Program in Biomedical Sciences and Engineering (PBSE)

Track in Microbial Biology and Pathogenesis (MICRO)

Graduate Student Handbook

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Dear Graduate Students in the PBSE MICRO track,

Welcome to UCSC! This handbook is your guide to our graduate program as well as to other services on campus. As a new student, you can find answers to many of the questions that arise when planning a graduate career and beginning at a new university. You may want to check the METX department’s web page at http://www.metx.ucsc.edu, where you will be able to access additional information about the METX Department, which will be your home department at UCSC. For information on PBSE, please see pbse.ucsc.edu. For more information about the University of California, Santa Cruz, visit the web site http://www.ucsc.edu.

If you have any questions or need assistance during your time here at UCSC, please contact Allyson Ramage, Graduate Program Coordinator and Department Manager at 831-459-4719 or metxadmn@ucsc.edu. You can find Allyson in room 430, Physical Sciences Building.

The Department of Microbiology and Environmental Toxicology staff is available to assist you with all questions pertaining to the rules and regulations of the university. The Department office can provide university forms and general information about university procedures, or will refer you to the appropriate office for further information. The Department office is located in room 430, Physical Sciences Building. The phone number is 831-459-4719.

Additionally, please feel free to contact me regarding advising matters, or any other concerns. I can be reached at 831-459-5520, or saltikov@ucsc.edu. My office is located in room 438, Physical Sciences Building. Good luck with your studies.

Sincerely,
Chad Saltikov, Professor
Chair
Department of Microbiology and Environmental Toxicology

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Welcome!

Congratulations and welcome to the Program in Biomedical Sciences and Engineering at the University of California, Santa Cruz! I will be your faculty contact for the MICRO track during your graduate educational career at UCSC. Our department manager will be your contact for help with administrative procedures required by the campus, the METX department, or the Graduate Division. Do not hesitate to contact either one of us for assistance or with any questions you have.

On behalf of the PBSE faculty and the METX department, I welcome you and look forward to seeing you this fall.

Sincerely,
Vicki Auerbuch Stone, Associate Professor
Graduate Director
Overview
The Ph.D. track in Microbial Biology and Pathogenesis prepares students for careers in biological research and teaching. This training program emphasizes the application of diverse approaches, including biochemistry, genetics, genomics, ecology, and imaging to address questions at the forefront of microbial biology. Interdisciplinary research is encouraged and supported by a diverse group of faculty from the Departments of Microbiology & Environmental Toxicology, Biomolecular Engineering, Ocean Sciences, Molecular Cell & Developmental Biology, and Evolutionary and Ecology Biology.

Participating Faculty (Department)
1. Manel Camps (METX)
2. Victoria Auerbuch Stone (METX)
3. Karen Ottemann (METX)
4. Chad Saltikov (METX)
5. Fitnat Yildiz (METX)
6. Jonathon Zehr (Ocean Sciences)
7. Marm Kilpatrick (Ecology and Evolutionary Biology)
8. Doug Kellogg (Molecular, Cell and Developmental Biology)
9. Todd Lowe (Biomolecular Engineering)
10. Phil Berman (Biomolecular Engineering)
11. Beth Shapiro (Ecology and Evolutionary Biology)
12. Marilou Sisson-Magnus (Ocean Sciences)
13. Rebecca Dubois (Biomolecular Engineering)
14. Susan Carpenter (Molecular, Cell and Developmental Biology)

Administrative Structure
MICRO Track students are guided through the PBSE program by METX faculty and staff:

Admissions Committee
Comprised of a subset of the METX faculty. Responsibilities include reviewing applications, planning recruiting activities, accepting students, and developing offers of support.

Graduate Director
The Graduate Director, in consultation with other PBSE faculty, sets rotation assignments, provides rotation talk advising and feedback, and, together with the METX Department Manager, serves as the point-person for first year MICRO track students.

Advising Committee
Each student’s Advising Committee is comprised of 3 program faculty, including the Graduate Director. Responsibilities of this committee include student orientation and advising on coursework, TAships, and qualifying exams during the first three years in the program.

Dissertation Committee
Each student’s Dissertation Reading Committee is comprised of at least three faculty, two within the METX program and at least one outside faculty member. Responsibilities of this committee include providing feedback on research direction and career trajectory during the last several years of the program, as well as approving attainment of the student’s degree.
Application and Admission to the MICRO Ph.D. Program

Deadlines
The application deadline is December 1st for admission to the program in the fall of the following academic year. Application procedures and information are available on the MICRO track web page http://pbse.ucsc.edu/pbse-application.html. On-line applications are available at http://graddiv.ucsc.edu/prospective-students/index.html. After the deadline, files are reviewed by the Admissions Committee (see Admissions Process section below).

Admission criteria
The Admissions Committee evaluates candidates based on numerous indicators of potential, which include but are not limited to the following:

· Evidence of research potential and commitment to research in the statement of purpose
· Previous research experience
· Evidence of research potential in letters of recommendation (3 required)
· GRE scores: both general and subject (Biology, Biochemistry, or Chemistry) exams
· GPA
· Grades in relevant undergraduate courses
· Evidence of quantitative and analytical skills
· Evidence of ability to communicate in writing
· Indications of special expertise, experience, or cultural perspectives that the student may contribute to our program
· Performance in interviews

Admission process
After evaluation of each file, the Admissions Committee ranks the applicants. The number of offers made can fluctuate from year to year, depending on the relative strength and size of the applicant pool, and resources available. The MICRO program is committed to supporting all of its graduate students for the five years of a normal degree. Therefore, our total number of offers is guided by available resources (e.g. TA, GSR, Fellowships, etc.).

The top ranked applicants are contacted by telephone and invited for a formal interview visit organized by the Admissions Committee prior to any offer. Most interviews are held over a 2-day period in January. Prospective students meet with MICRO faculty and students. Feedback from the interview is used to determine offers. The Graduate Division formally notifies prospective students of the offer by March 15. Students are required to accept or decline the offer by April 15.

International students
Because of limited resources to cover out-of-state tuition, which remains in effect for the duration of the degree, relatively few international students are admitted to the program. The University may cover a significant proportion of out-of-state tuition after a student advances to candidacy, please discuss with your PI.
Getting Started

General advising
In the 1st year, the MICRO advising committee and the faculty who supervise rotations are responsible for providing academic and research advice. After students join their thesis lab, the thesis advisor assumes guidance responsibilities, although the advising committee remains active until the student advances to candidacy. Once a student advances to candidacy, students obtain support from their Dissertation Research Committee. Students are always welcome to seek additional advice from the their advising and dissertation committees, especially concerning procedural issues.

Administrative Support
Administrative support for the Micro Track is provided by Allyson Ramage and the PBSE coordinator, (Teel Lopez). Allyson Ramage will provide most administrative support to all first year PBSE MICRO track students, including organization of advising meetings and teaching assignments. Teel Lopez will coordinate rotations.

Email
All MICRO graduate students will have an e-mail account set up for them by the time they arrive in fall quarter. The address for each student is typically last name@ucsc.edu (i.e. jones@ucsc.edu). The e-mail address for each graduate student is included in a departmental alias, PBSEgrads@ucsc.edu. The majority of communication with students from the department office will be done through e-mail; students should develop the habit of checking e-mail a minimum of 3-4 times a week.

Mailboxes
A mailbox will be assigned to rotation students in the METX Department mailroom, PSB 430B. All campus mail addressed to the student will be delivered to that location. The student may also use that address for outside mail related to their student career. Students should use their home address for personal mail, bills, etc.

Office supplies
Graduate students should purchase their own office supplies for use in classes. The Department Offices do not provide those supplies. Students serving as a teaching assistant (TA) for a course may obtain supplies needed to perform their TA duties from the appropriate office. Such supplies might include overhead transparencies and markers for discussion sections, pens to use in correcting papers, and paper for documentation. After students join their thesis lab, they should consult with the lab P.I. about funding for supplies.

Photocopying
There are photocopiers available throughout the Biomed, Physical Sciences and Sinsheimer Laboratories Buildings for instructional and personal copying. After students join their thesis lab, they should consult with the lab P.I. about funding for photocopying. For personal copying, students may add funds through their UCSC portal

TA assignments
At the end of each academic year, graduate students and their advisors are surveyed about their teaching needs for the next academic year. Teaching assignments are made by balancing financial needs of students, past performance and assignments, requests of the instructors, and the needs of the
department. Every effort is made to accommodate everyone’s preference, but this is not guaranteed. Students may communicate with the METX Graduate Advisor (Allyson Ramage) about their teaching preferences and she will take them into account. In addition to attending and assisting in lectures, TAs are generally expected to lead discussion or laboratory sections, hold weekly office hours and grade homework and exams.

**Financial support**
The MICRO Program is committed to supporting graduate students for up to 5 years. Support is provided in the form of Graduate Student Researchship (GSRs), Teaching Assistantships (TAs) and a limited number of fellowships. Graduate advisors support their students during the summer as GSRs.

**Ph.D. Program**

**Coursework**
Required core courses:
- METX 200, *Interdisciplinary Approaches to Environmental Toxicology*
- METX 205, *Scientific Skills, Ethics, and Writing*
- METX 206A, *Advanced Microbiology*
- METX 210, *Molecular and Cellular Basis of Bacterial Pathogenesis* OR METX 250, *Environmental Microbiology* (although both are encouraged)

At least one additional approved elective. BIO 200B is strongly suggested for this elective. Please see [http://pbse.ucsc.edu/micro-courses.html](http://pbse.ucsc.edu/micro-courses.html) for course list.

**Timetable for the first 3 years of the Ph.D. degree**

**Year 1**

**Fall**
- Advisory meeting with MICRO Advising Committee
- BIO 200B
- METX 200
- METX 292 Seminar
- METX 297, Biol297 or Chem297 Independent Study

Rotation 1, first six weeks (each rotation is six weeks long)
- Rotation Talk
- Rotation 2 begins

**Winter**
- METX206A Advanced Microbiology
- METX292 Seminar
- METX 297, Biol297 or Chem297 Independent Study
- Elective course, optional (see website for list of offerings)

Rotation 2 ends
- Rotation Talk
- Rotation 3
- Selection of thesis laboratory and commencement of thesis research
Spring  METX210 (Pathogenesis) or METX250 (Environmental)
      METX292 Seminar
      METX281 Topical Seminar
      METX 297, Biol297 or Chem297 Independent Study
      Elective course, optional (see website for list of offerings)

Year 2
Fall  Literature review due by first day of quarter
      Advisory meeting with MICRO Advising Committee
      METX292 Seminar
      METX281 Topical Seminar
      METX299 Independent Study
      QE I committee assigned by METX department

Winter METX 205 if not taken first year
       METX292 Seminar
       METX281 Topical Seminar
       METX297 Independent Study

Spring METX292 Seminar
       METX281 Topical Seminar
       METX299 Independent Study
       QE I
       Selection of QEII committee

Year 3
Fall  Advisory meeting with MICRO Advising Committee
      METX292 Seminar
      METX281 Topical Seminar
      METX297 Independent Study
      QEII
      Third Year Talk

Winter METX292 Seminar
       METX281 Topical Seminar
       METX299 Thesis Research
       Selection of Dissertation Reading Committee

Spring METX292 Seminar
       METX281 Topical Seminar
       METX299 Thesis Research
       Deadline for Advancement to candidacy

* See METX handbook for details on qualifying exam (QE) guidelines, since unlike in other PBSE tracks, the two parts of the qualifying exam, QE I and QE II, are given separately.
1st-year student orientation
Newly admitted students are expected to arrive early in the week before classes begin to participate in orientation. The campus provides a general orientation for new graduate students. It is not required by MICRO but is strongly recommended, as it provides useful general information that would be difficult to acquire elsewhere. The PBSE program provides an in-house orientation that includes bio-safety training, computer resource orientation, and introduction to our science library. A PBSE research conference and welcome dinner at the beginning of the quarter provides a great opportunity to meet faculty and continuing graduate students. A METX BBQ around the start of the Fall quarter provides new MICRO track students with the opportunity to interact with the broader METX department.

Advising
Students accepted into the Ph.D. program meet individually with members of the MICRO advising committee during the first week of Fall quarter (typically on orientation day) to review their academic background and plan a curriculum for their first year. In addition, students may meet individually with the Graduate Director and their rotation PIs during their 1st year for informal feedback on their progress. Students will also receive formal evaluations for each rotation that becomes part of their permanent record.

Language requirement
Proficiency in a foreign or computer language is not a requirement for the MICRO program.

Teaching requirement
Students are required to serve as teaching assistants (TAs) for at least 1 quarter during the degree. Students are encouraged to TA for 2 different courses to obtain more experience and knowledge. Duties should require no more than 20 hours a week and will likely include weekly office hours and sections, as well as grading, proctoring exams and preparation of course material for distribution (e.g. handouts, taping lectures). Graduate students are not expected or permitted to write narrative evaluations, although their comments may be solicited and incorporated by the instructor.

Course work
All students must take the core curriculum for a letter grade (except seminar and lab meeting). The exception is that first year students should take their research units S/U for the first two quarters (for their rotations). Students may also be advised to take additional undergraduate courses, to remedy specific deficiencies in their background. These also must be taken for a letter grade. When graduate students are evaluated on a satisfactory/unsatisfactory basis, a passing performance corresponds to the letter grade B or better, in accordance with the grading policies of the graduate division.

Rotation selection
The purpose of rotations is to provide students with diverse research training in 3 different laboratories, and to allow students and faculty to determine whether they can establish a productive collaboration. Before the beginning of each quarter, 1st year students submit to Teel Lopez a ranked list of 3-5 faculty names and a brief explanation of why they are interested in those faculty. Before submitting their choices, students should talk to faculty regarding potential projects and whether the faculty will be taking rotation students. Rotation assignments are made by the MICRO Graduate Director in consultation with METX faculty. Students are generally assigned their 1st choice unless there are multiple students who list the same 1st choice. In that case, students are given their 2nd choice. Faculty are not permitted to make any promises to students regarding permanent positions in their lab, officially or unofficially, during the entire
year until after the third rotation. Discussions regarding permanent positions in labs may begin after the Spring poster session following the third rotation.

Occasionally, a student may not find a suitable laboratory at the end of 3 rotations. They may select a 4th laboratory for a rotation with the permission of the MICRO advising committee and the rotation advisor.

Laboratories outside the PBSE may be selected but the student must consult with the MICRO advising committee. Students may do rotations in labs from different PBSE tracks without seeking permission.

**Summer research prior to Fall quarter enrollment**

Graduate students may perform summer research prior to the start of the Fall quarter, but this is not considered a formal component of the PBSE training program. The student makes arrangements with a PI directly.

**Rotation talks**

Upon completion of the first two rotations, the student will give a rotation talk attended by their peers, PBSE faculty, and other members of the UCSC scientific community. Typically, each talk is ~8 minutes with an additional 2 minutes for discussion, but times may vary depending on class sizes. Following the third rotation, the student will present a poster at a special poster event.

**Evaluation of rotation performance**

Performance in each rotation is graded as satisfactory/unsatisfactory and summarized in a narrative evaluation by the rotation advisor. This evaluation becomes part of the student’s permanent record. Performance is evaluated on the basis of research effort and progress, intellectual mastery of the project, and performance in the talk. Faculty should submit evaluations in a timely manner.

**Faculty responsibility to rotation students**

While rotation students may work closely with one or more members of the laboratory, the primary responsibility for supervision lies with the faculty member. Faculty are encouraged to meet regularly with the rotation student to discuss their progress. Faculty should also attend the rotation talk. If unable to do so, another MICRO faculty member should be asked to attend the talk and provide an evaluation.

**Selection of a thesis laboratory**

No specific discussion of thesis laboratory choice is permitted between faculty and students until notification by the MICRO advising committee until after the Spring poster session following the third rotation. When notified, students may approach faculty members to discuss the possibility of joining their group. Students may elect to join a laboratory in which they have not rotated. Students who are unable to secure a thesis laboratory should contact the MICRO advising committee to seek assistance in scheduling a possible 4th rotation. Students who are unable to secure an advisor to sponsor their thesis research are considered to be in unsatisfactory academic standing, and will not be allowed to continue in the program.

**Seminars**

All MICRO graduate students are required to register for the weekly METX seminar (METX292). However, students are also encouraged to stay abreast of the MCD Biology, Chemistry, BME, EEB and Ocean Sciences seminar schedule and may substitute specific seminars that better suit their personal interests. Attendance to at least one seminar per week is mandatory.
Failing a course and academic probation
Students who fail any course, including an undergraduate course or rotation assignment, must meet with the MICRO advising committee to review their progress. At that time they may be placed on academic probation. If their progress does not improve after an additional quarter, they may be asked to leave the program. All failed courses must be made up at the next available opportunity, within one year as allowed by the Registrar.

2nd year advising meeting
Early in Fall quarter, the MICRO advising committee meets with 2nd year students to discuss their progress, 2nd year coursework, and preparation for oral exams.

Qualifying exams
In the MICRO track, students must pass both parts of their qualifying exam, QEI and II, given at different times. Please see the METX handbook for more details.

Avoidance of apparent conflict of interest
Formal evaluation of a student may lead to an apparent conflict of interest for a faculty member. Such situations can include, but are not limited to, serving on an oral or thesis committee for the student of a spouse or significant other. In such situations where an apparent conflict of interest could occur, the faculty should recuse him/herself. They may, however, serve as an ad hoc advisory member of such thesis committees, but will not participate in the formal evaluation process. Informal situations are not subject to apparent conflict of interest considerations.

Plagiarism - definition, guidelines, and consequences
The UCSC Code of Student Conduct states: "Plagiarism is defined as the use of intellectual material produced by another person without acknowledging its source. This includes, but is not limited to: 1) copying from the writings or works of another into one's academic assignment without attribution, or submitting such works as if it were one's own; 2) using the views, opinions, or insights of another without acknowledgement; or 3) paraphrasing the characteristic or original phraseology, metaphor, or other literary device of another without proper attribution." In assignments for class and when writing research articles and grants, students must express ideas in their own words and must give credit to the sources of the ideas.

When cases of plagiarism are discovered, the disciplinary actions are severe. After a first incident of plagiarism, the instructor will generally assign a 0 on the assignment that contained a plagiarized portion or portions, and the Program Head and the Graduate Dean will be notified of the incident. After a second incident of plagiarism, the program will recommend to the Program Head and the Graduate Dean that the student be expelled from our graduate program.

Progress Toward a Thesis

Selection of the thesis committee (dissertation reading committee)
After successful completion of the QEI and QEII, the student should immediately assemble their thesis committee in consultation with their thesis advisor. Grad Division will not advance a student without the Thesis Committee in place. The committee comprises the advisor plus at least two other faculty members, one of whom must be from METX and at least one faculty from outside the department or
outside UCSC. A majority of the members must be members of the UCSC Academic Senate. Outside members must be tenured members of an academic institution. The Dissertation Reading Committee Nomination form can be downloaded from the Graduate Division web site http://graddiv.ucsc.edu/current-students/applications-forms/index.html and should be turned in to the METX department office when the QEII is passed.

The student must meet with his/her thesis committee at least once per year until completion of the Ph.D. degree. The committee will provide continuing guidance throughout the development of the thesis, will provide ongoing assessment of the student's progress, and will evaluate the completed dissertation.

**Advancement to candidacy**

Advancement to candidacy occurs by the end of the 3rd year (9 quarters). Students have an additional 3 years (9 quarters) to complete their degree within normative time. (Note: International students, who remain “out-of-state” until advancement to candidacy, are encouraged to give their seminar before the beginning of the 3rd year, to minimize the fee costs to themselves and the department. In this case, students will have an additional 4 years (12 quarters) to complete their degree within normative time.)

**Target time and normative time**

The normative time for the Ph.D. degree within the University of California is 6 years, although a number of PBSE students attain their Ph.D. within 5 years. Students who fail to complete their thesis within this time must request an extension from the Graduate Division. A written request signed by the student and advisor detailing the timetable to finish should be countersigned by the thesis committee chair prior to submission to the Graduate Dean. Multiple extensions may be considered. If the Ph.D. degree is not awarded within 7 years from the date of advancement to candidacy, the student's candidacy shall lapse and the student will be required to pass a new oral qualifying exam prior to submitting the dissertation or undergo such other formal review as the student's department shall direct, and the result of this examination or review shall be transmitted in writing to the Graduate Council (Academic Senate Regulation 18.6).

**Preparation of the thesis**

When the student's advisor and thesis committee have agreed that the research is ready to be submitted, the student may proceed with "writing up" according to the guidelines prescribed by the University Library and the Graduate Division. The dissertation is of critical importance, because it reflects the candidate's ability to do independent research at a high level of scholarship and creativity. The dissertation should make clear that the candidate is familiar with and able to criticize and evaluate previous work done in his or her specialty field, and that the candidate has made a significant contribution to knowledge, at least part of which is of a quality and quantity worthy of at least 2 publications. The outline of the thesis should be approved by the thesis committee prior to preparation of the thesis. The thesis should be provided to the committee no less than one month prior to the thesis defense date. The thesis defense should comprise an open seminar. The METX department manager - can assist in coordinating thesis defense dates with the thesis committee. After the seminar, the thesis committee will meet with the student to discuss any changes to the thesis required for completion. Upon submission of the final thesis, the committee will sign the cover page and grant the Ph.D. Formal award of the Ph.D. is made by the Graduate Division. Summer thesis defenses are discouraged, since many faculty are absent and no formal seminar series is in place during the summer.
Ph.D. thesis defense
The MICRO Program requires a formal thesis defense before awarding the Ph.D. degree. This requirement must be satisfied before the thesis committee signs the cover page and other forms indicating that the thesis has been accepted. The defense takes place after all members of the committee have approved the written thesis. The defense must be a public seminar, attended by a majority of the candidate’s thesis committee, in which the candidate formally presents the substance of the thesis. After the seminar, the public must have sufficient opportunity to question the candidate. The thesis committee may then meet in private with the candidate for further questions, before determining whether the candidate’s thesis is accepted or rejected, or whether any problems need to be resolved. If both the thesis and the defense are acceptable, the cover page and necessary forms will be signed by the committee members, and all departmental requirements pertaining to the Ph.D. thesis defense will have been satisfied.

Granting of the Ph.D.
The PBSE graduate program is not a degree granting entity, but rather a collection of individual degree granting departments. As such, the policy for Ph.D. granting for PBSE students is as follows. All MICRO students who successfully fulfill all of the requirements to earn the Ph.D. will be awarded their degrees from the Department of Microbiology and Environmental Toxicology. In certain cases, a student may issue a request to the advising committee that their degree be granted by an alternative department (ie. MCD Biology) provided all of the appropriate requirements have been met. However, this should be done as early as possible during the student’s graduate career.

Other MICRO Program Policies

Graduate Division forms are available from http://graddiv.ucsc.edu/. All forms, applications, etc. in connection with the Graduate Division must be routed through the METX Graduate Coordinator.

Completion of previous degrees
1. No student may enroll as a graduate student at UCSC until a bachelor's degree has been completed.
2. Newly accepted students who are currently completing another graduate degree normally will not be permitted to enroll in the PBSE Graduate Program until the previous degree has been completed (or abandoned).
3. Under special circumstances, the MICRO advising committee may permit a student to complete a previous degree after entering the Ph.D. Program. Approval must be obtained from the MICRO advising committee before enrolling for the first time, along with a timetable for completion. Failure to follow that timetable may be grounds for dismissal from the Ph.D. Program on the basis of inadequate progress.

Leaves of absence
1. For information and forms: http://graddiv.ucsc.edu/current-students/academic-regulations/graduate-student-handbook/section-ten.html

Normal course loads
1. MICRO graduate students are expected to work full-time towards their degrees and, therefore, students should enroll in at least 10 units of credit each quarter.
2. Once formal upper-division and graduate courses recommended by the student's advisory committee have been completed, it is expected that the student will normally enroll in 10 or 15 units of METX299 Thesis Research, Chem299, or Biol299, each quarter (unless taking a 5 unit graduate elective).
3. Lighter or heavier loads must be approved in advance by the MICRO advising committee.

**Key milestones in the Ph.D. degree**

1. First Year Advising Committee *(1st year beginning Fall quarter)*
2. First Rotation and Talk
3. Graduate Coursework* *(Finish by End of Spring quarter 3rd year)*
4. Second Rotation and Talk
5. Third Rotation and Poster Presentation
6. Selection of Thesis Lab
7. Literature Review* *(Due by First day of Fall quarter of student’s second year)*
8. Second Year Advising Committee *(2nd year beginning Fall quarter)*
9. First Graduate QE (QEI) Committee Approved *(End of Winter quarter 2nd year)*
10. Graduate Oral Qualifying Exam* *(QEI)* *(End of Spring quarter 2nd year)*
11. Third Year Advising Committee *(3rd year beginning Fall quarter)*
12. Third Year Seminar* *(3rd year Fall quarter)*
13. Second Graduate QE (QEII) Committee Approved *(Beginning of 3rd year Fall quarter)*
   Committee Nomination of Ph.D Qualifying Examination [http://graddiv.ucsc.edu/current-students/applications-forms/index.html - four](http://graddiv.ucsc.edu/current-students/applications-forms/index.html)
14. Second Graduate Oral Qualifying Exam* *(QEII)* *(3rd year Fall quarter)*
15. Dissertation Reading Committee Approved *(No later than end of Winter quarter 3rd year)*
16. Advancement to Candidacy* *(No later than end of Spring quarter of 3rd year)*
17. Fourth Year Advising with Dissertation Reading Committee *(4th year Fall quarter)*
18. Fifth Year Advising with Dissertation Reading Committee *(5th year Fall quarter)*
19. Graduate Dissertation Seminar and Defense* *(latest by 6th year Spring quarter)*
   Application for Ph.D. [http://graddiv.ucsc.edu/current-students/applications-forms/index.html - five](http://graddiv.ucsc.edu/current-students/applications-forms/index.html)
20. Graduate Dissertation* *(by 6th year Spring quarter)*

* Or more often as dictated by the Dissertation Reading Committee.

Deviations from this pattern require good justification. Deviations must be approved by the student's advisory committee and by the MICRO advising committee. Approval is not automatic and should be sought as soon as the need is anticipated.