

## Academic Requirements for First Year PhD Comprehensive Exam in ECE

The ECE Department's PhD graduate research program is partitioned into three main areas of concentration and research:

### A. **Signals and Communications** – including the following graduate level courses:

- 1) ECE 410 Introduction to Augmented and Virtual Reality **NEW**
- 2) ECE 433 Probabilistic Models for Inference and Estimation **NEW**
- 3) ECE 440 Introduction to Random Processes
- 4) ECE 441 Detection & Estimation Theory
- 5) ECE 442 Network Science Analytics
- 6) ECE 444 Digital Communications
- 7) ECE 445 Wireless Communications
- 8) ECE 446 Digital Signal Processing
- 9) ECE 447 Digital Image Processing
- 10) ECE 448 Wireless Sensor Networks
- 11) ECE 449 Machine Vision
- 12) ECE 450 Information Theory
- 13) ECE 451 (BME451) Biomedical Ultrasound
- 14) ECE 452 (BME 453) Medical Imaging-Theory and Implementation
- 15) ECE 453 Ultrasound Imaging
- 16) ECE 457 Digital Video Processing
- 17) ECE 471 Computational Models of Musical Processes
- 18) ECE 472 Audio Signal Processing
- 19) ECE 473 Computational Methods of Music
- 20) ECE 475 Audio Software Design I
- 21) ECE 476 Audio Software Design II
- 22) ECE 477 Computer Audition
- 23) ECE 479 Audio Recording – Technology and Fundamentals

### B. **Integrated Electronics and Computer Engineering** – including the following graduate level courses:

- 1) ECE 400 Computer Organization
- 2) ECE 401 Advanced Computer Architecture
- 3) ECE 402 Memory Systems
- 4) ECE 404 Microprocessor Architecture
- 5) ECE 406 Introduction to Parallel Computing Using GPU's
- 6) ECE 409 (CSC 446) Machine Learning
- 7) ECE 413 Intro. to Hardware Security
- 8) ECE 429 Audio Electronics
- 9) ECE 431 Computational Methods
- 10) ECE 455 Software Analysis and Improvement
- 11) ECE 461 Intro to VLSI
- 12) ECE 462 Advanced CMOS VLSI Design
- 13) ECE 463 VLSI Error Control Systems
- 14) ECE 464 Fundamentals of VLSI Testing
- 15) ECE 465/565 Performance Issues in VLSI/IC Design & Analysis
- 16) ECE 466 RF and Microwave Integrated Circuits
- 17) ECE 467 Advanced Analog Integrated Circuit Design
- 18) ECE 468 Advanced Analog CMOS Integrated Circuit Design II
- 19) ECE 469 High Speed Integrated Electronics

**Physical Electronics, Electromagnetism, and Acoustics** – including the following graduate level courses:

- 1) ECE 421 (OPT 421) Optical Properties of Materials
- 2) ECE 422 Nanoelectronic Devices
- 3) ECE 423 Semiconductor Devices
- 4) ECE 424 Intro to Cond Matter Physics
- 5) ECE 426 (OPT 468) Waveguides & Optoelectronic Devices
- 6) ECE 428 (OPT 425) Radiation and Detectors
- 7) ECE 432 Acoustic Waves
- 8) ECE 433 Musical Acoustics
- 9) ECE 434 Microelectromechanical Systems
- 10) ECE 435 Introduction to Opto-Electronics
- 11) ECE 436 Nanophotonic and Nanomechanical Devices
- 12) ECE 438 Nonlinear Acoustics
- 13) ECE 439 Spatial Audio **NEW**
- 14) ECE 470 Digital Audio Effects **NEW**
- 15) ECE 474 (BME 474) Biomed Sensors, Circuits & Instrumentation
- 16) ECE 520 Spin-based electronics: theory, devices & applications

All first year PhD students must satisfy the following requirements for continuation in the PhD program:

1. **2+1+1 Course Requirement:** All PhD students must take and pass at least 2 graduate level courses (400-level) from their respective concentration area and at least one graduate level course from each of the two remaining areas. The courses must be taken during the first year of study<sup>1</sup>. The specific courses are to be selected by the students in agreement with their research advisors.
2. **Comprehensive Exam:** All PhD students must take an oral exam before the end of their third semester of full-time study<sup>1</sup>. The format of the oral exam (e.g., a question/answer session, a paper presentation or both) shall be determined by the Academic Advisor and shall be conducted in front of at least two faculty in the respective research area. The Advisor and/or Graduate Program Coordinator will provide general guidelines on what is expected of them for the exam. Upon completion of the oral exam, the exam committee shall provide the examination results to the Graduate Program Coordinator to be included in student's academic record. The exam committee shall provide their recommendation at the conclusion of the oral exam, specifically if the student should be allowed to continue to the next stage of their graduate program, if remedial work is required and the exam re-taken, or if the student should not continue in the PhD program. Final action will be taken after the recommendation is approved by the Graduate Program Coordinator and the Department Chair.

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<sup>1</sup> Students may petition to extend the time for completing these requirements. It is expected that part-time students and those with a non-ECE background may need additional time.