

successful completion of this examination, students are advanced to candidacy and are awarded the candidate in philosophy degree (see "Graduate Studies" section in this catalog). The **Dissertation Defense** is the final Ph.D. Examination. Upon completion of the dissertation research project, the student writes a dissertation that must be successfully defended in an oral examination and public presentation conducted by the doctoral committee. A complete copy of the student's dissertation must be submitted to each member of the doctoral committee approximately four weeks before the defense. It is understood that the copy of the dissertation given to committee members will not be the final copy, and that the committee members may suggest changes in the text at the time of the defense. This examination may not be conducted earlier than three quarters after the date of advancement to doctoral candidacy. Acceptance of the dissertation by the Office of Graduate Studies and the university librarian represents the final step in completion of all requirements for the Ph.D. There is no formal foreign language requirement for doctoral candidates. Students are expected to master whatever language is needed for the pursuit of their own research.

**Ph.D. Time Limit Policy.** Pre-candidacy status is limited to four years. Doctoral students are eligible for university support for six years (engineering physics, seven years). The defense and submission of the doctoral dissertation must be within seven years (engineering physics, eight years).

**Evaluations.** In the spring of each year, faculty advisors evaluate each doctoral student's overall performance in course work, research during the past academic year, and prospects for financial support for the next year. A written assessment is given to the student. If a student's work is found to be inadequate, the faculty advisor may determine that the student cannot continue in the doctoral program and will recommend dismissal to the dean of Graduate Studies.

#### JOINT DOCTORAL PROGRAM WITH SAN DIEGO STATE UNIVERSITY

The Department of Mechanical and Aerospace Engineering at UCSD participates in a joint doctoral program with the Graduate Group in Applied Mechanics at SDSU. The program leads to the degree of doctor of philosophy in engineering sciences (applied mechanics). Participants in the program are required to spend one year enrolled at UCSD; their dissertation research is carried out under the supervision of an SDSU faculty member. Information regarding admission may be obtained from the departmental Student Affairs Office.

#### THE GRADUATE CURRICULUM IN CHEMICAL ENGINEERING

The chemical engineering (CENG) graduate program is an interdepartmental program and is described more completely under the Chemical Engineering Program in this catalog.

#### PH.D. IN MECHANICAL AND AEROSPACE ENGINEERING WITH SPECIALIZATION IN MULTI-SCALE BIOLOGY

As of fall 2010, the UCSD campus is offering a new Ph.D. specialization in multi-scale biology that

Lab	Course Numbers	Title	Contributing Programs or Departments	Instructors	Quarter
1	BENG 283 Chem. 28/ BIOM 283	Supramolecular Complex Characterization	Chemistry and Biochemistry, Bioinformatics	Komives (Chemistry and Biochemistry), Bafna (Computer Science and Engineering)	Spring
2	BENG 276 Chem. 276 Math. 276 PHARM 276	Numerical Analysis for Multi-Scale Biology	Chemistry and Biochemistry, Mathematics, Bioengineering	McCammon (Chemistry and Biochemistry), Holst (Mathematics), Sejnowski (Biological Sciences) McCulloch (Bioengineering)	Spring
3	NEU 260 Chem. 260	Light and Electron Microscopy of Cells and Tissues	Neuroscience, Chemistry and Biochemistry, Molecular Pathology, Biology	Martone, Sosinsky, Ellisman (Neurosciences), Baker (Chemistry and Biochemistry), Hanein (Pathology)	Spring
4	BENG 278 RAD 278	Magnetic Resonance Imaging	Radiology, Bioengineering	Wong, Buxton, Frank, Liu (Radiology), Dale (Neurosciences)	Winter
5	PHYS 245 BGGN 265	Optical Imaging of Structure and Function in Excitable Systems	Physics, Neurosciences, Radiology, Bioengineering, Medicine, Biology	Kleinfeld (Physics), Wang (Biological Sciences), Berns (Bioengineering)	Spring
6	BENG 277 BIOM 287	Tissue Engineering	Bioengineering, Biomedical Science, Pediatrics, Pharmacology	Sah, Christman, Varghese (Bioengineering), Nigam (Pediatrics), Evans (Pharmacology)	TBA
7	BENG 260 BGGN 260	Neurodynamics	Bioengineering, Biology	Cauwenberghs (Bioengineering)	Winter

will be available to doctoral candidates in participating programs that span four divisions: Biological Sciences, Physical Sciences, Jacobs School of Engineering, and Health Sciences at UCSD.

The Ph.D. specialization is designed to allow students to obtain standard basic training in their chosen field within the biological sciences, physical sciences, engineering, and health sciences with training in integrative and quantitative analysis across multiple scales of biological organization from molecule to organism in health and disease into their graduate studies. It trains a new cadre of Ph.D. scientists and provides a unique interdisciplinary education at the interfaces between the biological, medical, physical and engineering sciences.

The specific objectives of this program are

- 1. Focused Collaboration** across nine graduate degree programs at UCSD to train a new generation of cross-disciplinary scientist
- 2. State-of-the-art interdisciplinary training** through a new technology-centered hands-on graduate laboratory course curriculum
- 3. Novel emphasis on research** aimed at integrative and quantitative analysis across multiple scales of biological organization from molecule to organism in health and disease

Students in the specialization are required to take at minimum three laboratory courses and serve as a TA one course. Courses offered are shown in the table at the top right portion of this page.

Prospective students must apply and be admitted into the Ph.D. program in mechanical and aerospace engineering described previously. (For more information, see the Mechanical and Aerospace Engineering Graduate program and/or the Interfaces Graduate Training Program administered within the Department of Chemistry and Biochemistry, 4010 York Hall, Revelle College)

## COURSES

*For course descriptions not found in the UC San Diego General Catalog, 2010–11, please contact the department for more information.*

All undergraduate students enrolled in MAE courses or admitted to an MAE program are expected to meet prerequisite and performance standards, i.e., students may not enroll in any MAE courses or courses in another department which are required for the major prior to having satisfied prerequisite courses with a C– or better. (The department does not consider D or F grades as adequate preparation for subsequent material.) Additional details are given under the various program outlines, course descriptions, and admission procedures for the Jacobs School of Engineering in this catalog. Furthermore, the majority of MAE courses have enrollment restrictions which give priority to or are open only to students who have been admitted to an MAE major. Where these restrictions apply, the registrar will not enroll other students except by department stamp on class enrollment cards. The department expects that students will adhere to these policies of their own volition and enroll in courses accordingly. Students are advised that they may be dropped at any time from course rosters if prerequisites have not been met.

While most lower-division courses are offered more than once each year, many MAE upper-division courses are taught only once per year, and courses are scheduled to be consistent with the curricula as shown in the tables. When possible, MAE does offer selected large enrollment courses more than once each year.

## LOWER-DIVISION

### MAE 02. Introduction to Aerospace Engineering (4)

An introduction to topics in aeronautical and astronautical engineering including aerodynamics, propulsion, flight mechanics, structures, materials, orbital mechanics,