Marquette University
Department of Electrical and Computer Engineering

Registration Form and Rules for
Doctoral Written Qualifying Exam (WQE)
and
Written Comprehensive Exam (MS COMP)

Last updated: March 23, 2023

MS Written Comprehensive Exam – (MS COMP)

1. Fundamentals Exam Requirement: covering topics from EECE6010; this is the Math Exam on Page 9

2. Major Exam Requirement: One major exam in the declared specialization area
   see the specializations below and the list of exams on Page 9
   Major Exam _____

Student's area of specialization: Select one from the eight areas of specialization <u>LINK</u> shown below.

<u>Specializations in Electrical Engineering:</u>

1. Signal Processing ---☐
2. Communications ---☐
3. Control Systems ---☐
4. Power & Energy System ---☐
5. Electronic Devices and Microsystems --☐

<u>Specializations in Computer Engineering:</u>

6. Machine Learning and Algorithms ---☐
7. Embedded Systems and Internet of Things (IoT) --☐
8. Computer Vision and Image Processing ---☐

<u>**Important:**</u> **All exams should be identified by exam names and <u>not</u> the course name or number. Registration form should exactly match the name of the exam as listed in this document (both Major and Minor exams). Refer to the list and definition of the EECE major and minor exams in this document**

Doctoral Written Qualifying Exam (WQE)

Student's area of specialization: Select one from the eight areas of specialization <u>LINK</u> shown below.

<u>Specializations in Electrical Engineering:</u>

9. Signal Processing --☐
10. Communications --☐
11. Control Systems ---☐
12. Power & Energy System --☐
13. Electronic Devices and Microsystems --☐

<u>Specializations in Computer Engineering:</u>

14. Machine Learning and Algorithms --☐
15. Embedded Systems and Internet of Things (IoT) ---☐
16. Computer Vision and Image Processing --☐

Consult with the attached WQE rules and enter your Major and Minor Requirements for the exam:

1. Major Exam #1: _____

2. Major Exam #2: _____

3. Minor Exam #1: _____

4. Minor Exam #2: _____

Important: All exams should be identified by exam names and <u>not</u> the course name or number. Registration form should exactly match the name of the exam as listed in this document (both Major and Minor exams). Refer to the list and definition of the EECE major and minor exams in this document.

1. Signal Processing

Major Requirements:

Probability Exam	(**Weight = 0.25**)	[3 hours]
Signal Processing Exam	(**Weight = 0.35**)	[3 hours]

Minor Requirements:

Minor exam 1*	(**Weight = 0.2**)	[2 hours]
Minor exam 2*	(**Weight = 0.2**)	[2 hours]

* Choose from the list of Signal Processing specialization minor exams shown below:

- Communications

- Either Control Systems or Modern Control

- Either Machine Learning or Algorithms

- Computer Vision and Image Processing

- Embedded Systems and Internet of Things (IoT)

- One from: Basic Power Electronics, Basic Electrical Machine and Drives, Electrical Transients, or Power and Energy Systems Protection

- Either Solid State Physics or Introduction to MEMS

- Electromagnetic Fields

2. Communications

Major Requirements:

Probability Exam **(Weight = 0.25)** [3 hours]

Communications Exam **(Weight = 0.35)** [3 hours]

Minor Requirements:
Minor exam 1* **(Weight = 0.2)** [2 hours]

Minor exam 2* **(Weight = 0.2)** [2 hours]

* Choose from the list of Communications specialization minor exams shown below:

- Signal Processing

- Either Control Systems or Modern Control

- Either Machine Learning or Algorithms

- Computer Vision and Image Processing

- Embedded Systems and Internet of Things (IoT)

- One of: Basic Power Electronics, Basic Electrical Machine and Drives, Electrical Transients, or Power and Energy Systems Protection

- Either Solid State Physics or Introduction to MEMS

- Electromagnetic Fields

3. Control Systems

Major Requirements:

Probability Exam	(**Weight = 0.25**)	[3 hours]
Modern Control Exam	(**Weight = 0.35**)	[3 hours]

Minor Requirements:

Minor exam 1*	(**Weight = 0.2**)	[2 hours]
Minor exam 2*	(**Weight = 0.2**)	[2 hours]

* Choose from the list of Control Systems specialization minor exams shown below:

- Signal Processing

- Communications

- Either Machine Learning or Algorithms

- Computer Vision and Image Processing

- Embedded Systems and Internet of Things (IoT)

- One of: Basic Power Electronics, Basic Electrical Machine and Drives, Electrical Transients, or Power and Energy Systems Protection

- Either Solid State Physics or Introduction to MEMS

- Electromagnetic Fields

4. Power and Energy Systems

Major Requirements:

Basic Electrical Machine and Drives Exam	(**Weight= 0.25**)	[3 hours]

Power and Energy Systems Core Exam   (**Weight= 0.35**)   [3 hours]
- Basic Power Electronics Exam   (**Weight= 0.2**)
- One of   (**Weight= 0.15**)

  - Electrical Transients Exam

  - Power and Energy Systems Protection Exam

  - Control Systems Exam

Minor Requirements:

Minor Exam 1*	(**Weight = 0.2**)	[2 hours]
Minor Exam 2*	(**Weight = 0.2**)	[2 hours]

* Choose from the list of Power and Energy Systems specialization minor exams shown below:

- Either Machine Learning or Algorithms

- Computer Vision and Image Processing

- Embedded Systems and Internet of Things (IoT)

- Signal Processing

- Communications

- Either Control Systems or Modern Control (if control systems is not used to fulfill major requirements)

- Probability

- Either Solid State Physics or Introduction to MEMS

- Electromagnetic Fields

-                    -

5. Electronic Devices and Microsystems

Major Requirements:

Math Exam   (**Weight = 0.25**)   [3 hours]

Electronic Devices and Microsystems Core Exam   (**Weight= 0.35**)   [3 hours]
- Solid State Physics Exam
- Any 3 questions from the following two exams
  - Introduction to MEMS Exam (3 questions)
  - Electromagnetic Fields Exam (3 questions)

Minor Requirements:

Minor Exam 1*   (**Weight = 0.2**)   [2 hours]

Minor Exam 2*   (**Weight = 0.2**)   [2 hours]

* Choose from the list of Electronic Devices and Microsystems specialization minor exams shown below:

- Either Machine Learning or Algorithms

- Computer Vision and Image Processing

- Embedded Systems and Internet of Things (IoT)

- Signal Processing

- Communications

- Either Control Systems or Modern Control

- Probability

- One of: Basic Power Electronics, Basic Electrical Machine and Drives, Electrical Transients, or Power and Energy Systems Protection

6-8. All (three) Computer Engineering Specializations

Major Requirements:

Machine Learning Exam	(**Weight = 0.3**)	[3 hours]
Algorithms Exam	(**Weight= 0.3**)	[3 hours]

Minor Requirements:

Minor exam 1*	(**Weight = 0.2**)	[2 hours]
Minor exam 2*	(**Weight = 0.2**)	[2 hours]

* Choose from the list of Computer Engineering specialization minor exams shown below:

- Signal Processing

- Communications

- Either Control Systems or Modern Control

- Probability

- One of: Basic Power Electronics, Basic Electrical Machine and Drives, Electrical Transients, or Power and Energy Systems Protection

- Electromagnetic Fields

- Either Solid State Physics or Introduction to MEMS

- Computer Vision and Image Processing

- Embedded Systems and Internet of Things (IoT)

EECE Major Exams

Exam Name	Topics covered in	Duration
Math (also used as the Fundamentals Exam)	EECE 6010	3 hours
Probability	EECE 6020	3 hours
Signal Processing	EECE 5510	3 hours
Communications	EECE 5560	3 hours
Modern Control	EECE 6310	3 hours
Basic Electrical Machine and Drives	EECE 5210	3 hours
Power and Energy Systems Core		3 hours
Basic Power Electronics	EECE 5220	
+ one of		
Electrical Transients	EECE 5250	
Power and Energy Systems Protection	EECE 5240	
Control Systems	EECE 5310	
Solid State Physics	EECE5430	3 hours
Electronic Devices and Microsystems Core		3 hours
Any 3 questions from the following two exams:		
Introduction to MEMS (3 questions)	EECE6245	
Electromagnetic Fields (3 questions)	Either one of EECE 5100, 5110, 6110 or 6120	
Machine Learning	EECE 6822	3 hours
Algorithms	EECE 6810	3 hours

EECE Minor Exams

A minor exam is a two-hour exam on the following topics[*]:

- The topic of any major requirement exam (machine learning, algorithms, basic electrical machine and drives, probability, modern control, basic power electronics, electrical transients, power and energy systems protection, control systems, math, solid state physics, microsystems, communications, or electromagnetic fields)
- computer vision and image processing
- embedded systems and internet of things (IoT)

*Each specialization has additional restrictions on the selection of the minor exam.
Major and Minor Exams selected and listed on the registration form should be copied exactly from the exam names shown above. Do not use course numbers.