FOREWORD

The purpose of this manual is to provide specific information on policies, procedures, and regulations pertaining to graduate study in the Environmental Toxicology Program.

Students completing degree requirements in the Graduate Program in Environmental Toxicology will earn either the degree of Master of Science in Environmental Toxicology or Doctor of Philosophy in Environmental Toxicology. The doctoral program in Environmental Toxicology is a research-based program with two tracks of study. The Environmental Toxicology Track focuses on identifying and quantifying the harmful effects of environmental chemicals on human health and elucidating the mechanisms by which these agents act. The Exposure Sciences and Risk Assessment Track focuses on the evaluation of human exposures to environmental chemicals and on scientific principles used in evaluating risks to human health from environmental exposures. The master’s program offers course work in environmental toxicology and exposure sciences with options to focus on experimental research.

Students in the Environmental Toxicology Program are encouraged to meet with their faculty advisor and with other faculty members early in their first year to plan their programs of graduate study; this will permit students to accomplish their objectives in the most efficient and satisfactory manner. Each student should meet with all members of the Program's faculty to become familiar with their individual research interests before selecting a research topic and faculty advisor. An introductory course, Target Organ Toxicology, TOX 206A,B is offered during the fall and winter quarter and is taught by several members of the Environmental Toxicology faculty. This course gives a broad overview of toxicology to new students and allows students to make contact with many faculty during their first quarter of residence. Student-professor contact is also facilitated by active participation in the weekly seminar program.

Updates of this manual can be read on the Program's home page, http://www.medicine.uci.edu/occupational/graduate.asp
Welcome to the
Environmental Toxicology
Graduate Program

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I. ENTRANCE REQUIREMENTS

General requirements for admission to graduate study are given in the UCI General Catalogue in the section "Research and Graduate Studies" and in the Graduate Division bulletin "UCI Graduate Application for Admission". The catalogue is on-line and can be read at http://www.editor.uci.edu.

Table I lists the entrance requirements for graduate students majoring in Environmental Toxicology. In cases where students with deficiencies in certain areas are admitted into the graduate program, those deficiencies will be made up during the first year of residence in the program. The student will be notified of any apparent deficiency at the time of acceptance into the graduate program. These requirements are superseded for students who have already earned the M.D. degree.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Suggested UCI Equivalent</th>
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<tbody>
<tr>
<td>Calculus</td>
<td>Math 2A-B-C Calculus (3D Elementary Differential Equations is recommended but not required)</td>
</tr>
<tr>
<td>Physics</td>
<td>Physics 3A-B-C Basic Physics</td>
</tr>
<tr>
<td>General Chemistry</td>
<td>Chem I A-B-C General Chemistry</td>
</tr>
<tr>
<td>Organic Chemistry</td>
<td>Chem 5 1 A-B-C; laboratory recommended</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>BioSci 98 Biochemistry; laboratory recommended</td>
</tr>
<tr>
<td>General Biology</td>
<td>BioSci 94 Diversity of Life; BioSci 96 Ecology</td>
</tr>
<tr>
<td>Physical Chemistry</td>
<td>any TWO of the following three courses:</td>
</tr>
<tr>
<td>(strongly recommended but not required)</td>
<td>Chem 130A Chemical Thermodynamics</td>
</tr>
<tr>
<td></td>
<td>Chem 130B Quantum Chem. And Spectroscopy</td>
</tr>
<tr>
<td></td>
<td>Chem 130C Chem. Dynamics and MacroMolecules</td>
</tr>
<tr>
<td></td>
<td>OR</td>
</tr>
<tr>
<td></td>
<td>any TWO of the following three courses:</td>
</tr>
<tr>
<td></td>
<td>Chem 13 1 A Chemical Thermodynamics</td>
</tr>
<tr>
<td></td>
<td>Chem 131B Quantum Chemistry</td>
</tr>
<tr>
<td></td>
<td>Chem 13 1C Statistical. Mechs. and Chem. Dynamics</td>
</tr>
</tbody>
</table>
II. GENERAL REQUIREMENTS FOR GRADUATE DEGREES AT UCI

Each student should become familiar with the descriptions of Academic Policies and Graduate Degrees in the Research and Graduate Studies section of the UCI General Catalogue. A graduate student is expected to complete satisfactorily at least 12 units of academic credit applicable to the graduate program in each regular academic quarter (fall, winter and spring) and satisfy all requirements of the academic program according to a schedule approved by the Director of the Graduate Program. Only grades A, A-, B+, B, and S represent satisfactory scholarship and may be applied toward advanced degree requirements. A UCI course in which a grade of B- is earned may be accepted in partial satisfaction of the degree requirements if the student has a grade point average of at least 3.0 in all courses applicable to the degree. Students may not apply courses graded Pass or Not Pass toward any degree or satisfactory progress requirements. A grade point average below the B level (3.0) is not satisfactory, and a student whose grade point average is below that level is subject to academic disqualification.

A graduate student who has not demonstrated satisfactory progress is not eligible for paid appointments, such as Graduate Student Researcher, and may not hold a fellowship or other award which is based upon academic merit; this includes appointment as a predoctoral trainee on federal training grants.

The Dean of Graduate Studies may disqualify a student who has a grade point average in graduate and upper-division courses below 3.0 for two or more successive quarters, or fails to pass or does not take the required examinations within the time specified for the graduate program, or does not maintain satisfactory academic progress toward completion of the program.

III. REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN ENVIRONMENTAL TOXICOLOGY

The predoctoral student must complete the following requirements (explained in detail below) to qualify for the degree of Doctor of Philosophy in Environmental Toxicology:

1. a major program of study (courses and research) including a comprehensive written preliminary examination and an oral qualifying examination;

2. a minor program of study in a field distinct from but relevant to toxicology;

3. assist the faculty in the teaching of one or more lecture courses in toxicology;

4. a written dissertation based on the student's original research, and a successful defense of the dissertation during an oral examination given by the student's doctoral committee;

5. full-time residence for at least 6 regular academic quarters.
CURRICULUM PLAN: First and Second Years

Core Curriculum – for both Environmental Toxicology Track and Exposure Sciences and Risk Assessment Track

TOX 206 A-B  Target Organ Toxicology, 6 units/qtr.

One of the following 3 introductory statistics courses:
- STATS 201  Statistical Methods for Data Analysis I 4 units
- PUBHLTH 207  Public Health Statistics 4 units
- EPIDEM 204  Biostatistics 4 units

TOX 270  Human Exposure to Environmental Contaminants 4 units
EPIDEM 200  Principles of Epidemiology 4 units
TOX 298 A-B-C  Environmental Toxicology Seminar 2 units

Core Courses – Environmental Toxicology Track

TOX 201  Principles of Toxicology 4 units
TOX 207  Exp Design and Interp of Toxicol Studies 2 units
Approved Electives, 16 units
Minor, 8 units

Core Courses – Exposure Sciences and Risk Assessment Track

STAT 202-203  Statistical Methods for Data Analysis II, III 4 units/qtr

One of the following two GIS courses:
- PUBHLTH 235  Geographic Information Systems 4 units
- CRM/LAW 248  Geographic Information Systems 4 units
- TOX 275  Exposure Modeling and Risk Assessment 4 units
Approved Electives, 8 units

Approved Elective Pool- Environmental Toxicology Track*

Four of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOX 202</td>
<td>Environmental Toxicology</td>
<td>4</td>
</tr>
<tr>
<td>TOX 204</td>
<td>Neurotoxicology</td>
<td>4</td>
</tr>
<tr>
<td>TOX 212</td>
<td>Inhalation Toxicology</td>
<td>4</td>
</tr>
<tr>
<td>TOX 220</td>
<td>Industrial Toxicology</td>
<td>4</td>
</tr>
<tr>
<td>PUBHLTH 276</td>
<td>Toxic Chemicals in the Environment</td>
<td>4</td>
</tr>
<tr>
<td>MBB 203</td>
<td>Structure/Biosyn. Nucl. Acids</td>
<td>4</td>
</tr>
<tr>
<td>MBB 204</td>
<td>Structure/Biosyn. of Proteins</td>
<td>4</td>
</tr>
<tr>
<td>DCB 231B</td>
<td>Cell Biology</td>
<td>4</td>
</tr>
<tr>
<td>PATH 225</td>
<td>Molecular Mechanisms of Disease</td>
<td>3</td>
</tr>
<tr>
<td>Anatomy 203A,B</td>
<td>Human Microscopic Anatomy</td>
<td>6</td>
</tr>
<tr>
<td>Physiology 206A,B</td>
<td>Introduction to Medical Physiology</td>
<td>11</td>
</tr>
</tbody>
</table>

*additional courses may be added to this pool upon approval of the Program Faculty

Approved Elective Pool- Exposure Sciences and Risk Assessment Track

One of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOX 264</td>
<td>Intro to Environmental Health Science</td>
<td>4</td>
</tr>
<tr>
<td>TOX 269</td>
<td>Air Pollution, Climate and Health</td>
<td>4</td>
</tr>
<tr>
<td>EPIDEM 205</td>
<td>Environmental Epidemiology</td>
<td>4</td>
</tr>
<tr>
<td>PUBHLTH 276</td>
<td>Toxic Chemicals in the Environment</td>
<td>4</td>
</tr>
<tr>
<td>PUBHLTH 265</td>
<td>Advanced Environmental Health Science</td>
<td>4</td>
</tr>
</tbody>
</table>

*additional courses may be added to this pool upon approval of the Program Faculty

Third and Fourth Years

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units/qtr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOX 298A-B-C</td>
<td>Environmental Toxicology Seminar</td>
<td>2</td>
</tr>
<tr>
<td>TOX 299A-B-C</td>
<td>Research Problems</td>
<td>1-12</td>
</tr>
</tbody>
</table>
A sample program is given below for each track.

### Sample Program – Environmental Toxicology Track

<table>
<thead>
<tr>
<th>Year</th>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1st yr. Fall</strong></td>
<td>TOX 206A</td>
<td>6 units</td>
<td></td>
</tr>
<tr>
<td><strong>1st yr. Winter</strong></td>
<td>TOX 206B</td>
<td>6 units</td>
<td>PUBHLTH 207, 4 units</td>
</tr>
<tr>
<td><strong>1st yr. Spring</strong></td>
<td>TOX 270</td>
<td>4 units</td>
<td>TOX 201, 4 units</td>
</tr>
<tr>
<td><strong>2nd yr. Fall</strong></td>
<td>elective</td>
<td>4 units</td>
<td>TOX 298, 2 units</td>
</tr>
<tr>
<td><strong>2nd yr. Winter</strong></td>
<td>elective</td>
<td>4 units</td>
<td>minor, 4 units</td>
</tr>
<tr>
<td><strong>2nd yr. Spring</strong></td>
<td>Comprehensive exam</td>
<td></td>
<td>minor, 4 units</td>
</tr>
<tr>
<td><strong>Yr 3</strong></td>
<td>Qualifying exam</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Yrs 3-5</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Sample Program – Exposure Sciences and Risk Assessment Track

<table>
<thead>
<tr>
<th>Year</th>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1st yr. Fall</strong></td>
<td>TOX 206A</td>
<td>6 units</td>
<td>STATS 201, 4 units</td>
</tr>
<tr>
<td><strong>1st yr. Winter</strong></td>
<td>TOX 206B</td>
<td>6 units</td>
<td>STATS 202, 4 units</td>
</tr>
<tr>
<td><strong>1st yr. Spring</strong></td>
<td>TOX 270</td>
<td>4 units</td>
<td>STATS 203, 4 units</td>
</tr>
<tr>
<td><strong>2nd yr. Fall</strong></td>
<td>CRM/LAW 298</td>
<td>4 units</td>
<td>TOX 298, 2 units</td>
</tr>
<tr>
<td><strong>2nd yr. Winter</strong></td>
<td>TOX 275</td>
<td>4 units</td>
<td>elective, 4 units</td>
</tr>
<tr>
<td><strong>2nd yr. Spring</strong></td>
<td>Comprehensive exam</td>
<td></td>
<td>elective, 4 units</td>
</tr>
<tr>
<td><strong>Yr 3</strong></td>
<td>Qualifying exam</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Yrs 3-5</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>
**Environmental Toxicology Course Descriptions**

201 Principles of Toxicology (4) S. Problem solving to demonstrate principles of toxicology; quantitative dose-response relationship; toxicant-target (receptor) interaction emphasizing interspecies differences in Ah receptor and dioxins; complete *in vivo* metabolism of xenobiotics by mammalian systems: integration of organ responses to toxic agents. Prerequisite: TOX 206A-B, or consent of instructor. (Staff)

202 Environmental Toxicology (4) F. Analysis of real problems involving toxic chemicals and the human food, air and water supplies, occupational exposures, and life styles. Formal problems will be considered by small groups of students and discussed by the class. (Staff)

204 Neurotoxicology (4) W. The effects of various harmful chemicals upon nervous system function. Emphasis given to the molecular events underlying neurological damage and to the relation of such processes to basic mechanisms of neurobiology. (Bondy)

206A-B Target Organ Toxicology (6,6) F,W. Analysis of the responses occurring in individual organs of man and animals exposed to environmental chemicals at toxic levels; distinctive structural and functional features of ten organ systems are presented in terms of phenomena, mechanisms of action, and methods of study. (Staff)

207 Experimental Design and Interpretation of Toxicology Studies (2) F or W. Introduction to methods of structuring toxicology experiments and analyzing data including experimental design, data distributions, sample sizes, hypothesis testing, linear regression, analysis of variance, multiple comparison testing and non-parametric tests. (Kleinman)

212 Inhalation Toxicology (4) S, odd years. The principles and practice of laboratory inhalation toxicology. Topics include aerosols, gases, respiratory tract structure and function, lung defenses, aerosol deposition exposure techniques, characterization of exposure atmospheres, experimental designs, animal models, research ethics, and regulations and guidelines. (Phalen)

220 Industrial Toxicology (4) S. Analysis of responsibilities toxicologists have in industry, including product safety generating material safety, data sheets, animal testing, ecotoxicological testing, risk/hazard communication, and assisting industrial hygienists and occupational physicians; emphasis on interdisciplinary nature of industrial toxicology and communication skills. Prerequisite: TOX 206A-B. (Lambert)

264 Environmental Health Sciences I: Introduction to Environmental Health Science (4). Convergence of agents (chemical, physical, biological, or psychosocial) in the environment can emerge as diseases influenced by social, political, and economic factors, allowing them to become rooted in society. How these agents from various spheres come together and impact human health. Prerequisite: graduate standing or consent of instructor. Same as Public Health 264/ Environmental Health, Science, and Policy E224/Epidemiology 264. (Wu)

269 Air Pollution, Climate, and Health (4). Emission of air pollutants into the atmosphere, physical and meteorological processes that affect transport, and influence on global warming.
Concepts of how and where people are most exposed, and how exposures and health effects differ in developed and developing regions. Same as Epidemiology 270/Public Health 269 and Environmental Health, Science, and Policy E247. (Wu)

**270 Human Exposure to Environmental Contaminants (4).** Introduces founders of conceptual thought that environmental contaminants can impact health. Theory and principles of exposure assessment, the continuum from emissions of a contaminant into the environment to evidence of health effects in a population. Same as Epidemiology 270/Environmental Health, Science, and Policy E248/Public Health 270. (Edwards)

**275 Exposure Modeling and Risk Assessment (4).** This course surveys the general principles, basic mathematical methods, and practices of environmental modeling and human health risk assessment. Topics include advection-dispersion models for contaminants in air and water, uptake by plants and animals, dose-response modeling, risk management, and risk perception. Although the emphasis is on environmental toxicants, infectious disease transmission models are are briefly introduced. Students conduct an original risk assessment as a final group project. Same as Public Health 275 (Bartell).

**290 Independent Study in Environmental Toxicology (4) F,W,S.** With consent from a faculty member who will supervise the program, a student may receive credit for individual study in some area of toxicology, culminating in the completion of a scholarly paper on the subject. May be repeated for credit. (Staff)

**297 Advanced Topics in Occupational Toxicology (2) F,W,S.** Discussions with clinical and research faculty in environmental toxicology and occupational medical on current toxicology problems in the workplace and critical review of current publications in the field. Journal club/seminar format. (Bondy).

**298A-B-C Environmental Toxicology Seminar (2) F,W,S.** Presentation and discussion of current research problems and issues by students, postdoctoral fellows, faculty, and guests, covering the broad research and policy areas of environmental toxicology. (Luderer/Kleinman)

**299 A-B-C Research Problems (1 to 12) F,W,S.** Research work for the M.S. thesis or Ph.D. dissertation. (Staff)
Seminar

The Environmental Toxicology Seminar (TOX 298) is a required course for each graduate student in the program for each quarter the student is in residence. The seminar is organized by the faculty and graduate students and features one speaker-discussion leader on Fridays at 3:30 p.m. during fall, winter and spring quarters. This is the one opportunity on a weekly basis that brings the faculty and students together, and all students in the program are expected to attend all TOX 298 seminars and to take active parts in the discussions. The faculty is also expected to attend seminar. They pay special attention to the scientific quality of the questions asked by the students, and reluctance to participate in the discussions may be interpreted as a failure to understand the material. Individual presentations last about one hour; each masters' student will present a seminar once a year. Each predoctoral student will present two seminars per year. For first and second year predoctoral and first year masters students the subject of the seminar should be on a topic in toxicology in which they have special interest but not a report of their own on-going research. Senior graduate students can make their research efforts the subject of one of their seminar presentations each year. The student's grade (A, B, etc) for seminar will be based on the student's presentation itself unless the student has failed repeatedly to attend the seminar throughout the academic year. Presentation criteria include:

1. ability to analyze toxicology problems rather than merely describe them
2. thoroughness with which the topic was reviewed and presented
3. ability to respond adequately to questions from the audience
4. ability to communicate one's ideas, i.e. a clear and interesting presentation, including public speaking skills and illustrations (slides, etc.)

Students should follow the steps below in preparing their seminar presentations.

1. select the topic carefully; consult with the seminar coordinator (Dr. Kleinman), the program director (Dr. Luderer), your research advisor and other faculty members if you need help choosing a topic. The topic must be in the areas of toxicology, exposure sciences or risk assessment, should be based on scientific evidence, and should be analytical ("why is something toxic; "what is the scientific evidence that something causes a specific response") rather than descriptive ("compound A causes renal damage"). Stress mechanisms of toxic action wherever possible.
2. begin preparing early; it can take up to 50 hours to prepare an excellent presentation.
3. do a literature search to make sure you have covered all the pertinent areas; if you don't know how to search the scientific literature, ask Dr. Kleinman or your research advisor,
4. read all of your material before writing your presentation; take notes and make outlines. Ask yourself questions; this may suggest further searching of the literature.
5. integrate your material and decide what information you want to present, what order you want to use to present your material, and how you are going to present it (verbally, slide with text or table or graph or photograph, etc).
6. write out your presentation.
7. consult with a faculty member to make sure you are on the right track.
8. prepare your Powerpoint presentation
9. practice giving the presentation
10. don't read from notes; use your graphic material as 'cue cards'.
Minor Program of Study

The structured minor is an integral part of graduate training in environmental toxicology and should be constructed to accommodate the academic objectives of each student. The minor program is planned by the student and the student's advisor to broaden the student's scope in toxicology. This additional training identifies the graduate as a research toxicologist with expertise in a supporting field such as physiology or biochemistry as opposed to a general toxicologist and significantly enhances the opportunities for top postdoctoral and career appointments. Typical examples of minor programs relevant to toxicology include two graduate courses (8 units) in cell biology, molecular biology, biochemistry, biophysics, genetics, physiology, neuroscience, environmental microbiology, marine biology, organic chemistry, physical chemistry, statistics, engineering, social ecology, law, etc.

Research Rotations

The new student is expected to get involved in research at the earliest possible time, usually in the first quarter of the program. When a student is unsure in selecting a laboratory or research group, that student is encouraged to take advantage of the rotation option. A rotation consists of a series of residencies in laboratories of the student's choice; approximately one quarter is spent in each laboratory/research group. Three rotations per academic year are possible; usually, one year is adequate to permit the student to make an informed choice. Professors will be responsible for acting as an advisor/mentor to the student and instructing the student in proper laboratory procedures, experimental design, and data analysis/scientific interpretation. If the entering student is sure of the area in which he/she wants to work, a research rotation is not necessary.
Comprehensive Examination

A written comprehensive examination is given by the Environmental Toxicology faculty, usually at the end of the second year of study. The examination evaluates the student's knowledge of the fields covered by the core courses. The student must demonstrate competence in the core subjects and the ability to think analytically in order to continue to the dissertation research. All program faculty members can participate in preparing examination questions, but usually only those faculty who have taught the student write questions. Students are required to answer a percentage (75%) of these questions, although some questions may be mandatory. The comprehensive examination is closed book and is given in one day over an eight-hour period. Responses are graded pass/fail and are critiqued in writing. The student about to take this examination is encouraged to consult faculty and senior graduate students who have recently completed this requirement to get an idea of the true nature of the examination and sample questions. Students failing in only one of the subject areas tested will be permitted to retake that subject examination within three months. Failure in two or more subject areas, or failure on the second attempt of the retake subject leads to disqualification from the predoctoral program; under such circumstances the student may petition the faculty to transfer to the master's degree program.
Qualifying Examination

An oral qualifying examination is required and should be taken not later than the twelfth quarter after entrance into the program; usually it is given early in the third year of graduate study. It is administered by the Candidacy Committee for the individual student. Committee members are recommended by 1) the Director of the Environmental Toxicology Program, 2) the student's research advisor, and 3) the student, and approved by the Director of the Environmental Toxicology Graduate Program and the Dean of Graduate Studies and Research. The Candidacy Committee is comprised of five members, a majority of whom are members of the program faculty. The Chair of the Candidacy Committee must be a member of the program faculty and a voting member of the Academic Senate. Committee members are recommended by 1) the Director of the Environmental Toxicology Program, 2) the student's research advisor, and 3) the student, and approved by the Director of the Environmental Toxicology Graduate Program and the Dean of Graduate Studies and Research. The Candidacy Committee is comprised of five members, a majority of whom are members of the program faculty. The Chair of the Candidacy Committee must be a member of the program faculty and a voting member of the Academic Senate. The UC Faculty Bylaws requires that all members of the Candidacy Committee be voting members of a UC academic senate; as the number of the faculty in the Environmental Toxicology program is small, exception to this rule to permit non-tenured Environmental Toxicology faculty to serve on these committees can be approved by the Dean of Graduate Studies if the exception is well-justified. One member of the Candidacy Committee, designated the "outside member," must be a voting member of the UC Academic Senate - not necessarily the Irvine Division - who does not hold an appointment in the student's discipline or academic unit (school or independent program). As the outside member represents the UC faculty at large, special expertise in the area of the student's dissertation is not necessary. Three members of the Candidacy Committee will continue, after the student has successfully completed the oral examination and advanced to candidacy, as the Doctoral Committee to supervise completion of the research dissertation.

The names of the proposed faculty members for the Candidacy Committee must be submitted to the Graduate Studies Office by the Director of the graduate program at least two weeks prior to the date of the qualifying examination.

In preparation for and as part of the oral qualifying examination, the student must prepare a written research proposal which should include the background, specific objectives, rationale, experimental protocol and methods, and significance of the research project. This proposal serves as the initial focus of the qualifying examination; that is, it starts the examination in an area in which the student should feel comfortable. This mitigates some of the nervousness students may experience in taking a critical oral examination before a faculty panel. (The proposal can also serve as a guide to the student's dissertation research program; however, the student is not obligated to follow the course of studies in that proposal in developing the final dissertation.) It is recommended that students practice answering incisive questions orally before taking this examination. Students who fail this examination may be given the opportunity to stand for re-examination at the discretion of the Candidacy Committee. Re-examination should occur within 6 months of the first qualifying examination. Students failing the second examination are disqualified from the doctoral program; they may petition the program faculty to transfer to the master's degree program.
The results of the Qualifying Examination will be submitted to the Office of Graduate Studies on the Ph.D. Form I. The form must be signed by all committee members at the time the candidacy examination is concluded and submitted even if the examination was failed. If the unanimous recommendation of the Committee is favorable, a $90 Advancement to Candidacy Fee must accompany the Form I (paid by the student, unless other arrangements have already been made). The student must advance to candidacy at least one quarter before the quarter in which the degree is expected to be awarded.

**Teaching Requirement**
Each student, after advancing to candidacy, is required to assist in one of the lecture courses in toxicology, under the supervision of the faculty, to gain experience in preparing lectures and explaining scientific concepts clearly and concisely to junior graduate students and residents. This requires approximately 30 hours of preparation to deliver one 50-minute lecture.

**Dissertation and Final Examination**
The dissertation will present basic research on an original experimental problem in environmental toxicology. The research will demand an intensive concentration of the student's time, effort and energy, and the faculty advisor will encourage the student to work with greater independence as progress is achieved. Progress in the research project is followed by the student's Doctoral Committee by evaluating semiannual reports presented by the student. The student is encouraged to seek consultation with faculty members, and other scientists and professionals outside the University to make the research experience as enriching as possible.

When the student and/or advisor feels the student has learned how to do original and independent research and has produced publishable results, the student should present his/her experimental results to the candidate's Doctoral Committee; when the Committee agrees that the experimental work should terminate, the candidate begins writing the
dissertation. The student submits draft copies of the written dissertation to each member of his/her Doctoral Committee for review and approval (this review takes approximately a month).

The Doctoral Committee supervises a final examination, the focus of which is the content of the doctoral dissertation (dissertation defense). Ordinarily, the final examination will be given just prior to the completion of the dissertation and while the student is in residence during a regular academic session, and will be open to all members of the academic community. The defense is usually conducted in the same format as a seminar.

The Doctoral Committee certifies that the completed dissertation is satisfactory through the signatures of all Committee members on the signature page of the completed dissertation. The final copy must meet the University's requirements for style, format, and appearance before the degree can be conferred. Copies of Standards and Procedures Manual, which describes University's requirements, are available at the UCI Bookstore. The manual is also available on the UCI web site, http://www.lib.uci.edu/rrsc/tdmanual.htm/.

After the dissertation has been approved by the Doctoral Committee, a final copy of the dissertation must be submitted, with the appropriate forms. The electronic submission option is now the preferred option, although paper submission is still permitted. In either case, the document will be examined to assure that it meets all University requirements. More information about submission requirements can be found on the Graduate Division website (http://www.grad.uci.edu/current/thesis.htm). The student must also provide one copy of the dissertation for each member of his/her Doctoral Committee and one copy for the Graduate Program in Environmental Toxicology. The

Upon completion of the dissertation defense and approval of the dissertation, the Doctoral Committee recommends, by submission of the Ph.D. Form 11, the conferral of the Ph.D. degree, subject to final submission of the approved dissertation for deposit in the University Archives.

The expense of preparing the written dissertation is borne by the student. The Environmental Toxicology Program does provide, without charge to the student, use of microcomputers and word processing and graphics software for preparing the document.
IV. REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN ENVIRONMENTAL TOXICOLOGY

Requirements for the M. S. degree may be satisfied in one of two ways. Under Plan I, the student completes the Environmental Toxicology core program with an average grade of B or above and under the direction of a faculty advisor also prepares a thesis that is acceptable to the thesis committee. Under Plan II, the student completes the core program plus a minimum of eight additional credits (all with an average of B or above) from a pre-approved pool, prepares a scholarly paper based on individual study in an area of toxicology under supervision of a faculty member, and satisfactorily passes the written comprehensive examination at the M.S. level.

Plan I

Each candidate for the Master of Science degree must participate in Environmental Toxicology Seminar (TOX 298), prepare a research thesis, complete the required courses listed below, meet the University requirements for residence (at least three quarters) full-time enrollment (12 upper division or graduate units each quarter, including credit for supervised research or teaching), and satisfactory progress (at least 8 units of graduate or upper division credit completed each quarter with grades of B's, or above). A minimum of 28 quarter units in approved courses is required, at least 20 units of which must be earned in graduate courses exclusive of credit given for thesis research and preparation.

CORE CURRICULUM – Plan I

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOX 206 A-B</td>
<td>Target Organ Toxicology</td>
<td>6 units/qtr.</td>
</tr>
<tr>
<td></td>
<td>One of the following 3 introductory statistics courses:</td>
<td></td>
</tr>
<tr>
<td>STATS 201</td>
<td>Statistical Methods for Data Analysis I</td>
<td>4 units</td>
</tr>
<tr>
<td>or PUBHLTH 207</td>
<td>Public Health Statistics</td>
<td>4 units</td>
</tr>
<tr>
<td>or EPIDEM 204</td>
<td>Biostatistics</td>
<td>4 units</td>
</tr>
<tr>
<td>TOX 270</td>
<td>Human Exposure to Environ Contaminants</td>
<td>4 units</td>
</tr>
<tr>
<td>EPIDEM 200</td>
<td>Epidemiology</td>
<td>4 units</td>
</tr>
<tr>
<td>TOX 298 A-B-C</td>
<td>Environmental Toxicology Seminar, 2 units per quarter</td>
<td></td>
</tr>
</tbody>
</table>

Approved electives, 8 units selected from the pool below.

Total units required: 40, plus enrollment in TOX 299 for thesis research (usually 2 units in Winter and Spring of first year and 10 units in subsequent quarters)

APPROVED ELECTIVE POOL*

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOX 201</td>
<td>Principles of Toxicology</td>
<td>4 units</td>
</tr>
<tr>
<td>TOX 202</td>
<td>Environmental Toxicology</td>
<td>4 units</td>
</tr>
<tr>
<td>TOX 204</td>
<td>Neurotoxicology</td>
<td>4 units</td>
</tr>
<tr>
<td>TOX 212</td>
<td>Inhalation Toxicology</td>
<td>4 units</td>
</tr>
<tr>
<td>TOX 220</td>
<td>Industrial Toxicology</td>
<td>4 units</td>
</tr>
</tbody>
</table>
Plan I  (Thesis Plan)

The Masters student is required to write a thesis based on a research problem the student has worked on under faculty supervision in the area of Environmental Toxicology. The first-year student in Plan I is expected to get involved in a research project at the earliest possible time, usually in the first quarter of the program. When a student is unsure of where to work, that student is encouraged to take advantage of the research rotation option. A rotation will consist of up to one quarter residence in a laboratory/research group of the student's choice.

A committee of three faculty members recommended by the Graduate Advisor and officially appointed by the Dean of Graduate Studies is appointed to guide the student through the research problem and determine when a sufficient amount of work has been completed satisfactorily. At that time, the student presents the research results to the committee; after successful presentation of the results, the student can advance to candidacy for the Master of Science degree. The student must advance to candidacy no later than one quarter before the quarter in which the degree is expected to be awarded. The student should be in continual contact with the committee as the work progresses to ensure prompt completion of an appropriate thesis. All three members of the committee must approve the thesis and sign the title page of the approved final version. After the committee has approved the thesis, the thesis must be submitted electronically or as a paper copy. The final copies of the thesis must be accepted before the degree can be conferred. Copies of the Standard and Procedures Manual are available at the UCI Bookstore and on the UCI website.

Plan II  (Comprehensive Examination Plan)

The requirements to fulfill Plan II differ from those of Plan I in that a) a comprehensive examination in toxicology must be taken and passed, rather than a thesis written, b) a
scholarly paper in some area of Environmental Toxicology must be written and accepted by the student's faculty advisor, and c) a minimum of 40 units, plus enrollment in TOX 290 for thesis research (usually 2 units in Winter and Spring quarters of Year 1 and 6 units in Fall quarter of Year 2).

**CORE CURRICULUM – Plan II**

TOX 206 A-B  Target Organ Toxicology  6 units/qtr.

One of the following 3 introductory statistics courses:

- STATS 201  Statistical Methods for Data Analysis I  4 units
- PUBHLTH 207  Public Health Statistics  4 units
- EPIDEM 204  Biostatistics  4 units

TOX 270  Human Exposure to Environ Contaminants  4 units

TOX 298 A-B-C  Environmental Toxicology Seminar, 2 units per quarter

Approved electives, 8 units selected from the pool below.

Total units required: 40, plus enrollment in TOX 290 for thesis research (usually 2 units in Winter and Spring of first year and 6 units in Fall quarter of second year)

The approved elective pool is as listed in Plan I above.

V. GRADUATION AND DIPLOMA INFORMATION (MS AND Ph.D.)  

A student who expects to complete all requirements for an advanced degree in a given quarter must be advanced to candidacy for that degree prior to the first day of the quarter in which the degree will be conferred. Students must complete the Graduate Student Diploma and Commencement form and are responsible for providing accurate information that will be printed on their diploma and in the commencement program.

Questions regarding eligibility to participate in spring commencement and the logistics of commencement exercises should be directed to the Office of Graduate Studies, and the Commencement Office.
VI. GRADUATE STUDENT RESEARCHERS

A Graduate Student Researcher performs research related to his or her degree program in an academic department or research unit under the direction of a faculty member. Appointment as a Graduate Student Researcher, in combination with other University appointments, may not exceed half time during the academic quarters. During the summer recess, appointments may be increased to 100 percent.

Student fees (including graduate student health insurance fee) and nonresident tuition, if applicable, may be paid for Graduate Student Researchers with appointments of 25% time or more by the hiring funding source, including federal grants and contracts. Students eligible for appointments as Student Researchers are so notified at the time of acceptance into the graduate program.

VII. TEACHING ASSISTANTSHIPS

There are no undergraduate students in the School of Medicine; as teaching assistantships are awarded to graduate students to teach undergraduate courses, no teaching assistantships are available through the School of Medicine. Graduate students in Environmental Toxicology may be eligible for teaching assistantships in the School of Biological Sciences and the School of Social Ecology, but such awards are rarely made outside these schools.

VIII. REGISTRATION PROCEDURE

Enrollment consists of two separate steps: 1) enrollment in classes and 2) payment of fees. Both steps must be completed to be officially registered for the term. Access WebReg for information as to enrollment dates. Students may check their ZOT account online at: http://www.reg.uci.edu/registrar/soc/webreg.html
IX. FACULTY

Ulrike Luderer, MD, PhD, MPH — Co-Director, Environmental Toxicology Graduate Program
Luderer's research on reproductive and developmental toxicology is currently focused on understanding the role(s) of oxidative stress and antioxidants in ovarian toxicity, ovarian aging and ovarian cancer. A second area of focus is developmental toxicology of the reproductive system, specifically the developmental basis of premature ovarian failure and ovarian cancer.

Dean B. Baker, MD — Director, Center for Occupational and Environmental Health
Baker's epidemiologic research is focused on environmental studies of hazardous waste sites, childhood exposure to environmental pollutants, asthma among inner-city children, the role of irritant exposure in occupational asthma, occupational stress, indoor air pollution and the use of biological markers of exposure for subclinical effects.

Scott M. Bartell, PhD
Bartell's research in exposure sciences and risk assessment focuses on probabilistic models and statistical methods for exposure assessment, environmental epidemiology and risk decision analysis.

Stephen C. Bondy, PhD
Bondy's research in molecular neurotoxicology focuses on the potential role of toxic agents in the promotion of brain aging and neurological disease. Studies include evaluation of agents that accelerate or retard the aging process. Endpoints range from behavioral tests to assay of gene expression. In addition, the properties of aluminum that relate to neurotoxicity and its possible contribution to Alzheimer's disease are being investigated.

Vincent J. Caiozzo, PhD
Caiozzo's expertise is in structure and function of muscle with an emphasis on exercise physiology. He has a special interest in the role of environmental toxicants in modulating physiological responses in human muscle.

Jefferson Y. Chan, MD, PhD
Chan's research in chemical pathology focuses on the oxidative stress response in cells exposed to toxic xenobiotics.

Ralph J. Delfino, MD, PhD
Delfino's research is focused on air pollution exposure assessment and health effects, chronic disease and environmental epidemiology, and gene-environment interactions.

Derek Dunn-Rankin, PhD
Dunn-Rankin's major research focus is on laser and optical diagnostics in practical systems, optical particle sizing, droplet formation and vaporization and their application to human exposures.
Rufus D. Edwards, PhD
Edwards’ research in exposure sciences and risk assessment focuses on air pollution, particles, volatile organic compounds, greenhouse gases and environmental epidemiology in the developing world and European cities.

Chenyang (Sunny) Jiang, PhD
Jiang's research focus is in coastal water quality microbiology and the application of molecular techniques to detect human pathogenic bacteria and viruses in aquatic environments.

Virginia Kimonis, MD
Kimonis is a Clinical Geneticist-Scientist with a strong interest in the genetics of neuromuscular diseases. Her laboratory focuses on the genetic causes of muscle disease. She is particularly interested in inherited muscle disorders that occur in combination with diseases of bone.

Michael T. Kleinman, PhD — Co-director, Air Pollution Health Effects Laboratory
Kleinman’s research focuses on the mechanisms of cardiopulmonary injury following inhalation of toxic compounds. His laboratory uses state-of-the-art methods to evaluate the roles of free radicals and oxidative stress in sensitive human volunteers and laboratory animals. In vitro methods are used to evaluate specific mechanisms. Other interests include analytical and atmospheric chemistry, environmental sampling and analysis, and the application of mathematical and statistical methods to environmental and occupational assessments of exposure and risk.

Charles E. Lambert, PhD
Lambert’s research is in industrial and regulatory toxicology, pharmaceutical toxicology as it relates to impurities and degradants, green chemistry and life cycle evaluations, risk assessment and risk communication.

Charles L. Limoli, PhD
Limoli studies the mechanisms by which cells perpetuate genomic instability in response to radiation and environmental toxicants and the role of oxidative stress in these processes. He also explores how DNA damage and oxidative stress may drive the progression of normal multipotent cells in the central nervous system to brain tumor stem cell.

Oladele A. Ogunseitan, PhD — Chair, Department of Population Health and Disease Prevention
Ogunseitan’s research is focused on microbial diversity and ecology, environmental pollution, industrial ecology, health and development.

Kathryn E. Osann, PhD
Osann’s specialty is in cancer epidemiology and applied biostatics.
Robert F. Phalen, PhD — Co-director, Air Pollution Health Effects Laboratory
Phalen's research focus is on the aerodynamics of particle deposition in the developing lung and in the adult lung. Another area of interest is in the assessment of lung defense mechanisms using radio-labeled aerosol inhalation challenges. His lab uses quantitative morphometry to study the mechanism of interference with organogenesis and possible long-term consequences for chronic lung disease due to toxic inhalation exposure. Additional studies include evaluating the tolerance of animals to air pollution mixtures as a mechanism that may protect humans against ambient pollutants.

John Leslie Redpath, PhD
Redpath studies into the chemical and physical modification of radiation damage are aimed at basic research in carcinogenesis. His recent work is focused on radiation-induced neoplastic transformation and tumor suppression gene inactivation.

Ronald C. Shank, PhD – Co-Director Graduate Program
The principal thrust of Shank's research is to elucidate mechanisms of action of environmental toxicants, especially carcinogens. The current focus is on the mechanisms in DNA adduct formation by multiple carcinogens and maintenance methylation of DNA in defined sequences using various tools of molecular biology. Of special interest are molecular mechanisms in the competition for binding sites on DNA.

Jun Wu, PhD
Wu's research focus is on air pollution exposure assessment and air pollution epidemiology.
X. FREQUENTLY USED NUMBERS AND ADDRESSES

Graduate Division, 120 Aldrich Hall. Ext. 44611  
http://www.grad.uci.edu/

Office of the Registrar, 215 Aldrich Hall. Ext. 47896  
http://www.reg.uci.edu/

Ronald C. Shank, Ph.D., Co-Director, Environmental Toxicology Graduate Program,  
10 FRF Building, North Campus, Ext. 45186, rcshank@uci.edu

Ulrike Luderer, M.D., Ph.D., Co-Director, Environmental Toxicology Graduate Program  
Center for Occupational and Environmental Health (COEH),  
5201 California Avenue, Suite 100, Ext. 48081, uluderer@uci.edu

Robin Ferguson, Financial Assistant, Payroll and Purchasing  
4 FRF Building, North Campus, Ext. 47243, rferguson@uci.edu

Campus mail code (ZOT code): 1830

Program/Department Fax number – 949-824-2345 (at the COEH)
XI. IMPORTANT FILING DEADLINES

The following are deadlines for advancement and final degree paperwork for both master and doctoral students.

**Final degree paperwork deadline for master and doctoral students**

- **Summer 2011 Degree Deadline**: September 7, 2011 (to be eligible for a Summer ’11 degree)
- **Fall 2011 Degree Deadline**: December 2, 2011 (to be eligible for a Fall ’11 degree)
- **Winter 2012 Degree Deadline**: March 16, 2012 (to be eligible for a Winter ’12 degree)
- **Spring 2012 Degree Deadline**: June 8, 2012 (to be eligible for a Spring ’12 degree)

***No exceptions allowed

**Advancement deadlines for master students**

- **Summer 2011**: August 19, 2011 (to be eligible for a Fall’11 degree)
- **Fall 2011**: December 9, 2011 (to be eligible for a Winter’12 degree)
- **Winter 2012**: February 27, 2012 (to be eligible for a Spring ’12 degree)
- **Spring 2012**: June 15, 2012 (to be eligible for a Summer ’12 degree)

**Advancement deadlines for doctoral students**

- **Summer 2011**: September 16, 2011 (to be eligible for a Fall ’11 degree)
- **Fall 2011**: December 9, 2011 (to be eligible for a Winter’12 degree)
- **Winter 2012**: March 23, 2012 (to be eligible for a Spring ’12 degree)
- **Spring 2012**: June 15, 2012 (to be eligible for a Summer ’12 degree)

If you need additional information, please contact:

**Andrea Anderson**  
Student Affairs Officer  
Graduate Division  
120 Aldrich Hall  
Zot code 3180  
Email: alanders@uci.edu

* Dates are subject to change  
** Final degree paperwork includes dissertation approval by University Archives