

## Graduate programs in the USA offering the subjects of CSE and mathematics

We summarize ten Graduate programs in the USA who offer Computational Science and Engineering (CSE)-related subjects based on mathematics, which are of the similar nature to the department of CSE at Yonsei University.

These programs are interdisciplinary nature or interdepartmental programs; lie at the interface of mathematics, computing, engineering, applied sciences, and technology. The items tabulated here were selected for a quick view of the programs.

The basic management of their curriculums is similar. The programs generally consist of the followings

- Complete coursework (includes basic/core courses) with satisfactory grades and/or preliminary/qualifying examination
- Carry out research with a supervisor towards a thesis/dissertation
- Defense/oral exam of written thesis, otherwise specified.

Institution	Degrees offered	Categories of research topics	Basic requirements of degree	Others
Harvard, School of Engineering and Applied Sciences (SEAS)	Master of Science, Master of Engineering, Ph.D. in Applied Mathematics, Ph.D. in Applied Physics, Ph.D. in Computer Science, Ph.D. in Engineering Sciences	Bioengineering, Electrical Engineering, Environmental Science and Engineering, Materials Science and Mechanical Engineering	- SEAS-wide course requirements for the Ph.D. degree with area-specific course requirements, - oral qualifying examination, - dissertation and final oral examination	
Princeton , Applied and Computational Mathematics (PACM)	Ph.D. in Applied and Computational Mathematics	- Asymptotics, analysis, numerical analysis, and signal processing - Discrete mathematics, combinatorics, algorithms, computational geometry and graphics - Mechanics and field theories (including computational physics /	- first-year student should choose the three focus topics from the six categories of the topics. - take regular or reading courses with their advisors in each of the three areas, completing the regular exams and course work for these courses. - second-year student take the general examination	

		chemistry / biology) - Optimization (including linear and nonlinear programming and control theory) - Partial differential equations and ordinary differential equations (including dynamical systems) - Stochastic modeling, probability, statistics, information theory	- If the student passes this general examination, he or she becomes a Ph.D. candidate. - then pursue research towards Ph.D.	
MIT, Applied Mathematics Programs	Doctor of Philosophy, Doctor of Science <b>Both in Applied Mathematics</b>	A broad range of applied math topics including <ul style="list-style-type: none"> <li>• Methods</li> <li>• Computer Science</li> <li>• Combinatorics</li> <li>• Probability or Statistics</li> <li>• Natural Science</li> <li>• Theoretical Engineering</li> </ul>	- coursework, - language requirement, - oral qualifying exam, - original thesis - defense. Ph.D. students must complete 11 graduate courses with grades of A or B. Also submit a tentative Plan of Study for approval	
Stanford , Institute for Computational and Mathematical Engineering (ICME)	Master of Science Ph.D. in Computational and Mathematical Engineering Ph.D. Minor in Computational Engineering	A broad range of applied science and engineering	Ph.D. Degree Requirements - coursework of 135 units - Maintain a grade point average (GPA) of 3.5 - qualifying examination - dissertation - oral examination of the dissertation	
Brown, Division of Applied Mathematics	Ph.D. in Applied Mathematics Sc.M in Applied Mathematics	- ordinary, functional, and partial differential equations - stochastic control theory - applied probability, statistics and stochastic systems theory - neuroscience and computational molecular biology - numerical analysis and scientific computation	- Complete all first year basic courses with satisfactory grades (all B or above, and with no more B's than A's) - Locate an advisor who has explicitly agreed to supervise the student's thesis work during the second year of study - Pass both the major and minor preliminary exams	

		- the mechanics of solids, materials science and fluids	by the end of their third year of study - Complete their dissertation within 6 years	
Cornell, Center for Applied Mathematics (CAM)	Ph.D. in Applied Mathematics	mathematical biology, probability theory, nonlinear dynamics, numerical analysis, network theory, optimization, mathematical finance, signal processing, mathematical physics, game theory and the list goes on	Take at least eight courses in mathematics and its applications. The courses must include an advanced course in computational methods. The seven major Focal Areas: <ul style="list-style-type: none"> <li>● Computational Methods</li> <li>● Mathematical Analysis</li> <li>● Differential Equations and Dynamical Systems</li> <li>● Stochastic Methods</li> <li>● Discrete Mathematics and Optimization</li> <li>● Algorithms and Complexity</li> <li>● Algebra and Logic</li> </ul>	Students are required to have minors in Mathematics and in another field relevant to their doctoral research.
Caltech, Computing and Mathematical Sciences (CMS)	<ul style="list-style-type: none"> <li>● Ph.D./MS in Applied and Computational Mathematics</li> <li>● Ph.D./MS in Computer Science</li> <li>● Ph.D./MS in Control and Dynamical Systems</li> </ul>	A wide range of areas such as fluid mechanics, materials science, mathematical biology, engineering applications, image processing, and mathematical finance.	Ph.D. Degree Requirements in Applied and Computational Mathematics: core courses <ul style="list-style-type: none"> <li>● Methods of Applied Mathematics</li> <li>● Linear Algebra and Applied Operator Theory</li> <li>● Applied Real and Functional Analysis</li> <li>● Introductory Methods of Computational Mathematics</li> <li>● Introduction to Stochastic Processes and Modeling</li> </ul>	
Northwestern, Engineering Sciences and Applied Mathematics	MS/Ph.D. in Applied Mathematics	A variety of mathematical methods in the investigation of problems arising in biomechanics, combustion theory, diffusion processes, fluid mechanics, geophysics, interfacial phenomena,	Ph.D. Degree Coursework Requirements - 20 units minimum includes: <ul style="list-style-type: none"> <li>● Differential Equations of Mathematical Physics 3 units</li> <li>● Asymptotic and Perturbation Methods in Applied Mathematics 2 units</li> <li>● Models in Applied Mathematics 1 units</li> <li>● Numerical Solution of Partial Differential</li> </ul>	

		molecular biology, queueing theory, reactor theory, solid mechanics, statistical mechanics, transport theory, wave phenomena	Equations 2 units ● Electives (designated or approved) 12 minimum*	
UCLA, Computational & Applied Mathematics (a group within the math dept)	MS/Ph.D. in <b>Applied Mathematics</b>		First year students are required to take at least two of core sequences, unless they have already passed some of the Area Exams. Students must complete at least 18 courses with a grade of B or better. Core Sequences for students in Applied Mathematics: ● Advanced Numerical Analysis ● Applied Ordinary/Partial Differential Equations ● Real Analysis ● Complex Analysis	
Columbia, Applied Physics and Applied Mathematics	Doctor of Engineering Science (Eng.Sc.D.), Ph.D. in applied physics, Ph.D. in Applied Mathematics, Ph.D. in Materials science and engineering Also M.S. degrees are available of the subjects	1. Applied Mathematics Graduate Program: ● Analysis of partial differential equations, large-scale scientific computing, nonlinear dynamics, inverse problems, medical imaging, geophysical/geological fluid dynamics, and biomathematics ● Earth science: atmosphere, ocean, and climate science and geophysics 2. Applied Physics Graduate Program ● Theoretical and experimental	Curriculums are flexibly from departments including: ● Earth and Environmental Engineering ● Electrical Engineering ● Mathematics ● Radiation Oncology ● Physics	A degree is an inter- departmental Ph.D. option.

		<p>plasma physics (fusion and space plasmas)</p> <ul style="list-style-type: none"><li>• Solid state physics (semiconductor, surface, low-dimensional physics, molecular electronics)</li><li>• Optical and laser physics (laser interactions with matter)</li><li>• Nuclear science (medical applications)</li></ul> <p>3. Materials Science and Engineering Graduate Program</p> <ul style="list-style-type: none"><li>• Thin films</li><li>• Nanomaterials, electronic, optical, and magnetic materials</li><li>• Mechanical response of materials</li></ul>		
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