

ENGINEERING SCIENCES AND APPLIED MATHEMATICS PHD

Degree Requirements

The following requirements are in addition to, or further elaborate upon, those requirements outlined in The Graduate School Policy Guide (<https://catalogs.northwestern.edu/tgs/academic-policies-procedures/>).

PhD

Total Units Required: 18

Course	Title
ES_APPM 411-1	Differential Equations of Mathematical Physics
ES_APPM 411-2	Differential Equations of Mathematical Physics
ES_APPM 411-3	Differential Equations of Mathematical Physics
ES_APPM 412-0	Methods of Nonlinear Analysis
ES_APPM 420-1	Asymptotic and Perturbation Methods in Applied Mathematics
ES_APPM 420-2	Asymptotic and Perturbation Methods in Applied Mathematics
ES_APPM 421-1	Models in Applied Mathematics
ES_APPM 445-0	Iterative Methods for Elliptic Equations
ES_APPM 446-1	Numerical Solution of Partial Differential Equations
ES_APPM 448-0	Numerical Methods for Random Processes
ES_APPM 444-0	High Performance Scientific Computing
GEN_ENG 519-0	Responsible Conduct for Research Training
Mathematical Modeling Electives (approved; 2 units)	
General Electives (approved; 5 units)	

Other PhD Degree Requirements

- **Examinations:** written preliminary examinations in differential equations, advanced calculus, complex variables and linear algebra; oral qualifying examination for admission to candidacy
- **English Language Proficiency:** meet The Graduate School's spoken English proficiency requirement (<https://www.tgs.northwestern.edu/funding/assistantships/graduate-and-teaching.html>) to be a teaching assistant (<https://catalogs.northwestern.edu/tgs/academic-policies-procedures/teaching/>)
- **PhD Dissertation:** original research, defended before student's doctoral committee
- **Final Evaluations:** oral presentation and faculty evaluation when all other requirements complete