

## Ph.D. in Engineering

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**Degree Codes:** ES PhD ENGR

**Concentration:** Micro and Nanoscale Systems Engineering

Course Category	Number	Course Name		SCH
<b>Core Courses</b>	MATH 574	Numerical Solutions of PDE	3	9
	ENGR 641	Formulation of Solutions to Engineering Problems	3	
	STAT 620	Theory of Probability	3	
<b>Concentration Courses<sup>1</sup></b>	MSE 501	Fundamentals of Microfabrication Processes	3	12
	Select three of the following five courses			
	MSE 502	Microsystems Principles	3	
	MSE 504	Advanced Materials for Micro/Nano Devices & Systems	3	
	MSE 505	Nanotechnology Principles	3	
	MSE 506	Micro/Nano Scale Materials Measurements & Analysis	3	
	MSNT 506	Nanofabrications by Self-Assembly	3	
<b>Qualifying Examinations<sup>2</sup></b>	ENGR 685	Written Qualifying Exam	0	
	ENGR 686	Oral Comprehensive Exam (pre-requisite ENGR 685)	0	
<b>Doctoral Seminar</b>	ENGR 611	Dissertation Enhancement Seminar (taken three times)	1	3
<b>Directed Study</b>	ENGR 650 <sup>3</sup>	Doctoral Directed Study (take up to 6 SCH)	6	6
<b>Electives</b>	Select six (18 semester hours) courses from electives list or others approved by advisory committee			18
<b>Research and Dissertation<sup>4</sup></b>	ENGR 651	Pre-Candidacy Doctoral Research	1-9	9
	ENGR 751	Post-Candidacy Dissertation Research	1-9	9
				Total 66

<sup>1</sup> The concentration courses for the concentration in Micro and Nanoscale Systems Engineering.

<sup>2</sup> The qualifying examinations are managed by the Chair of the Advisory Committee. ENGR 685 consists of a written exam of topics covered in the curriculum. ENGR 686 is a presentation of preliminary research achievements, a defense of proposed PhD research, and a demonstration of sufficient knowledge of topics covered in the curriculum. A written proposal is required before a student may enroll in ENGR 686. None of the examinations may be taken more than two times.

<sup>3</sup> Taken under the supervision of the faculty member. Can be a preparation for the research leading to the dissertation.

<sup>4</sup> Complete 9 SCH of ENGR 651 prior to ENGR 686. After successful passing ENGR 686, complete 9 SCH of ENGR 751. Registration in any quarter is for 1 to 3 semester hours or multiples thereof, up to a maximum of 9 semester hours per quarter.

\*Students are expected to have published one or more peer reviewed journal publications or conference proceedings by the time they graduate.

**Suggested Electives**

BIEN 510	Bioinstrumentation	ENGR 622	The Academic Enterprise
BIEN 523	Nanomedicine	ENGR 631	Global Competitiveness and Management of Technology
BIEN 557	Special Topics: BioMEMS	MEEN550B	Advanced Manufacturing Processes
BIEN 557	Special Topics: Protein Engineering	MEEN 557	Durability of Materials
CMEN 504	Advanced Chemical Engineering Kinetics	MEMT 508	Finite Element Analysis
CMEN 513	Transport Phenomena	MEMT 511	Modern Engineering Materials
CMEN 522	Advanced Thermodynamics	MSE 504	Adv. Mat. Micro/nano Dev/sys
CMEN 557	Special Topics: Nanosystems Modeling	MSE 507/ ELEN 537	Advanced Microfabrication with CAD
CHEM 502	Selected Topics in Organic Chemistry: Principles of Polymers	MSE 508/ ELEN 538	Advanced Microelectronics Devices with CAD
CHEM 524	Quantum Chemistry	MSE 510	Microsystem Design, Fabrication, and Testing Laboratory
ELEN 533	Optoelectronics	MSE 512/ CMEN557	Biotechnology Principles
ELEN 535	Adv Topics In Microelectronics	MSE 557	Nanosystems And Devices
ENGR 566	Quality in Engineering	PHYS 512	Solid State Physics
ENGR 592	Engineering Computational Methods	STAT 621	Theory of Statistics

**Plan of Study Important Information:** When entering information in the plan of study, it is important to note that only core courses and all core courses need to be put in section 1.1, while all others are put in section 1.2 (i.e. special topics, seminar, and research courses).

Updated 4/2018