

Ph. D. in Engineering

Micro/Nanotechnology and Micro/Nanoelectronics Emphasis

Recommended Plan of Study (09/2006)

Degree Codes: ES PhD ENGR

Contact: Professor Kody Varahramyan

General Core Courses

Take all three of the following: (9 SCH)

ENGR 641	Formulation of Solutions to Engineering Problems (<i>Fall</i>)
STAT 505	Statistics for Engineering and Science (<i>Winter</i>)
MATH 574	Numerical Solutions to PDEs (<i>Spring</i>)

Disciplinary (Micro/Nano) Core Courses

Take the **first two** and choose **two** from the remaining three: (12 SCH)

MSE 501	Fundamentals of Microfabrication Processes
MSE 502	Microsystems Principles
MSE 504	Advanced Materials for Micro/Nano Devices & Systems
MSE 505	Nanotechnology Principles
MSE 512	Biotechnology Principles

Qualifying Examinations

ENGR 685	Doctoral Qualifying Examination
ENGR 686	Oral Comprehensive Examination

Doctoral Seminar: 3 SCH

All students are automatically enrolled in the Doctoral Seminar course (ENGR 610) each Fall quarter. 3 SCH of the seminar may be counted towards the degree.

Independent Study and Special Topics (12 SCH total)

At least two Doctoral level Special Topics courses (ENGR 657) are part of the required course work for the degree, for a total of 6 SCH.

A PhD student must participate in 6 SCH of Doctoral Independent Study (ENGR 650) under the supervision of a faculty member. Independent Study can be a preparation for the research leading to the dissertation.

Recommended Elective courses*

Choose four of the following: (12 SCH)

ELEN 535	Advanced Topics in Microelectronics
MSE 507/ELEN 537	Advanced Microfabrication with CAD
MSE 508/ELEN 538	Advanced Microelectronic Devices with CAD
MSE 506	Micro/Nano Scale Materials Measurements & Analysis
MSE 557	Special Topics
MSE 609	Microsystems Analysis with CAD
MSE 610	Microsystems Design with CAD
BIEN 557	Special Topics – BioMEMS
BIEN 557	Special Topics – Protein Engineering

* Courses not listed are also acceptable, provided they are approved by the Advisory Committee.

CHEM 502	Selected Topics in Organic Chem. - Principles of Polymers
CHEM 523	Nanofabrication by Self-Assembly
CMEN 504	Advanced Chemical Engineering Kinetics
CMEN 513	Transport Phenomena
CMEN 557	Special Topics - Chemical Microsystems
CMEN 557	Special Topics – Nanosystems Modeling
CMEN 557	Special Topics - Thermodynamics
ELEN 533	Optoelectronics
MEMT 511	Modern Engineering Materials
PHYS 512	Solid State Physics
ENGR 566	Quality in Engineering
ENGR 592	Engineering Computational Methods
ENGR 622	The Academic Enterprise
ENGR 631	Global Competitiveness and Management of Technology

Research and Dissertation	18 hours of research and dissertation
ENGR 651	Research and Dissertation

Total: 48 SCH of courses + 18 SCH of Research & Dissertation = 66 SCH.

Research and Dissertation Minimum 18 hours (ENGR 651).
3, 6 or 9 hours per quarter. Maximum total allowed is 30 hours.

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