
# GRADUATE STUDENT MANUAL

**FALL 2012**

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# Who's Who in the Materials Department

# FACULTY

| | Professor | Joint Appt. | Area |
|---|---|---|---|
| * | Tresa M. Pollock (Chair, ICMR Director) | — | Structural |
| * | Michael L. Chabinyc (Associate Chair) | — | Macro/Biomolecular |
| * | Guillermo C. Bazan (CPOS Director) | Chem | Macro/Biomolecular |
| | John Bowers (IEE/CEEM Director) | ECE | Electronic |
| | Larry A. Coldren (OTC Director) | ECE | Electronic |
| * | Steven P. DenBaars (SSLEC Co-director) | ECE | Electronic |
| * | Craig Hawker (MRL/DMI Director) | Chem | Macro/Biomolecular |
| | Alan J. Heeger | Phys | Macro/Biomolecular/Electronic |
| | Jacob N. Israelachvili | ChE | Macro/Biomolecular |
| * | Edward J. Kramer | ChE | Macro/Biomolecular/ Structural |
| | Herbert Kroemer | ECE | Electronic |
| * | Carlos G. Levi (Dept. Graduate Advisor) | ME | Structural/Inorganic |
| | Robert M. McMeeking | ME | Structural |
| * | Shuji Nakamura (SSLEC Co-director) | ECE | Electronic |
| | G. Robert Odette | ME | Structural |
| | Chris Palmstrøm | ECE | Electronic |
| | Philip A. Pincus (BMSE Director) | Phys/BMSE | Macro/Biomolecular |
| * | Cyrus R. Safinya | Phys/BMSE | Macro/Biomolecular |
| * | Omar Saleh | BMSE | Macro/Biomolecular |
| * | Ram Seshadri (MRL Associate Director) | Chem | Inorganic |
| | Hyongsok (Tom) Soh | ME | Macro/Biomolecular |
| * | James S. Speck (ICWBS Director) | — | Electronic/Inorganic |
| * | Susanne Stemmer | — | Inorganic/Electronic |
| | Galen D. Stucky | Chem | Inorganic/Electronic |
| * | Chris Van de Walle | — | Electronic |
| | Claude Weisbuch | | Electronic |
| * | Frank W. Zok (COEC Director) | — | Structural |

** Majority appointment in Materials*

Please see Departmental Website (www.materials.ucsb.edu) for Emeriti and Affiliated Faculty.

## TECHNICAL STAFF

| | |
|---|---|
| Brian Carralejo | Metalorganic Chemical Vapor Deposition Laboratory |
| Mark Cornish | Microscopy / Specimen Preparation (SEM) |
| Mike Edwards | Computer Consultant |
| John English | Molecular Beam Epitaxy (MBE) Laboratory |
| Michael Iza | Metalorganic Chemical Vapor Deposition Laboratory |
| Budd Jamieson | Computer Consultant |
| Stephan Kraemer | FIB, TEM and Atom Probe |
| Tom Mates | Thin films and interfaces, SIMS and XPS |
| Peter Maxwell | Materials Processing |
| Deryck Stave | Structural Materials Processing Laboratory |
| David Whitlatch | MOCVD |

## ADMINISTRATIVE STAFF

| | |
|---|---|
| Sheryl Condino | Assistant to Professors<br>Denbaars, Nakamura, Speck, Van de Walle and Weisbuch |
| Mary E. Cummings | Associate Manager |
| Travis Dadigian | Contracts & Grants/ Payroll Personnel |
| Heather Gardner | Receptionist/Academic Personnel Coordinator |
| Tawny Hernandez | Financial Analyst |
| Amanda Kronick | Purchasing Coordinator |
| Aubriana Laube | Assistant to Professors<br>Chabinyc, Kramer, Levi, Pollock, Saleh and Zok |
| Joanne McNie | Assistant to Professors<br>Pincus, Safinya, Stemmer and Seshadri |
| Dawn McTague | Management Services Officer |
| Oura Neak | Graduate Program Coordinator |
| Tara Owens | Financial Manager, SSLEC |
| Yukina Warner | Corporate Programs Manager, SSLEC |


# Introduction

## THE UC SYSTEM

The University of California was chartered as a land-grant college in 1868. Ten UC campuses are now situated throughout the state, in Berkeley, Davis, Irvine, Los Angeles, Merced, Riverside, San Diego, San Francisco, Santa Barbara, and Santa Cruz. Together, the campuses have over 170,000 faculty members and a current enrollment of about 220,000 students. About one-fourth of UC students are studying at the graduate and professional level. The University also operates a variety of laboratories, agricultural field stations, extension offices, and other facilities. The University is the primary state-supported academic agency for research, and the pre-eminent system of public higher education in the country.

The ten UC campuses are governed by the Regents of the University of California, a corporate board of 26 members. The Regents in turn, delegate authority to the President, the Chancellor of each campus, and to the Academic Senate, which represents the faculty.

## THE UCSB CAMPUS

The UCSB campus was established in 1944 and moved to its present location on the site of a former marine base in 1953. The 989 acre grounds include the main campus, the Santa Ynez and Storke apartments and the West campus. The student community of Isla Vista is surrounded by the UCSB campus and the Pacific Ocean.

Within its beautiful setting, the University of California, Santa Barbara is a major research institution offering undergraduate and graduate education in the arts, humanities, the social sciences, and science and technology. Large enough to have excellent facilities for study, research, and other creative activities, the campus is also small enough to foster close relationships among faculty and students. The total student population is about 22,000, with over 19,000 undergraduates and 3,000 graduate students. The UCSB faculty numbers over 1,000 and includes five Nobel laureates, recipients of the National Medal of Science, members of the National Academy of Sciences, the National Academy of Engineering, the American Academy of Arts and Sciences, Fellows of the Royal Society of London and the Royal Academy of Engineering, numerous Guggenheim fellows, Fulbright scholars, and fellows of the National Endowments for the Arts and for the Humanities.

The UCSB campus has 6 academic units: the College of Creative Studies, the College of Engineering, the College of Letters and Sciences, the Gevirtz Graduate School of Education, the Donald Bren School of Environmental Science & Management and the Graduate Division.

# THE COLLEGE OF ENGINEERING

The College of Engineering is the second largest undergraduate college at UCSB, including approximately 1300 undergraduate students and 750 graduate students. In recent years, the College has become one of the most dynamic engineering schools in the nation. It currently has a full-time, permanent faculty of 138 and consists of five degree-granting departments:

- Chemical Engineering
- Computer Science
- Electrical and Computer Engineering
- Materials (Graduate Only)
- Mechanical Engineering

The College of Engineering is home to major internationally funded Research Centers focused on Materials including:

- California NanoSystems Institute (CNSI)
- Center for Energy Efficient Materials (CEEM)
- Center for Multifunctional Materials and Structures
- Center for Polymers and Organic Solids
- Dow Materials Institute
- Institute for Collaborative Biotechnologies (ICB)
- Institute for Energy Efficiency (IEE)
- Institute for Multiscale Materials Science
- Interdisciplinary Center for Wide Band-Gap Semiconductors
- International Center for Materials Research
- Materials Research Laboratory (MRL) - an NSF-funded MRSEC
- Mitsubishi Chemical Center for Advanced Materials
- Nanotech - UCSB Node of the National Nanofabrication Infrastructure Network (NNIN)
- Optoelectronics Technology Center
- Solid State Lighting and Energy Center
- SRC Nonclassical CMOS Research Center
- UCSB Nanofabrication Research Center

# THE MATERIALS DEPARTMENT

The Materials Department at UCSB was established as a Graduate Program in 1985, and as an independent department in early 1987, building on existing research programs in the College of Engineering as well as the Physics and Chemistry Departments. The Department was conceptualized and built under two basic guidelines:

- to educate graduate students in advanced materials and
- to introduce them to novel ways of doing research in a collaborative, multidisciplinary environment.

For the purposes of the academic program the Department is organized into four distinct but interconnected areas specializing in electronic/photonic materials, macromolecular/biomolecular materials, structural materials and inorganic materials. Faculty, postdoctoral researchers, and students in the various specialties collaborate within and across these areas. Currently, the Materials Department has approximately 160 graduate students and 28 faculty members, many of who have joint appointments with other departments (page 4). In addition, approximately 40 postdoctoral associates and visiting researchers are affiliated with the department in any given year.


# Graduate Program Information

# PROGRAM OF STUDY

The Materials Department offers programs leading to the Ph.D. degree with specializations in the following major areas: Electronic/Photonic Materials (compound semiconductors, electronic oxides, quantum structures and optoelectronic materials); Inorganic Materials (functional materials for energy, magnetic or catalytic applications); Macro/Biomolecular Materials (synthesis, design and characterization of functional synthetic polymers -including self-assembling and conductive materials - and biopolymers, including biomembranes); and Structural Materials (materials for advanced energy and transportation systems, lightweight and threat protection structures, mechanics of functional and biological systems).

The curriculum in each area has the flexibility needed to provide multidisciplinary educational opportunities in the field of advanced materials, encompassing topics such as optoelectronic devices, semiconductor oxides, biomolecular systems and high temperature composites. Materials synthesis, processing and characterization feature prominently with courses in the processing of semiconductor materials, polymers and organic materials, alloys, ceramics, composites, as well as advanced topics in electron microscopy, spectroscopy and structural tomography. Programs of study and research are individually tailored to accommodate research needs and student interest. Multidisciplinary education is strongly encouraged by means of joint faculty supervision of research and by the selection of courses. Students are also encouraged to cross over traditional boundaries into other departments on campus (for example, Electrical and Computer Engineering, Mechanical Engineering, Chemical Engineering, Biological Sciences, Chemistry and Biochemistry, and Physics) through collaboration and taking courses in those departments as appropriate. There is no foreign language requirement but all students are encouraged to explore opportunities for international research experiences at one of our collaborating institutions.

The Materials Department does not require completion of an M.S. degree before advancing to the Ph.D. Students interested in terminating their studies at the M.S. level should read the corresponding section of this manual below.

# ADVISING AND ACADEMIC AFFAIRS

Decisions regarding the M.S./Ph.D. program and graduate student affairs reside with the Academic Affairs Committee. This committee consists of four faculty members, including the Departmental Graduate Advisor and the Department Chair. The committee is responsible for approving examination and dissertation committees upon consultation with the student and research advisors. The committee is also responsible for reviewing all petitions regarding examinations and credit for courses taken elsewhere. It is also the focus for discussions and recommendations concerning improvements in the graduate curriculum and examination procedures.

Each student must select a research advisor **within the first quarter of enrollment**, preferably earlier, based on mutual research interests and availability of research assistantships. Joint research advising by two faculty members is strongly encouraged to ensure that research programs have a strong multidisciplinary character.

# UCSB'S GRADUATE HANDBOOK

Because the Materials Graduate Program is designed primarily for doctoral students, this document focuses on the specific degree requirements for the Ph.D. degree. A brief description of the M.S. Program is given below for students interested in terminating at this level. (There is a separate manual for students in the BS/MS track, which is only available to UCSB undergraduates in the Electrical, Chemical and Mechanical Engineering BS programs, as well as to BS/BA students in Chemistry/Biochemistry.) Additional relevant information can be found in the UCSB Graduate Policies and Procedures Handbook, available online at www.graddiv.ucsb.edu/handbook/.

# MASTER'S PROGRAM

Completion of an M.S. degree on the way to the Ph.D. is neither required nor encouraged, unless there are special circumstances like a change in research topic. Students who elect this path must follow Plan 1 (below) achieve a 3.5 grade-point average in their coursework and pass the preliminary examination as described on the "Ph.D. Program" section below. Students wishing to terminate their studies with a Master's Degree may choose from the two Plans of Study below. All students in the BS/MS program must follow Plan 2 for the M.S. degree.

***Plan 1.***
Students in this plan are required to (1) complete 42 units including **27** units of formal coursework, of which a minimum of 21 units must be approved 200 level courses (200-289), at most 6 units of approved advanced undergraduate courses not used already for credit toward a previous degree, 3 units of seminars (Matrl 290) and 12 units of thesis research (Matrl 598), and (2) submit an acceptable thesis based on original research. There is no oral defense of the M.S. thesis, but the thesis must be approved by a committee of three faculty members, including the student's advisor. At least one committee member must have a majority appointment in Materials, and one must have a non-zero appointment in Materials.

***Plan 2.***
Students in this plan are required to (1) complete 42 units of coursework including a minimum of **27** units from approved 200 level courses (200-289), at most 6 units of approved advanced undergraduate courses not used already for credit toward a previous or concurrent[1] degree, no fewer than 3 and no more than 6 units of independent studies or research (Matrl 596), and 3 units of seminars (Matrl 290), and (2) submit an acceptable engineering report based on the independent studies. The report must be approved by a committee of two faculty members, including the student's advisor. At least one member of the committee must have a majority appointment in Materials.

Appropriate course tracks for use in planning a program of study are presented in a subsequent section. Further details are also available from the Materials Graduate Affairs Office, or the Graduate Faculty Advisor.

[1] Students in the BS/MS programs cannot use any courses toward both the BS and the MS degree.

# Ph.D. PROGRAM

Students are expected to complete the Ph.D. program within five years after entry at the Bachelor's level and within three years after entry at the Master's level.

Students admitted with a Bachelor's degree are required to complete a minimum of 72 units of academic work structured in the following manner: 42 units of 200-level courses (excluding seminars and independent study), 15 units of seminars (Matrl 290) and/or independent studies, and 15 units of dissertation research (Matrl 599). Up to 8 units of upper division undergraduate courses may be taken for credit toward the 200 level course requirements with prior approval of the student's advisor. Students entering with a M.S. degree may petition to waive certain unit requirements for the Ph.D. (up to 15 units of 200-level courses and a possible six units of seminars) deemed to have been fulfilled by Master's studies elsewhere. However, students are required to enroll in one unit of seminar (Matrl 290) for every quarter of residence they spend at UCSB, even if they have exceeded the unit requirement.

All Ph.D. students are required to complete the following series of core courses in the appropriate sequence:

***Matrl 200A*** – Thermodynamic Foundation of Materials
***Matrl 200B*** – Electronic & Atomic Structure of Materials (Prerequisite: Matrl 200A)
***Matrl 200C*** – Structure Evolution (Prerequisite: Matrl 200A)

In preparation for more advanced and specialized courses within their area of specialization, students are strongly encouraged to complete this core course sequence during their first year of study. (These courses may not be waived). A minimum grade of B in each of these courses is required prior to taking the Qualifying Examination (described below).

Incoming students are expected to design a tentative study program suitable to their interests and research field with the assistance of their advisor and submit it for approval to the Academic Affairs Committee within the first two quarters of residence. The study plan must be endorsed by the student's faculty advisor and approved by the department graduate advisor, although it may be modified during the course of the student's program. (Modifications may be subject to approval by the Academic Affairs Committee. The student should consult the Graduate Program Coordinator in the Materials Department Office for questions in that regard.)

In developing an appropriate interdisciplinary course of study, Ph.D. students are expected to take both the available courses in their major area of interest as well as courses designed to broaden their knowledge of other materials. Most courses will be selected from the main sequence of courses (offered every year) from one of the four principal areas of emphasis in the Department. Students should also capitalize on the opportunity to take any general or more specialized courses offered on a less frequent basis. Students should consult the appropriate Course track for their major from the following pages in planning a program of study.

## *Electronic/Photonic Materials Course Track*

| Course Number | Course Title | Units |
|---|---|---|
| **Main Sequence Courses:** | | |
| 206A-B | Fundamentals of Electronic Solids I, II | 4 |
| 211A | Engineering Quantum Mechanics | 4 |
| 215A-B-C | Semiconductor Device Processing (215A is *required for authorization to work independently in clean room.*) | 4 |
| **General Courses:** | | |
| 209A | Crystallography and Diffraction Fundamentals | 3 |
| 209B | X-Ray Diffraction II: Advanced Methods | 3 |
| 209C | Electron Microscopy | 3 |
| 219 | Phase Transformations | 3 |
| 228 | Computational Materials | 3 |
| **Specialized Courses:** | | |
| 204 | Introduction to Magnetism and Magnetic Materials | 3 |
| 205 | Wide-Band Gap Materials | 3 |
| 216 | Defects in Semiconductors | 3 |
| 217 | Molecular Beam Epitaxy & Band Gap Engineering | 3 |
| 224 | Optical and Luminescent Materials | 3 |
| 226 | Electrical and Functional Crystals and Ceramics | 3 |
| 227 | Metal Organic Chemical Vapor Deposition | 3 |
| 263 | Thin Films and Multilayers | 3 |
| 288AA-ZZ | Special Topics in Electronic Materials | 3 |
| **Background Courses:** | | |
| 162A | Quantum Description of Electronic Materials | 4 |
| 162B | Fundamentals of Solid State | 4 |
| ECE 162C | Optoelectrical Materials and Devices | 4 |

## *Inorganic Materials Course Track*

| Course Number | Course Title | Units |
|---|---|---|
| **Main Sequence Courses:** | | |
| 209A | Crystallography and Diffraction Fundamentals | 3 |
| 218 | Introduction to Inorganic Materials | 3 |
| 274 | Solid State Inorganic Materials | 3 |
| **General Courses:** | | |
| 209BL | X-Ray Diffraction I: Principles and Practice | 3 |
| 209B | X-Ray Diffraction II: Advanced Methods | 3 |
| 209C | Electron Microscopy | 3 |
| 219 | Phase Transformations | 3 |
| 222A | Colloids & Interfaces | 3 |
| 228 | Computational Materials | 3 |
| **Specialized Courses:** | | |
| 204 | Introduction to Magnetism and Magnetic Materials | 3 |
| ChE 216A | Intro. To Magnetic Resonance Spectroscopy Tech. | 3 |
| 224 | Optical and Luminescent Materials | 3 |
| 226 | Electrical & Optical Properties of Oxides | 3 |
| 251A | Processing of Inorganic Materials | 3 |
| 251B | Densification & Microstructural Control | 3 |
| 286AA-ZZ | Special Topics in Inorganic Materials | 3 |
| **Background Courses:** | | |
| Chem 175 | Physical Inorganic Chemistry | 3 |

## *Macromolecular/Biomolecular Materials Course Track*

| Course Number | Course Title | Units |
|---|---|---|
| **Main Sequence Courses:** | | |
| 271A | Synthesis of Macromolecules | 3 |
| 271B | Structure and Characterization of Complex Fluids | 3 |
| 271C | Properties of Macromolecules | 3 |
| **General Courses:** | | |
| 214 | Advanced Topics in Equilibrium Statistical Mechanics | 3 |
| 222A | Colloids and Interfaces | 3 |
| 228 | Computational Materials | 3 |
| 273 | Experimental Techniques in Macromolecular Materials | 3 |
| **Specialized Courses:** | | |
| 253 | Liquid Crystal Materials | 4 |
| 276A | Biomolecular Materials I: Structure & Function | 3 |
| 276B | Biomolecular Materials II: Applications | 3 |
| 277 | Synthesis of Biomolecular Materials | 3 |
| 278 | Interactions in Biomolecular Complexes | 3 |
| 280A | Synthesis and Electronic Structures of Conjugated Polymers | 3 |
| 280B | Organic Electronic Devices | 3 |
| 280C | Fabrication and Measurement of Devices with Soft Matter | 3 |
| 282 | Transition Metal Catalyzed Polymerization | 3 |
| 284 | Synthetic Chemistry of Macromolecules | 3 |
| 287AA-ZZ | Special Topics in Macromolecular Materials | 3 |
| **Background Courses:** | | |
| ChE 102 | Biomaterials and Biosurfaces | 3 |
| 135 | Biophysics and Biomolecular Materials | 3 |
| 160 | Introduction to Polymer Science | 3 |
| ChE 225 | Principles of Bioengineering | 3 |

## *Structural Materials Course Track*

| Course Number | Course Title | Units |
|---|---|---|
| **Main Sequence Courses:** | | |
| 207 | Mechanics of Materials | 3 |
| 220 | Mechanical Behavior of Materials | 3 |
| 234 | Fracture Mechanics | 3 |
| **General Courses:** | | |
| 209A | Crystallography and Diffraction Fundamentals | 3 |
| 209B | X-Ray Diffraction II: Advanced Methods | 3 |
| 209C | Electron Microscopy | 3 |
| 219 | Phase Transformations | 3 |
| 228 | Computational Materials | 3 |
| **Specialized Courses:** | | |
| 230 | Elasticity | 3 |
| 240 | Finite Element Structural Analysis | 3 |
| 251A | Processing of Inorganic Materials | 3 |
| 261 | Composite Materials | 3 |
| 263 | Thin Films and Multilayers | 3 |
| 289AA-ZZ | Special Topics in Structural Materials | 3 |

## Registration Information

Registration is completed on the web via the GOLD system. Complete instructions on this process can be found in the Schedule of Classes, which is available online at www.registrar.ucsb.edu. The Office of the Registrar will assess a $50 late registration fee to students who register after the deadline. (This fee will not be covered by the department.) In addition to required or elective courses needed for their program of study, students must register for one unit of Matrl 290 (under their academic advisor's code) every academic quarter in residency in order to receive credit for attending group meetings and seminars. Students must check with their academic advisor the appropriate requirements for earning the credit in Matrl 290 – see additional information under Special Preparation for Teaching.) Students must also enroll in at least one unit of either Matrl 598 or Matrl 599 every academic quarter after having selected an advisor and having begun research. The number of units in Matrl 598 or Matrl 599 should be selected to bring the quarter total to at least 12 units. Students should register for Matrl 598 until they have advanced to candidacy (by passing the qualifying examination), after which they register for Matrl 599. Also, while serving as teaching assistants, students must register for Matrl 501 under the instructor in charge of the class (see below).

## Foreign Language and Minors

There are no formal requirements regarding either foreign languages or minors. However, Ph.D. students are strongly encouraged to incorporate courses from outside their area of specialization into their curriculum in order to broaden their knowledge of the materials field. They are also encouraged to become proficient in one or more foreign languages relevant to the technical literature in their field. Students having a particular interest in strengthening their background in foreign languages for this purpose are encouraged to pursue the necessary coursework to fulfill that interest.

## Special Preparation for Teaching

All Ph.D. students are required to act as Teaching Assistants for at least one quarter while in residence at UCSB (usually during the first year), in either Materials courses or within departments providing courses consistent with the student's undergraduate background. To receive credit for the required teaching, students must register for Matrl 501 under the instructor in charge of the class while serving as Teaching Assistants. (2 units for 25%TA, 4 units for 50%TA. These units may not be counted towards the 72 units of academic work required for graduation). Teaching Assistants supervise labs, conduct recitation, tutor undergraduate students and give seminars. Because this is a requirement of the program, students' stipends will remain unchanged while serving as Teaching Assistants.

Students are also required to present research seminars, thereby ensuring that experience be gained in organizing and presenting lectures. Seminars are required at the group level (about one per quarter), the program level (one per year) and at conferences. Such activities enable students to improve the skills necessary for the subsequent pursuit of teaching opportunities.

## Monitoring Student Progress Through the PhD Program

The Materials Department has the following system of annual assessments to monitor the student's progress through the Ph.D. program.

| | |
|---|---|
| Year 1 | Preliminary Examination |
| Year 2 | Qualifying Examination (Advancement to Candidacy) |
| Years 3, 4, … | Progress Assessments |
| End of Program | Dissertation defense |

With the exception of the Dissertation defense, all assessments are to be performed by a faculty committee within ±2 months of each anniversary of the student's entrance into the Department (typically between August and November of each year). All assessments are to include a written document (described below for each case), an oral presentation and a period of questions and discussion, after which the committee will render its assessment of the student's progress and make recommendations for future actions. Students must deliver a copy of their written document to the Graduate Program Assistant for the departmental records at the same time the document is delivered to the committee, and consult with the Graduate Program Assistant regarding the filing of any necessary paperwork for each stage. The general guidelines for all written documents prepared by the students for the assessments are 12 pt font, 1" margins on all sides, 1.5 lines spacing. References and figures are to be placed after the text and are not included in the number of pages of text specified for the corresponding document. For theses and dissertations the students must follow the guidelines specified by the Graduate Division.)

***Preliminary Examination***

The Preliminary Examination is administered 10-14 months after the student's entrance into the program. Students who do not meet this deadline may be put on academic probation and may become ineligible for financial support.

The examination committee consists of three faculty members from the student's major field, including the student's advisor. At least two of the members must be ladder faculty with a non-zero percent appointment in Materials, and preferably at least one should be a majority appointment. One member of the committee, other than the advisor, will serve as Chair of the Preliminary Examination committee. The committee members are selected by the student in consultation with his/her advisor and are subject to approval by the Academic Affairs Committee. The names of the committee members should be submitted to the Departmental office at least 3 months prior to the examination.

Students with a GPA of 3.5 or better in the graduate program at UCSB are automatically eligible to take the examination. Students with a GPA above 3.2 may petition for a waiver of the 3.5 GPA requirement. The petition must be filed with the Graduate Program Assistant and is evaluated by the Departmental Graduate Advisor (and the Academic Affairs committee if the circumstances require it) in consultation with the student's advisor. Each student may have two opportunities to pass the Preliminary Examination. Students who fail the examination in the first opportunity must take it again within a 2-4 month period from the first exam. Students with a GPA less than 3.2 at the end of their first year are ineligible to take the Preliminary Examination unless they can increase their GPA to 3.2 within the next academic quarter, at which point they

may petition the Department for an opportunity to take the exam, with prior consent of their academic/research advisor.

The Preliminary examination is intended to assess whether the student has the fundamental knowledge, intellectual maturity and degree of understanding of his/her major field and prospective research topic to be able to write a dissertation proposal successfully over the course of the following year. At least 3 months prior to the examination date the committee will assign the student a specific topic relevant to his/her intended research project. The student will research the literature on the assigned topic, identify key outstanding issues and/or research opportunities, propose ideas on how to address these issues and/or exploit the opportunities, and outline a tentative research plan. The student is expected to prepare a short document (10 pages of text maximum, plus a minimum number of figures and suitable references after the text) summarizing his/her findings and ideas. The document must be submitted to the committee and the Departmental Graduate Office at least one week before the examination date. At the examination, the student will present a 30-40 min seminar outlining his/her findings, ideas and prospective research plan. After the presentation, the committee will probe the student's understanding of the subject, his/her knowledge of the fundamentals of materials science relevant to the problem, and his/her ability to think soundly and creatively. It is also expected that by this point in time the student should have had some initial research experiences and be able to relate those to the literature he/she has researched. After the examination the committee may render one of the following decisions, with recommendations for future action or corrective measures as appropriate:

(i) Advance to the Qualifying Examination without reservations.
(ii) Advance to the Qualifying Examination with a warning of deficiencies in the student's background or understanding that need to be corrected (e.g. by taking additional courses, independent reading, etc.) by the time of the Qualifying Examination.
(iii) Requirement that the student takes the Preliminary Examination again before he/she is allowed to advance to the Qualifying Examination. This second exam must take place within a 2-4 month period following the first one. Failure to advance after the second exam requires the student to leave the program, with the option of completing an MS degree.
(iv) Recommendation that the student finishes at the MS level, with an allowance of one year to finish the requirements for that degree.

### *Qualifying Examination (Advancement to Candidacy)*

The Qualifying Examination is administered 22-26 months after the student's entrance into the program. Students who do not meet this deadline may be put on academic probation and may become ineligible for financial support.

The examination committee consists of at least four faculty: three having more than a 0% appointment in the Materials Department (at least one of them preferably with a majority appointment in Materials) and one with no more than a 0% appointment in the Materials Department. One member of the committee, other than the advisor, will serve as Chair of the Qualifying Examination committee. Members of the examination committee are nominated by

the student and research advisor at least 3 months prior to the examination and must be approved by the Academic Affairs Committee. The examination committee typically becomes the dissertation committee.

Pre-requisites for the Qualifying Examination include: (i) successful completion of the Preliminary Examination; (ii) completion of the Materials Department core courses (200A, B, C) with a minimum of B in each one of them; and (iii) a minimum 3.5 GPA in the graduate program at UCSB. Students with a GPA above 3.2 may petition the Academic Affairs Committee for a waiver of the 3.5 GPA requirement. Students with a GPA below 3.2 are not eligible to advance to candidacy.

The purpose of the qualifying examination is to assess whether the individual has acquired the requisite understanding of his intended research topic and critical thinking ability to elaborate and execute a sound research plan for his/her dissertation. Some preliminary research is required to elaborate the dissertation proposal, but the exam is not intended to evaluate a project that is well past the planning point.

The examinee must submit a formal dissertation proposal (maximum 10 pages of text plus a sensible number of figures and a substantial list of references both placed after the text) that summarizes the intended research problem, the research approach, results to date, and future directions. This proposal should be submitted to the examination committee and the Department at least two weeks before the examination. (Failure to deliver the thesis proposal to the committee on time may result in postponement of the examination.) The format of the examination includes a 40-45 min presentation of the dissertation proposal by the student, during which time only questions of clarification will be allowed. The presentation will be followed by questions from the committee for a period of approximately 60-80 min. A decision will be rendered by the committee at the end of the examination, with one of the following recommendations:

i) Advance to Candidacy without reservations.
ii) Advance to Candidacy with reservations, which should be re-evaluated in the subsequent annual assessment.
iii) Requirement that the student takes the examination again before he/she is allowed to advance to Candidacy. This second exam must take place within a 6 month period following the first one. Failure to advance to candidacy after the second exam requires the student to leave the program, with the option of completing an MS degree.

***Annual Progress Assessments***

After advancement to candidacy, each student is required to report his/her progress to the dissertation committee at least once a year on a formal basis (*i.e.* 36±2, 48±2 and, if needed, 60±2 months after the student's entrance into the program). Students who do not meet this deadline may be put on academic probation and may become ineligible for financial support.

The student is expected to prepare a short written progress report for the committee, deliver it to the members and meet with them for an oral presentation of the progress report and discussion of his/her progress, research findings and ideas for the remaining work. (Alternatively, the student may provide a draft of a paper submitted for publication in lieu of the document, as example of his/her progress, with a brief summary of accomplishments during the previous year.) The committee will assess the progress and provide advice to the student on problems that may hinder the completion of the dissertation on a timely basis. If the student is not progressing satisfactorily toward completing his/her degree, the committee may recommend that the student be put on probation (e.g. by giving incomplete or unsatisfactory grades in the thesis units) and, if the problem is not corrected, recommend that the student finishes with an MS degree after completing the appropriate requirements.

***Dissertation Defense***

The purpose of the dissertation defense is to ascertain that the student has completed a coherent, original body of research on his/her chosen topic and is able to defend the results and conclusions in front of a knowledgeable public. Students prepare and submit the final draft of the dissertation to the dissertation committee (as constituted for the Qualifying Examination) and the Department four weeks prior to the intended date of the dissertation defense. (Failure to deliver the dissertation draft to the committee and the Department on time may result in postponement of the defense.) The Department copy is made available for general inspection. The committee ascertains the suitability of the draft and provides comments and recommendations for amendments to the dissertation. The candidate is responsible for addressing any issues raised by the committee and for submitting a corrected version of the dissertation at least one week prior to the date of the defense. Once approved by the committee, permission is granted for the candidate to present a formal defense of the dissertation, which should be done in a public seminar.

The seminar must be attended by the dissertation committee, which will be chaired by the student's advisor. Any attendee at the defense can question the candidate. However, the committee chair has the authority to terminate inappropriate questioning. After public discussion is concluded, the audience will be asked to leave the room and the committee will continue the examination of the candidate in private. After the examination, the committee will deliberate and render a decision on whether the candidate has earned the Ph.D. degree.

Once the candidate has passed his/her dissertation defense, the last requirement is to file the dissertation with the Davidson library via the Graduate Division. A Guide to Filing Theses and Dissertations is available on the Graduate Division web page (http://www.graddiv.ucsb.edu/pubs/filingguide.shtml). In addition to the two copies that are filed in the Davidson library, the student should submit two copies of the final version of the dissertation to the Department to be bound. One copy will be kept in the departmental collection and the other will be returned to the student after binding.


# Other Important Procedures

## LAB SAFETY POLICY

It is mandatory that all new Graduate Students attend the EH&S live lab safety course that is typically scheduled on the Wednesday before instruction begins. If you arrive on campus before attending the live lab safety course, you must take the online lab safety course before entering any UCSB lab and/or office space located in a lab.

The online lab safety course is available at http://ehs.cnsi.ucsb.edu/Visitors.htm.

It is also mandated by the Materials Department that you retake the EH&S online lab safety course per year at http://learningcenter.ucsb.edu/default.aspx. Individual laboratories may require additional safety training procedures that must be completed before the student is allowed access to the lab and use of the equipment. Students should consult with the technical staff person in charge of the lab (or the faculty advisor for individual labs) to ensure they have met all the safety training requirements.

## ELECTRONIC KEY CARD ACCESS

Access cards are required for several Materials/SSLEC office spaces and labs. If it is determined that students will need access to these spaces, an order form can be obtained from the Materials Office Receptionist in EII, Room 1355. Once a student has been issued a card from the UCEN, they will need to return to the reception area to begin the access approval process. Access is determined individually based on research discipline and office location. Students must meet all the training and safety requirements before they are allowed use of the labs, even if they have been issues a key card.

## COMPUTING FACILITIES

Computers are located in all Materials Department student offices. Additionally, students are allowed to bring in personal laptops and workstations for use on Materials networks. To register a computer for network access, fill out the online IP address request form at:

http://www.materials.ucsb.edu/request_ip.php

Please be aware that system and network security is strictly enforced. The departments Computing and Network Security Policy can be found at:

http://www.materials.ucsb.edu/policies/computer_security.php

All students are eligible for College of Engineering email accounts through the Engineering Computing Infrastructure (ECI). To open an account, please follow the link below.

https://accounts.engr.ucsb.edu/create

The Department employs a part-time system administrator, Mike Edwards, and a full-time system administrator, Budd Jamieson, to maintain computers and answer any questions about the computing services. For computing and network assistance, please email mats-help@engineering.ucsb.edu.

## ON-LINE RESOURCES

The Materials Department Web Site (www.materials.ucsb.edu) is a valuable source of departmental and university information. At the web site, you will find:

- Quarterly schedule of Materials courses
- Listings of Materials personnel (faculty, staff and students) with email addresses
- Links to faculty web pages
- List of available facilities within the department
- List of related research centers and groups (with links to their web pages)
- Electronic lab access via Access Card
- Health and safety information, including the Department Emergency Plan, Lab Safety Manuals, and links to important MSDS information and EH&S sites
- Travel policies and procedures manual

# CAMPUS MAP


Transportation and Parking Services
UNIVERSITY OF CALIFORNIA, SANTA BARBARA
MAP & DIRECTORY
Parking Regulations
• UCSB Parking Permits required at all times.
Purchase permits from permit dispensers, located throughout campus, or from the Parking Sales Office located in Building #381, off Stadium Road. To vend permit, please follow instructions on the dispenser. Payment options are Visa, MasterCard, cash or campus Access card. Please observe all parking signage as parking violations are subject to citation.
• Monday-Friday from 7:30AM to 5:00PM, visitor permits are valid in "Visitor/Student" spaces and parking lots.
• Saturday and Sunday all day, visitor permits are valid in "Faculty", "Staff" and "Visitor/Student" spaces and parking lots except spaces marked "Enforced At All Times", Reserved" or "Restricted".
For updated parking information please visit our web site @ www.tps.ucsb.edu or call our customer service line at 805-893-5388
Central Stores, Receiving, Mail Services
Public Safety
Harder Stadium
Facilities Management
Environmental Health & Safety
Caesar Uyesaka Stadium
Storke Field
Future site of San Clemente Housing
Recreation Center
Athletic Fields
Intercollegiate Athletics
Robertson Gym
Student Affairs & Admin. Services
Cheadle Hall
Coral Tree Cafe
Campbell Hall
Phelps Hall
Mosher Alumni House
Mesa
Student Health
Future site of ESSB
Old Gym
South Hall
Kerr Hall
North Hall
Ellison Hall
Buchanan Hall
Physical Sciences North
Physical Sciences South
Chemistry
Engineering Science
Engr II
Kohn Hall
Broida Hall
MRL
Harold Frank Hall
Bren Hall
Davidson Library
Webb Hall
Noble Hall
Life Sciences
Bio SIF
Bio II
Psych
Girvetz Hall
Humanities and Social Sciences
Counseling & Career Services
Student Resource
Theater and Dance
Arts
Art Museum
Music
Lotte Lehman Concert Hall
Storke Tower
Arts Library
Events Center
Faculty Club
University Center
Isla Vista Theater
San Rafael Hall
Manzanita Village
San Miguel Hall
San Nicolas Hall
Santa Rosa Hall
Santa Cruz Hall
Anacapa Hall
University House
Office of Technology & Industry Alliances
Marine Biotechnology Laboratory
REEF/Aquarium
Marine Science Research
UCSB Lagoon
California Nanosystems Institute (CNSI)
EAST GATE
Ward Memorial Blvd.
Lagoon Road
Mesa Road
Ocean Road
El Colegio Road
Stadium Road
Cervantes Road
El Greco Road
Picasso Road
Segovia Road
Cordoba Road
Pardall Road
Madrid Road
Embarcadero Hall
Seville Road
Trigo Road
Sabado Tarde Road
El Nido Lane
Del Playa Drive
UCEN Road
Channel Islands Road
INFORMATION KIOSK
VISITOR CENTER
UNIVERSITY CENTER
PARKING SERVICES
PARKING DESIGNATIONS
Permits required at all times.
A Faculty
B1 Residential Students
B2 Residential Students
B3 Residential Students
C Students, Commuters and Visitors
S Staff
R Reserved
V Vendors
Accessible Parking
Motorcycles
Bus Stop
Coastal Access
Residence Halls
Traffic Light
Parking Meters (available to general public)
Parking Dispensers
Parking
SPEED LIMIT 25
Enforced by Radar
Emergency
• For fire, police or medical emergency assistance call 9-911 or use emergency phones (in red boxes).
• UCSB Police Department, Public Safety Building, non-emergency 805-893-3446 (24 hours).
• CSO Escort Service is available by calling 805-893-2000.
FEBRUARY 2007