STEVENS
INSTITUTE OF TECHNOLOGY
1870

Schaefer School of
Engineering and Science

Department of Electrical and
Computer Engineering

MASTER'S STUDENT GUIDE

2023-24

Handbook for ECE Master's Programs

Department of Electrical and Computer Engineering

Fall 2023

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I. Programs

A. General Guidelines

- Refer to your Workday Academic Progress to view your program requirements, how your completed and in-progress courses apply to your program, and to deduce which requirements you still need to fulfill.
    - Each master's program, regardless of major or degree, requires a **concentration** and three courses under that concentration. Workday does not automatically know your intended concentration unless you declare it. Please follow these instructions to declare your concentration by your second semester of study: https://sit.instructure.com/courses/35399/files/8066683?module_item_id=1196138
- Contact the academic advisor, Ms. Nina Cheung at ncheung@stevens.edu with questions.
- Each student is also assigned a faculty advisor, who provides guidance on in-depth and long-term planning, including topics such as selecting a concentration or technical electives. You can find out who is your faculty advisor in Workday and meet your faculty advisor during their office hours or by appointment.

B. Degree Programs and Curriculum

- Master of Engineering (ME) in Electrical Engineering (EE)
- Master of Science (MS) in EE
- Master of Engineering in Computer Engineering (CPE)
- Master of Science in CPE
- Master of Engineering in Applied Artificial Intelligence (AAI)
- Master of Science in AAI

B.1 Program Timeline

- Minimum 30 credits (10 courses) to graduate
    - If you plan to finish your program in four semesters, please enroll in a 3+3+3+1 course load to maintain your F-1 status: https://www.stevens.edu/maintain-your-f-1-status
    - Full-time study: flat-rate tuition charge for 3 or 4 courses per semester.
    - Final semester: per-credit tuition charge for 1 or 2 courses.

B.2 Program Structure

- 500, 600, 700, 800, 900 level courses are for graduate students.
- 100 to 400 level courses are for undergraduate students; Do not take any course under 500 level.

B.3 Academic Plan for ME (Master of Engineering) Degrees

Students are required to complete:

- 1 mathematical foundation course
- 4 core courses in a chosen program
- 3 concentration courses in a chosen concentration
- 2 elective courses

Important note:

- Complete the mathematical course and core courses during the first two semesters of study.
- The elective courses could be any ECE graduate courses at the 500 or 600 levels.
    - If you need to take a non-ECE graduate course as elective, your faculty advisor must approve it before including it in your Academic Plan.
    - The AAI/CPE/EE 800 project course cannot be used as elective.

B.4 Academic Requirements for MS (Master of Science) Degrees

Project Track. Students are required to complete:

- 1 mathematical foundation course
- 4 core courses in a chosen program
- 3 concentration courses in a chosen concentration
- 1 elective course
- one 3-credit project course and EE 820 (0-credit research seminar)

or

Thesis Track. Students are required to complete:

- 1 mathematical foundation course
- 4 core courses in a chosen program
- 3 concentration courses in a chosen concentration
- Two 3-credit 900 thesis (6-credits total)

Important note:

- Complete the mathematical course and core courses during the first two semesters of study.
- MS students in the **Project Track**
    - Must have a project advisor first.
    - Take the 3-credit project course (AAI/CPE/EE 800) in your final semester. Note that AAI/CPE/EE 800 and EE 820 and are co-requisites.
- MS students in the **Thesis Track**
    - Must have a thesis advisor first.
    - Take the first 3-credit thesis course (EE/CPE/AAI 900) and second 3-credit thesis course in your final two semesters as two separate 3-credit courses for a total of 6-credits. 900 thesis culminates in a final paper and defense.

B.5 Course Schedule

- The majority of ECE courses are offered on campus. Online courses are primarily designed for part-time students.
- If a course is offered both on-campus and online, it is denoted as (A/WS).
    - Courses offered only on campus are denoted as (A)
    - Courses offered only online are denoted as (WS)
- Courses offered in Fall, Spring, and Summer semesters are denoted as [F], [S], [M], respectively.
    - [FS] means a course is offered in both the Fall and Spring semesters
- For example, (A/WS) [FS]; (WS) [M] means the course is offered both on-campus and online and in both Fall and Spring semesters. In addition, it is offered online in the Summer.

Note that the course schedule is subject to change depending on enrollment and the availability of resources.

B.6 Program Requirements

B.6.1 Mathematical Foundation Courses (select 1 for each program)

- EE
  - EE 605 Probability and Stochastic Processes I (A/WS) [FS], or
  - EE 602 Analytical Methods in Electrical Engineering (A) [F]
- CPE
  - EE 605 Probability and Stochastic Processes I (A/WS) [FS], or
  - CPE 602 Applied Discrete Mathematics (A) [FS]
- AAI
  - EE 605 Probability and Stochastic Processes I (A/WS) [FS], or
  - EE 602 Analytical Methods in Electrical Engineering (A) [F]

B.6.2 Core Courses (select 4 for each program)

- EE
  - EE 548 Digital Signal Processing (A) [F]; (WS) [SM]
  - EE 603 Linear Systems Theory (A/WS) [FS]; (WS) [M]
  - EE 609 Communication Theory (A) [FS]
  - EE 575 Introduction to Control Theory (A) [FS]; (WS) [S]
  - EE 608 Applied Modeling and Optimization (A) [F]; (WS) [FS]
- CPE
  - CPE 517 Digital and Computer Systems Architecture (A/WS) [FS]
  - CPE 555 Real-Time and Embedded Systems (A) [FS]; (WS) [F/M]
  - CPE 593 Applied Data Structures & Algorithms (A/W) [FS]
  - CPE 690 Introduction to VLSI Design (A) [FS]
  - EE 608 Applied Modeling and Optimization (A) [F]; (WS) [FS]
- AAI
  - AAI 646 Pattern Recognition and Classification (A) [FS]; (WS) [M]
  - AAI 695 Applied Machine Learning (A/WS) [FS]
  - AAI 627 Data Acquisition, Modeling and Analysis: Big Data Analytics (A/WS) [FS]
  - AAI 628 Introduction to Deep Learning for Engineering (WS) [FS]
  - AAI 672 Applied Game Theory and Evolutionary Algorithms (A) [F]
  - EE 608 Applied Modeling and Optimization (A) [F]; (WS) [FS]

B.6.3 Concentration Courses for EE and CPE

- **EE and CPE Concentrations**
  1. Communications (EE)
  2. Power Engineering (EE)
  3. Robotics and Automation Systems (EE)
  4. Microelectronics and Photonics (EE)
  5. Artificial Intelligence (EE and CPE)
  6. Embedded Systems (CPE)
  7. Software and Data Engineering (CPE)
  8. Networks and Security (CPE)

- **Courses for EE and CPE Concentrations**

Concentration 1: Communications (select 3)

- EE 510 Introduction to Radar Systems (WS) [S]
- EE 583 Wireless Communications (A) [F]; (WS) [S]
- EE 585 Physical Design of Wireless Systems (WS) [FS]
- EE 582 Wireless Networking: Architecture, Protocols and Standards (A) [F]; (WS) [M]
- EE 568 Software-Defined Radio (WS) [M]

Concentration 2: Power Engineering (select 3)

- EE 575 Introduction to Control Theory (A) [FS]; (WS) [S]
- EE 589 Introduction to Power Engineering (A)[F]; (WS)[S]
- EE 590 Smart Grid (A) [S]; (WS) [F]
- EE 629 Internet of Things (A) [F]
- CPE 679 Computer and Information Networks (A) [F]; (WS) [FS]
- CPE 691 Information Systems Security (A) [S]; (WS) [F]

Concentration 3: Robotics and Automation Systems (select 3)

- EE 575 Introduction to Control Theory (A) [FS]; (WS) [S]
- EE 621 Nonlinear Control (A) [S]
- EE/CPE 631 Cooperating Autonomous Mobile Robots (A) [S]
- CPE 521 Introduction to Autonomous Mobile Robots (A/WS) [F]
- CPE 645 Image Processing and Computer Vision (WS) [M]
- EE 553 Engineering Programming: C++ (A/WS) [FS]

Concentration 4: Microelectronics and Photonics (select 3)

- CPE 690 Introduction to VLSI Design (A) [FS]
- EE/PEP 503 Introduction to Solid State Physics (A) [S]
- EE/PEP 509 Intermediate Waves and Optics (A) [S]
- PEP 515 Photonics I (A) [F]
- PEP 516 Photonics II (A) [S]

Concentration 5: Artificial Intelligence (select 3)

- AAI 551 Engineering Programming: Python (A/WS [FS]
- AAI 672 Applied Game Theory and Evolutionary Algorithms (A) [F]
- AAI 627 Data Acquisition, Modeling and Analysis: Big Data Analytics (A/WS) [FS]
- AAI 628 Introduction to Deep Learning for Engineering (WS) [FS]
- AAI 646 Pattern Recognition and Classification (A) [FS]; (WS) [M]
- AAI 695 Applied Machine Learning (A/WS) [FS]

Concentration 6: Embedded Systems (select 3)

- CPE 517 Digital and Computer Systems Architecture (A/WS) [FS]
- CPE 555 Real-Time and Embedded Systems (A) [FS]; (WS) [F/M]
- CPE 556 Computing Principles for Embedded Systems (A) [S]; (WS) [S] *(WS start in Spring'24)*
- CPE 690 Introduction to VLSI Design (A) [FS]
- EE 629 Internet of Things (A) [F]

Concentration 7: Software and Data Engineering (select 3)

- CPE 593 Applied Data Structures & Algorithms (A/W) [FS]; (WS starts in Fall 2023)
- EE 551 Engineering Programming: Python (A/WS) [FS]
- EE 552 Engineering Programming: Java (A) [S]; (WS) [FS]
- EE 553 Engineering Programming: C++ (A/WS) [FS]
- EE 627 Data Acquisition, Modeling and Analysis: Big Data Analytics (A/WS) [FS]
- EE 628 Introduction to Deep Learning for Engineering (WS) [FS]
- EE 629 Internet of Things (A) [F]
- CPE 810A Special Topics in Computer Engineering: GPU & Multicore Programming (A) [S]

Concentration 8: Networks and Security (select 3)

- CPE/CS 579 Foundations of Cryptography (A) [S]
- EE 584 Wireless Systems Security (WS) [FS]
- CPE 654 Design and Analysis of Network Systems (WS) [FS]
- CPE 679 Computer and Information Networks (A) [F]; (WS) [FS]
- CPE 691 Information Systems Security (A) [S]; (WS) [F]

B.6.4 Concentration Courses for AAI

- **AAI Concentrations**
  1. Electrical Engineering
  2. Computer Engineering
  3. Data Engineering
  4. Software Engineering
  5. Biomedical Engineering
  6. Systems Biology
  7. Mechanical Engineering
  8. Artificial Intelligence in Design and Construction

- **Courses for AAI Concentrations**

  Concentration 1: Electrical Engineering (select 3)

  - EE 548 Digital Signal Processing (A) [F]; (WS) [SM]
  - EE 575 Introduction to Control Theory (A) [FS]; (WS) [S]
  - EE 582 Wireless Networking: Architecture, Protocols and Standards (A) [F]; (WS) [M]
  - EE 603 Linear Systems Theory (A/WS] [FS]; (WS) [M]
  - EE 609 Communication Theory (A) [FS]
  - EE 608 Applied Modeling & Optimization (A/WS) [FS]

  Concentration 2: Computer Engineering (select 3)

  - CPE 517 Digital and Computer Systems Architecture (A/WS) [FS]
  - CPE 555 Real-Time and Embedded Systems (A) [FS]; (WS) [F/M]
  - CPE 593 Applied Data Structures & Algorithms (A/WS) [FS]
  - CPE 679 Computer and Information Networks (A) [F]; (WS) [FS]
  - CPE 690 Introduction to VLSI Design (A) [FS]
  - EE 608 Applied Modeling & Optimization (A/WS) [FS]

Concentration 3: Data Engineering (select 3)

- CPE 593 Applied Data Structures & Algorithms (A/W) [FS]; (WS starts in Fall 2023)
- AAI 627 Data Acquisition, Modeling and Analysis: Big Data Analytics (A/WS) [FS]
- AAI 628 Introduction to Deep Learning for Engineering (WS) [FS]
- AAI 551 Engineering Programming: Python (A/WS) [FS]

Concentration 4: Software Engineering (select 3)

- CPE 593 Applied Data Structures & Algorithms (A/WS) [FS]; (WS starts in Fall 2023)
- AAI 627 Data Acquisition, Modeling and Analysis: Big Data Analytics (A/WS) [FS]
- Is AAI 628 part of this concentration?
- EE 553 Engineering Programming: C++ (A/WS) [FS]
- EE 552 Engineering Programming: Java (A) [S]; (WS) [FS]
- AAI 551 Engineering Programming: Python (A/WS) [FS]
- CPE 810A Special Topics in Computer Engineering: GPU & Multicore Programming (A) [S]

Concentration 5: Biomedical Engineering

- BME 810: Biomedical Digital Signal Processing
- BME 558: Introduction to Brain Computer Interface
- BME 504/CPE 585: Medical Instrumentation and Imaging

Concentration 6: Systems Biology

- BIO 687: Molecular Genetics
- CH 580 Biochemistry I
- BIO 668 Computational Biology

Concentration 7: Mechanical Engineering

- ME 598 Introduction to Robotics
- ME 621: Introduction to Modern Control
- ME 644: Computer-Integrated Design and Manufacturing

Concentration 8: Artificial Intelligence in Design and Construction

- OE 511 Urban Oceanography
- CM 530 Strategic Responses to Cyclical Environments
- CM 560 Sustainable Design

B.6.5 Electives

- You may choose any ECE graduate course at the 500 or 600 levels as an elective.
  - If you want to take a non-ECE graduate course as an elective, your faculty advisor must approve it before including it in your Academic Plan. Do not request more than two courses from other departments.
  - The AAI/CPE/EE 800 project course cannot be used as an elective.

B.6.6 Project Courses and Thesis Courses for MS Students

- List of Project Courses (3 credits in one semester)
  - AAI/CPE/EE 800 Special Problems in AAI/CPE/EE
  - Take it in your final semester; Could be an individual project or a team-based project
  - Must also enroll in the 0-credit Research Seminar Course EE 820 as a co-requisite for AAI/CPE/EE 800
- List of Thesis Courses (6 credits in two semesters)
  - AAI/CPE/EE 900 Thesis Course in AAI/CPE/EE
  - Take the first 3-credit thesis and second 3-credit thesis courses in your final two semesters as two separate 3-credit courses for a total of 6-credits.
  - Strongly recommend enrolling in the 0-credit Research Seminar Course EE 820

Important note:

We recommend that you begin your 800 or 900 enrollment in advance, before the start of each term, since the enrollment process has many steps.

B.7 Online Courses Offered in the Summer (denoted as [M])

- CPE 555WS Real-Time and Embedded Systems (WS) [M]
- CPE 645WS Image Processing & Computer Vision (WS) [M]
- AAI/CPE 646WS Pattern Recognition & Classification (WS) [M]
- EE 548WS Digital Signal Processing (WS) [M]
- EE 568WS Software-Defined Radio (WS) [M]
- EE 603WS Linear System Theory (WS) [M]
- EE 582 Wireless Networking: Architecture, Protocols and Standards (WS) [M]

C. Graduate Certificate Programs (Optional)

1. Artificial Intelligence for Engineering
2. Power Systems Engineering
3. Autonomous Robotics
4. Microelectronics
5. Photonics
6. Real-Time & Embedded Systems
7. Secure Network Systems Design
8. Software Design for Embedded and Information Systems
9. Wireless Communications

For more details, please refer to: https://www.stevens.edu/academics/academic-catalog. Note that not all certificate courses are offered every year.

D. Program Change Policy

- Need a minimum 3.85 GPA to request ME to MS program change.
  - ME to MS program change requests will not be granted to first semester students until all your first semester grades are submitted to reflect the minimum 3.85 GPA.
  - Contact Ms. Nina Cheung at ncheung@stevens.edu with questions.
- There is no minimum GPA requirement to request MS to ME program change.
- Students need to submit a new application for degree and major changes.

II. Advising

A. Advising and Student-Faculty Interaction

- Academic advisor: Ms. Nina Cheung, ncheung@stevens.edu
    - Advises on Academic Progress and Program Completion
- Review your **Workday Academic Progress** page:
    - Sign-in to Workday --> Go to the **ACADEMICS** tab --> Go to your **ACADEMIC PROGRESS** --> View your **MASTERS PROGRAM REQUIREMENTS**.
    - The MASTERS PROGRAM REQUIREMENTS chart displays how your COMPLETED and IN PROGRESS courses apply to your academic requirements: 1 math, 4 core, 3 concentration courses, 2 electives for the ME degree / project and elective *or* thesis for the MS degree.
- ECE Student-Faculty Social Hour
    - One Wednesday in the 2nd or 3rd month of each semester. Check your Stevens email for details.
- ECE Student Advisement Canvas page for announcements, events, and forms
    - Link: https://sit.instructure.com/courses/43625
    - Email Nina to join the course

B. Academic Policies and Procedures

https://my.stevens.edu/provost/grad-academics-and-student-success/content/academic-policies-and-procedures

C. Planning for a Successful Stevens' Experience

- Cultural and extracurricular experience
- Design project and research experience
    - Visit the department website to learn ECE's 4 research clusters and faculty's research: https://www.stevens.edu/schaefer-school-engineering-science/departments/electrical-computer-engineering/research
    - ECE Research Scholarship Program. Details will be announced in ECE Student Advisement.
- ECE seminar talks: EE 820, 0-credit, Wednesday, 2:00 - 3:00 PM. Check Canvas announcements.
    - All MS students in the Project Track must register EE 820 and attend all talks.
    - All ME students and MS students in the Thesis Track are strongly recommended to register for EE 820 and attend all talks.
- Seminars organized by the School and Institute. Check your Stevens email.
- Activities organized by the Graduate Student Affairs. Check your Stevens email.
- Internship and work experience
    - Internship (CPT) – 1-3 credit CPT course with a maximum of 3 credits total for all semesters.
    - Work experience (OPT): Inquire at International Student and Scholar Services (ISSS). https://www.stevens.edu/directory/international-student-and-scholar-services
    - On-campus jobs: https://www.stevens.edu/directory/student-employment-office
    - Student career center: https://www.stevens.edu/directory/stevens-career-center

- ISSS: https://www.stevens.edu/directory/international-student-and-scholar-services
- Graduate Student Code of Academic Integrity: https://www.stevens.edu/sites/stevens_edu/files/Graduate-Student-Code-Academic-Integrity.pdf
- Mental health and wellness https://www.stevens.edu/directory/counseling-and-psychological-services
- IEEE and ASEE societies: www.ieee.org; www.asee.org
- Safety and drug-free environment
- Study for a Ph.D. degree in EE and CPE

D. English Language Experience

- English Language Communication courses:
  ELC 071: 4-credits, ELC 081: 2-credits, ELC 091: 2-credits
  https://web.stevens.edu/catalog/archive/2014-2015/special.html

Appendix. AAI/CPE/EE 800 project course enrollment process

If you are a Master of Science (MS) student in the Project Track, you need to take one 3-credit project course (AAI/CPE/EE 800) in the third semester. Below is the process to enroll in the course. Please contact Nina (ncheung@stevens.edu) for questions.

1. Select one project from the AAI/CPE/EE 800-Project-List and contact the professor who will advise your 800 project.
2. Fill in the AAI/CPE/EE 800 Project Enrollment form. This form confirms that you are eligible for an 800 project and that you have secured an ECE professor to advise you on a project.
3. Submit the Workday 800 Project request by following these steps:
   Request "Course Section Pre-requisite Override." You can find this request by searching in the global search bar for "Course Section Pre-requisite Override" (it should populate the item based on the part of the name), fill out the form with the course information and course section you want to enroll in, and then fill out the questionnaire on the following page. Once you submit the questionnaire, the request will route through Workday. If approved, you will receive a notification in Workday, which you can view by clicking on the bell icon. Once the request is approved, you should be able to enroll in the 800 project course. Link for Workday Student Processes: https://sit.instructure.com/courses/35399/modules.
4. You must also enroll in EE 820 - Research Seminar when enrolling in the AAI/CPE/EE 800 project course. EE 820 is a zero-credit, Pass/Fail seminar course. Students need to attend seminars to hear distinguished lectures on field-related topics.

Important note:
Students have until the end of add/drop period to change their enrollment. We recommend that you begin your 800 enrollment in advance, before the start of each term, since the enrollment process has many steps.