

## 15 Depth and Excluded Courses

### 15.1 Depth Courses for Communication, Control, and Signal Processing (CCSP)

EECE 5576 Wireless Communication Systems 4 SH  
EECE 5580 Classical Control Systems 4 SH  
EECE 5610 Digital Control Systems 4 SH  
EECE 5626 Image Processing and Pattern Recognition 4SH  
EECE 5639 Computer Vision 4SH  
EECE 5642 Data Visualization 4SH  
EECE 5664 Biomedical Signal Processing 4SH  
EECE 5666 Digital Signal Processing 4SH  
EECE 5644 Introduction to Machine Learning and Pattern Recognition 4SH  
EECE 5698 Special Topics: Mobile Robotics 4SH  
EECE 5698 Special Topics: Principles of Assistive Robotics 4SH  
EECE 7200 Linear Systems Analysis 4 SH  
EECE 7203 Complex Variable Theory and Differential Equations 4 SH  
EECE 7204 Applied Probability and Stochastic Processes 4 SH  
EECE 7211 Nonlinear Control 4 SH  
EECE 7213 System Identification and Adaptive Control 4 SH  
EECE 7214 Optimal and Robust Control 4 SH  
EECE 7242 Integrated Circuits for Communications & Mixed-Signal Processing 4 SH  
EECE 7245 Microwave Circuit Design for Wireless Communications 4 SH  
EECE 7293 Modern Imaging 4 SH  
EECE 7310 Modern Signal Processing 4 SH  
EECE 7311 Two Dimensional Signal and Image Processing 4 SH  
EECE 7312 Statistical and Adaptive Signal Processing 4 SH  
EECE 7313 Pattern Recognition 4 SH  
EECE 7315 Digital Image Processing 4 SH  
EECE 7323 Numerical Optimization Methods 4 SH  
EECE 7332 Error Correcting Codes 4 SH  
EECE 7334 Wireless Communications 4 SH  
EECE 7335 Detection and Estimation Theory 4 SH  
EECE 7336 Digital Communications 4 SH  
EECE 7337 Information Theory 4 SH  
EECE 7364 Mobile and Wireless Networking 4 SH  
EECE 7370 Advanced Computer Vision 4 SH  
EECE 7393 Analysis and Design of Data Networks 4 SH

EECE 7397 Advanced Machine Learning 4SH  
EECE 7398 Special Topics: Probabilistic System Modeling and Analysis 4 SH  
EECE 7398 Special Topics: Wireless Cognitive Radio Networks 4 SH

## **15.2 Depth Courses for Computer Engineering (CMPE)**

### **ECE Courses**

EECE 5626 Image Processing and Pattern Recognition 4SH  
EECE 5627 Arithmetic and Circuit Design for Inexact Computing 4SH  
EECE 5639 Computer Vision 4SH  
EECE 5640 High Performance Computing 4SH  
EECE 5642 Data Visualization 4SH  
EECE 5643 Simulation and Performance Evaluation 4SH  
EECE 5644 Introduction to Machine Learning and Pattern Recognition 4SH  
EECE 5698 Special Topics in Software Security 4SH  
EECE 5698 Special Topics: Mobile Robotics 4SH  
EECE 7205 Fundamentals of Computer Engineering 4 SH  
EECE 7240 Analog Integrated Circuit Designs 4 SH  
EECE 7313 Pattern Recognition 4 SH  
EECE 7332 Error Correcting Codes 4 SH  
EECE 7334 Wireless Communications 4 SH  
EECE 7352 Computer Architecture 4 SH  
EECE 7353 VLSI Design 4 SH  
EECE 7357 Fault-Tolerant Computers 4 SH  
EECE 7360 Combinatorial Optimization 4 SH  
EECE 7364 Mobile and Wireless Networking 4 SH  
EECE 7368 High Level Design of Hardware Software Systems 4 SH  
EECE 7370 Advanced Computer Vision 4 SH  
EECE 7374 Fundamentals of Computer Networks 4SH  
EECE 7375 Compilers for Modern Architecture 4SH  
EECE 7376 Operating Systems: Interface and Implementation 4SH  
EECE 7390 Computer Hardware Security 4SH  
EECE 7393 Analysis and Design of Data Networks 4 SH  
EECE 7394 Network and System Security 4SH  
EECE 7397 Advanced Machine Learning 4SH  
EECE 7398 Special Topics: Probabilistic System Modeling and Analysis 4 SH  
EECE 7398 Special Topics: Human Centered Computing 4SH

### **Mathematics Courses**

MATH 7232 Combinatorial Analysis 4 SH

MATH 7233 Graph Theory 4 SH

### **CCIS Courses** (subject to space availability, offering and approval from CCIS)

CS 5100 Foundations of Artificial Intelligence 4 SH

CS 5200 Database Management Systems 4 SH

CS 5310 Computer Graphics 4 SH

CS 5340 Computer-Human Interaction 4 SH

CS 5400 Principles of Programming Languages 4 SH

CS 5500 Managing Software Development 4 SH

CS 5600 Computer Systems 4 SH

CS 5770 Software Vulnerabilities and Security 4 SH

CS 6110 Knowledge-based Systems 4 SH

CS 6200 Information Retrieval 4 SH

CS 6310 Computational Imaging 4 SH

CS 6410 Compilers 4 SH

CS 6510 Advanced Software Development 4 SH

CS 6520 Methods of Software Development 4 SH

CS 6530 Analysis of Software Artifacts 4 SH

CS 6540 Foundations of Formal Methods and Software Analysis 4 SH

CS 6610 Parallel Computing 4 SH

CS 6740 Network Security 4 SH

CS 6750 Cryptography and Communication Security 4 SH

CS 6760 Privacy, Security and Usability 4 SH

CS 6810 Distributed Algorithms 4 SH

CS 7800 Advanced Algorithms 4 SH

### **15.3 Depth Courses for Electromagnetics, Plasma, and Optics (ELPO)**

EECE 5648 Biomedical Optics 4 SH

EECE 5694 EM and Photonic Devices 4 SH

EECE 5695 RF and Optical Antennas 4 SH

EECE 5697 Acoustics and Sensing 4 SH

EECE 7105 Optics for Engineers 4 SH

EECE 7202 Electromagnetic Theory 1 4 SH

EECE 7203 Complex Variable Theory and Differential Equations 4 SH

EECE 7245 Microwave Circuit Design for Wireless Communication 4 SH

EECE 7270 Electromagnetic Theory 2 4 SH  
EECE 7271 Computational Methods in Electromagnetics 4 SH  
EECE 7275 Antennas and Radiation 4 SH  
EECE 7276 Microwave Properties of Materials 4 SH  
EECE 7284 Optical Properties of Matter 4 SH  
EECE 7285 Optoelectronics and Fiber Optics 4 SH  
EECE 7287 Optical Detection 4 SH  
EECE 7293 Modern Imaging 4 SH  
EECE 7295 Applied Magnetism 4 SH  
EECE 7296 Electronic Materials 4 SH  
EECE 7297 Advanced Magnetic Materials 4 SH  
EECE 7298 Magnetic Materials Fundamentals and Measurements 4 SH  
EECE 7309 Special Topics in Electromagnetics, Plasma, Optics 4 SH

#### **15.4 Depth Courses for Microsystems, Materials, and Devices (MSMD)**

EECE 5606 Micro- and Nanofabrication 4 SH  
EECE 5647 Nanophotonics 4 SH  
EECE 5648 Biomedical Optics 4 SH  
EECE 5649 CMOS Analog Integrated Circuits 4 SH  
EECE 5680 Electric Drives 4 SH  
EECE 5696 Energy Harvesting Systems 4 SH  
EECE 7201 Solid State Devices 4 SH  
EECE 7240 Analog Integrated Circuit Design 4 SH  
EECE 7241 Advanced Solid State Devices 4 SH  
EECE 7242 Integrated Circuits for Communications & Mixed-Signal Processing 4 SH  
EECE 7243 Integrated Circuit Fabrication 4 SH  
EECE 7244 Introduction to Microelectromechanical Systems (MEMS) 4 SH  
EECE 7245 Microwave Circuit Design for Wireless Communication 4 SH  
EECE 7246 Design and Analysis of Digital Integrated Circuits 4 SH  
EECE 7247 Radio Frequency Integrated Circuit Design 4 SH  
EECE 7353 VLSI Design 4 SH  
EECE 7276 Microwave Properties of Materials 4 SH  
EECE 7284 Optical Properties of Matter 4 SH  
EECE 7295 Applied Magnetism 4 SH  
EECE 7296 Electronic Materials 4 SH  
EECE 7297 Advanced Magnetic Materials 4 SH

EECE 7298 Magnetic Materials Fundamentals and Measurements 4 SH

### **15.5 Depth Courses for Power Systems, Power Electronics, and Motion Control (POWR)**

EECE 5580 Classical Control Systems 4 SH  
EECE 5610 Digital Control Systems 4SH  
EECE 5666 Digital Signal Processing 4SH  
EECE 5680 Electric Drives 1 4SH  
EECE 5682 Power Systems Analysis 1 4SH  
EECE 5684 Power Electronics 4SH  
EECE 5686 Electrical Machines 4SH  
EECE 5688 Analysis of Unbalanced Power Networks 4SH  
EECE 5696 Energy Harvesting Systems 4 SH  
EECE 7200 Linear System Analysis 4SH  
EECE 7211 Nonlinear Control 4SH  
EECE 7212 Multivariable Control Systems 4SH  
EECE 7213 System Identification and Adaptive Control 4SH  
EECE 7214 Optimal and Robust Control 4SH  
EECE 7220 Power System Analysis 2 4SH  
EECE 7221 Power Systems Operation and Control 4SH  
EECE 7323 Numerical Optimization Methods 4SH  
EECE 7224 Power System State Estimation 4SH  
EECE 7226 Modeling of Transients in Power Systems 4SH  
EECE 7335 Detection and Estimation 4SH  
EECE 7236 Special Topics in Control 4SH  
EECE 7237 Special Topics in Power Electronics 4SH  
EECE 7238 Special Topics in Electric Drive 4SH  
EECE 7239 Special Topics in Power Systems 4SH  
ENGR 5670 Sustainable Energy 4SH

### **15.6 Breadth Course for All Concentrations**

The following course can be taken as breadth for all concentration but cannot be taken as depth for any concentration

EECE 7399 Preparing High Stakes Written and Oral Materials

## **15.7 Excluded Courses for All Concentrations**

CS 5010 Programming Design Paradigm 4SH

CS 5320 Digital Image Processing 4SH

CS 5330 Pattern Recognition and Computer Vision 4SH

CS 5520 Mobile Application Development 4SH

CS 5610 Web Development 4SH

CS 5700 Computer Networks 4SH

CS 5800 Algorithms 4SH

CS 6350 Empirical Research Methods 4SH

CS 6120 Natural Language Processing 4SH

CS 6710 Wireless Networks 4SH

In addition to these courses, all courses offered by the Professional Masters Programs, also known as Interdisciplinary Masters Programs, (Computer Systems Engineering, Software Engineering, Energy Systems, Engineering Management, Information Systems, Sustainable Building Systems, and Telecommunications Systems Management) are also excluded, except those explicitly listed under “Depth Courses” of one of the ECE concentrations.

## **16 Depth Courses for New Concentrations (Effective spring 2016)**

### **16.1 Depth Courses for Computer Systems and Software (CSYS)**

EECE 5627 Arithmetic and Circuit Design for Inexact Computing 4SH  
EECE 5640 High Performance Computing 4SH  
EECE 5643 Simulation and Performance Evaluation 4SH  
EECE 7205 Fundamentals Computer Engineering 4SH  
EECE 7352 Computer Architecture 4SH  
EECE 7353 VLSI Design 4SH  
EECE 7357 Fault Tolerant Computers 4SH  
EECE 7360 Combinatorial Optimization 4SH  
EECE 7390 Computer Hardware Security 4SH  
EECE 7376 Operating Systems: Interface and Implementation 4SH  
EECE 7368 High-Level Design of HW/SW Systems 4SH  
EECE 7375 Compilers for Modern Architectures 4SH  
EECE 7398 Special Topics: Advanced Computer Architecture 4SH  
CS 5200 Database Systems Management 4SH  
CS 6410 Compilers 4SH

### **16.2 Depth Courses for Computer Networks and Security (CNWS)**

EECE 5576 Wireless Communication Systems 4SH  
EECE 5640 High Performance Computing 4SH  
EECE 5698 Special Topics: Networks: Technology, Economics, Social Interactions 4SH  
EECE 5698 Special Topics in Software Security 4SH  
EECE 5645 Introduction to Software Security 4SH  
EECE 7204 Applied Probability and Stochastic Processes 4SH  
EECE 7205 Fundamentals Computer Engineering 4SH  
EECE 7352 Computer Architecture 4SH  
EECE 7364 Mobile and Wireless Networking 4SH  
EECE 7360 Combinatorial Optimization 4SH  
EECE 7393 Analysis and Design of Data Networks 4SH  
EECE 7390 Computer Hardware Security 4SH  
EECE 7374 Fundamentals of Computer Networks 4SH  
EECE 7398 Special Topics: Probabilistic System Modeling and Analysis 4 SH  
EECE 7393 Analysis and Design of Data Networks 4 SH  
CS 5700 Fundamentals of Computer Networks 4SH

CS 6754 Secure Wireless Ad-hoc Robots on Mission 1 4SH

CS 7785 Special Topics in Network Science 4SH

### **16.3 Depth Courses for Computer Vision, Machine Learning, and Algorithms (CVLA)**

EECE 5626 Image Processing and Pattern Recognition 4SH

EECE 5639 Computer Vision 4SH

EECE 5640 High Performance Computing 4SH

EECE 5644 Introduction to Machine Learning and Pattern Recognition 4SH

EECE 5642 Data Visualization 4SH

EECE 5698 Special Topics: Mobile Robotics 4SH

EECE 7204 Applied Probability and Stochastic Processes 4SH

EECE 7205 Fundamentals Computer Engineering 4SH

EECE 7313 Pattern Recognition 4SH

EECE 7323 Numerical Optimization Methods 4SH

EECE 7352 Computer Architecture 4SH

EECE 7360 Combinatorial Optimization 4SH

EECE 7370 Advanced Computer Vision 4SH

EECE 7397 Advanced Machine Learning 4SH

EECE 7398 Special Topics: Human Centered Computing 4SH