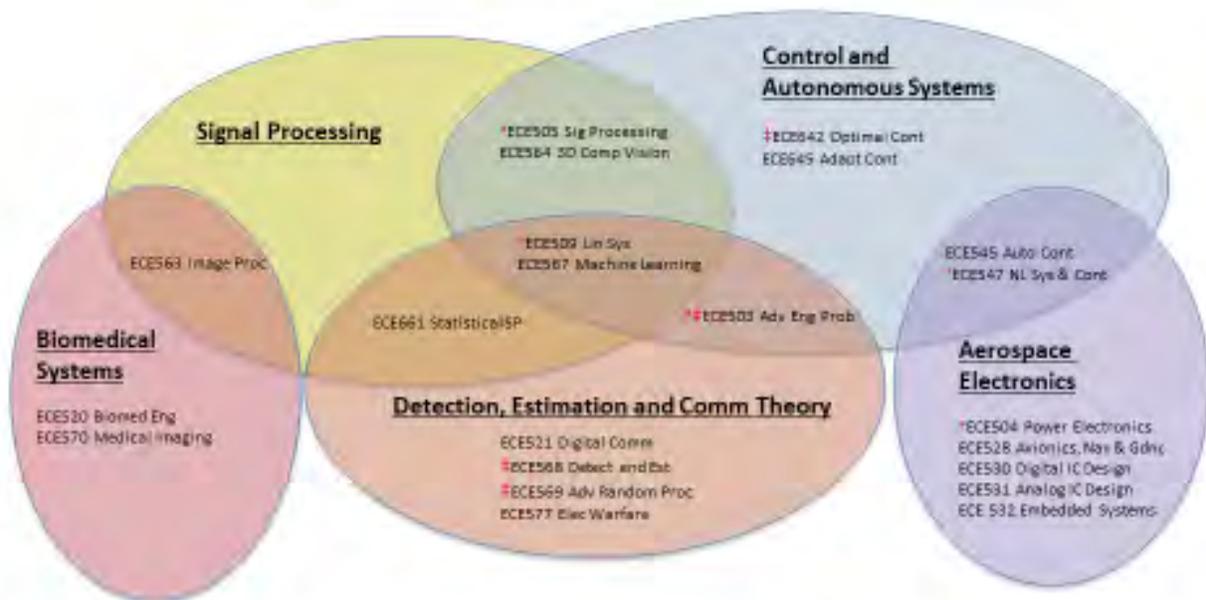
Spring 2021



* EL2 core courses

ELE- Signals and Systems

Spring 2021

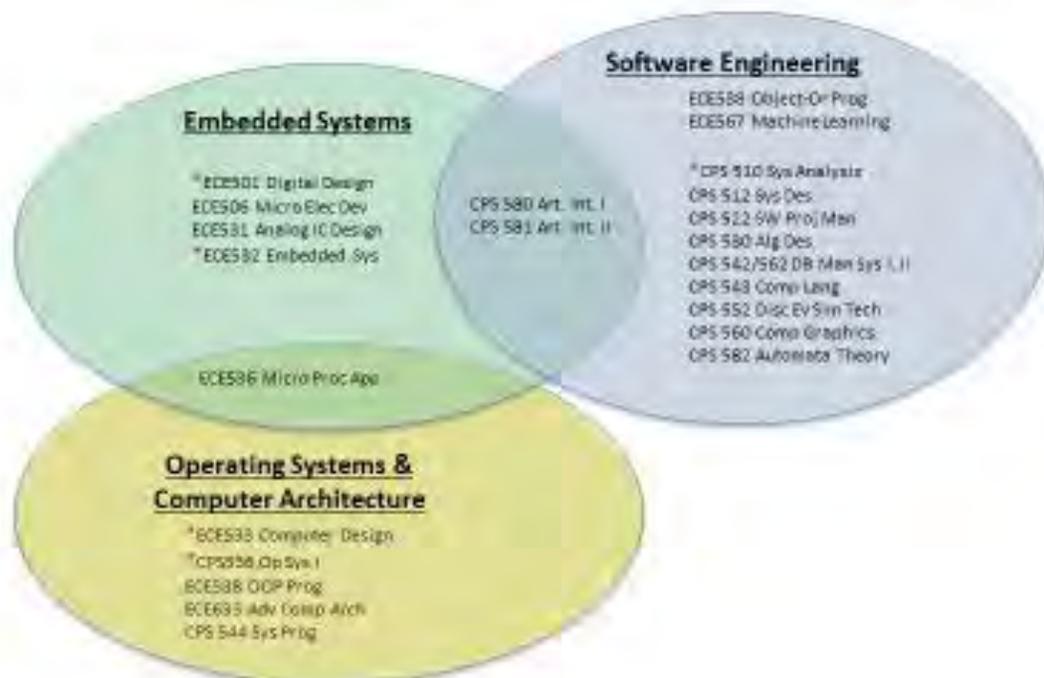


* ELE core courses

* PhD math courses

MSCPE - Programming Systems

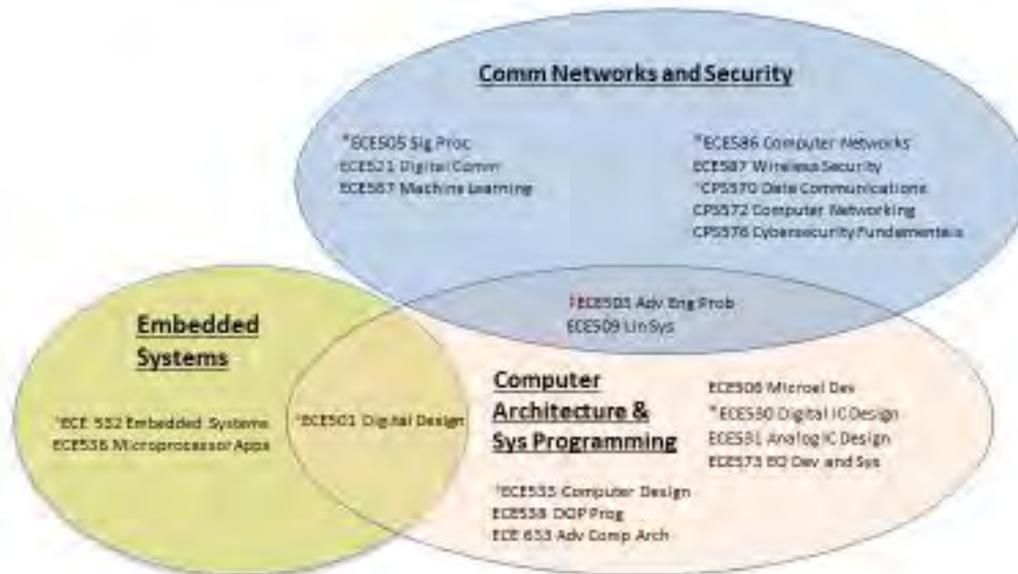
Spring 2021



* CPE core courses

MSCPE - Computing and Networking Systems

Spring 2021



* CPE core courses

‡ PhD/math courses



These three charts give a “bird’s eye” overview of the entire graduate curriculum in the ECE department. Their purpose is to help you, the student, understand the relationships between different areas of study, and also to help you choose your curriculum and define a well-thought-out Plan of Study, in consultation with your M.S. or Ph.D. adviser. By highlighting the relationship between different parts of the ECE graduate curriculum, these charts will also be helpful when your area of research is interdisciplinary in nature.

It is important to note that only the ECE curriculum is shown here, but you will want to keep in mind how your area of study can benefit from coursework in other departments, such as mathematics and computer science. Use these charts to create a draft of your Plan of Study, then finalize it in consultation with your adviser.

For more information, please visit our webpage:

https://www.udayton.edu/engineering/departments/electrical_and_computer/index.php or
contact: Eric Balster, chair, Department of Electrical and Computer Engineering, University of Dayton, Dayton, Ohio, 45469-0232. ph: (937) 229-3611; fax: (937) 229-4529;
e-mail: ebalster1@udayton.edu.

Forms you may need are available at: <https://porches.udayton.edu/web/porches/engineering>

Contact Information for ECE Research Labs

- Advanced Communications Network and Security Lab: Dr. Feng Ye, fye001@udayton.edu
- Center of Excellence in Computer Vision: Dr. Vijayan Asari, ORSP Endowed Chair in Wide Area Surveillance, vasari1@udayton.edu
- Center of Excellence in Distributed Sensing: Dr. Michael Wicks, ORSP Endowed Chair in Sensor Exploitation and Fusion, mwicks1@udayton.edu
- Embedded Data Processing Lab: Dr. Eric Balster, ebalster1@udayton.edu
- Motoman Robotics Lab: Dr. Raúl Ordóñez, rordonez1@udayton.edu
- Nonlinear Controls Lab: Dr. Raúl Ordóñez, rordonez1@udayton.edu
- Signal and Image Processing Lab: Dr. Russell Hardie, rhardie1@udayton.edu
- Intelligent Signals and Systems Lab: Dr. Keigo Hirakawa, khirakawa1@udayton.edu
- Center of Excellence for Thin film Research and Surface Engineering (CETRASE): Dr. Guru Subramanyam, gsubramanyam1@udayton.edu
- Electro-optics Graduate Program and Research: Dr. Partha Banerjee, pbanerjee1@udayton.edu
- Nanofabrication Lab: Dr. Andrew Sarangan, asarangan@gmail.com
- Nanophotonics Lab: Dr. Qiwen Zhan, qzhan1@udayton.edu
- Ladar and Optical Communication Institute (LOCI): Dr. Mikhail Vorontsov, ORSP Endowed Chair in Ladar, mvorontsov1@udayton.edu
- Center for High Performance Computing and Neuromorphic Computing: Dr. Tarek Taha, ttaha1@udayton.edu
- Institute for Development and Commercialization of Advanced Sensor Technologies (IDCAST): Mr. Michael O'Connor, Director, Michael.OConnor@udri.udayton.edu
- Sustainable Power Electronics & Electric Drive (SPEED): Dr. Dong Cao, dcao02@udayton.edu