MSE Comprehensive Exam

The MSE requires a comprehensive examination, which is quite general in nature. It is administered on the sixth Friday of the semester, consists of a written exam in the major area of study, and covers material through the master’s degree level. The ECEE area committee makes up the written exam.

The exam takes three hours. A grade of 60% or more is required to pass this exam.

The student must sign up for the exam by submitting the MSE Comprehensive Exam Sign Up to the ECEE graduate office by the end of the second week of classes. Before taking this exam, the student must have an approved Plan of Study with Graduate Education.

Any student failing the exam may petition to attempt it a second time. There is no guarantee that the petition will be accepted. A third exam will not be permitted.

The six major areas of study are:

- Control systems
- Electromagnetics, antennas and microwave circuits
- Electronic and mixed-signal circuit design
- Electric power and energy systems
- Physical Electronics and Photonics
- Signal processing and communications

A description of the exam for each of the six major areas of study appears on the following pages.
MSE Comprehensive Exam Descriptions by Area

**Control systems**

Closed book
Calculators are allowed

The exam covers undergraduate and graduate controls classes taken by the students in the exam. Typically the topics covered are:
2 questions from EEE 480/591
2 questions from EEE 481/591
2 questions from EEE 582
1 question from EEE 587
1 question from EEE 586
1 question from EEE 511/Random Processes
1 question from EEE 588 or EEE 586 or EEE 587

The choices of last two problems depend on the student background. Out of the ten questions the students should answer 7 correctly to receive full marks (100%). The passing grade is 60%.
Electromagnetics, antennas and microwave circuits

Closed book, Closed notes exam
Hand calculators allowed; NO laptops
No ‘cheat’ sheets with equations or any other material

1. Ten problems will be made available, but student can only attempt/choose seven
2. Each of the seven attempted/chosen problems is graded on the basis of 10 (maximum)
3. The maximum score you can get is 70; passing grade is 42 (60% of 70)
4. Questions/problems covering undergraduate electromagnetics classes (EEE 241 and EEE 341)
5. Questions/problems from the 400-level and 500-level electromagnetic classes taken from the POSs of those attempting the exam
6. Therefore, because of 5, each student taking the MSE exam most likely will not have taken all the classes from which problems are selected
Electronic and mixed-signal circuit design

Closed book exam
Calculators allowed

Courses covered:

1. EEE 425/591 - Digital Systems and Circuits
2. EEE 433/591 - Analog Integrated Circuits
3. EEE 523 - Advanced Analog Integrated Circuits
4. EEE 525 - VLSI Design

There will be three questions from each course. Students choose any eight questions to answer. To pass the exam, a score of 60% or better is required. Practice exams are not available.
Electric Power and Energy Systems- New as of June 5, 2019

1. Closed book exam  
2. No notes or handbooks  
3. Calculators only (use of cell phones or computer tablets is prohibited)  
4. The questions on the exam will be basic questions such that any MSE power student, who has taken the corresponding class, should be able to answer the question

The MSE exam will have a **Section A** and a **Section B. Students must answer a total of exactly seven (7) questions with at least three (3) from Section A and at least three (3) from Section B of the MSE Comprehensive Exam.**

**Section A:** Section A will cover 3 core classes: **EEE 572 Advanced Power Electronics, EEE 577 Power System Operations and Planning, and EEE 579 Transmission and Distribution.** There will be two (2) questions corresponding to each class giving Section A six (6) questions in total.

**Section B:** When signing up for the MSE Comprehensive Exam, each student will select between a minimum of four (4) and a maximum of six (6) power classes from those listed in Table 1. Each class selected by the student will have one (1) corresponding question in Section B.

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<th>EEE 562 - Reactor Theory and Design</th>
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<td>EEE 598_9 - Power System Reliability</td>
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**Please note that EEE 591 courses are not listed above. EEE 591 content is typically at the undergraduate level and these courses are not considered as sufficient preparation for the MSE Comprehensive Exam.**

**A total score of at least 420/700 is needed to pass the MSE Comprehensive Exam.**

To view sample problems from previous exams- please refer to this website:  
[https://sites.google.com/asu.edu/ee-mse-epes-comp_exam/home](https://sites.google.com/asu.edu/ee-mse-epes-comp_exam/home)
Physical Electronics and Photonics

Closed book
Calculators are allowed

Students have to choose 4 classes to be tested on:

Students choose minimum 3 of the 7 Solid-State Electronics Graduate classes highlighted in red (core courses) + 1 or less from the 591 classes the equivalents of which are listed in the Physical Electronics and Photonics Undergraduate classes.

- Also, students can choose only one from 465 and 565.
- Students can choose only one from 531 and 436.
- Students can choose only one from 437 and 537.
- 598 classes will not be allowed for selection.
- Professor chosen to prepare the exam might not necessarily be the professor that taught the class.
- Students will be given 12 questions (3 questions per class selected to be tested on), and 8 questions must be answered.

List of Solid-State Electronics Graduate Classes (Classes marked in red are core courses)

530 Advanced Silicon Processing
531 Semiconductor Device Theory I
532 Semiconductor Device Theory II
533 Semiconductor Device/Process Simulation
534 Semiconductor Transport
535 Electron Transport in Nanostructures
536 Semiconductor Characterization
537 Semiconductor Optoelectronics
539 Fundamentals of Solid-State Electronics
565 Solar Cells

List of Solid-State Electronics Undergraduate Classes that can be taken as EEE591 Courses

434 Quantum Mechanics for Engineers
435 Fundamentals of CMOS and MEMS
436 Fundamentals of Solid-State Devices
437 Optoelectronics
439 Semiconductor Facilities and Cleanroom Practices
465 Photovoltaic Energy Conversion
**Signal processing and communications systems**

The test is composed of two parts. Students must work four questions from Part 1, and three questions from Part 2.

Students may use a calculator, but no other reference material.

Courses normally covered in Part 1
EEE 203 Signals and Systems (1 question)
EEE 350 Random Signal Analysis (1 question)
EEE 404 Real-Time DSP (1 question)
EEE 407 Digital Signal Processing (2 questions)
EEE 455 Communication Systems (2 questions)

Courses normally covered in Part 2 (1 question per course)
EEE 506 Digital Spectral Analysis
EEE 510 Multimedia Signal Processing
EEE 551 Information Theory
EEE 552 Digital Communications
EEE 554 Random Signal Theory
EEE 459 Communication Networks
EEE 507 Multidimensional Signal Processing
EEE 508 Digital Image/Video Processing and Compression
EEE 558 Wireless Communications
EEE 557 Broadband Networks
EEE 505 Time-Frequency Signal Processing

For sample exams from the past three semesters please visit
[https://sites.google.com/asu.edu/ee-mse-sigproccom-com-exam/home](https://sites.google.com/asu.edu/ee-mse-sigproccom-com-exam/home)