PhD Degree Requirements

1) Admission Requirements

Admission to the Microbiology Graduate Group (MGG) is open only for the fall quarter. It is the applicant’s responsibility to ensure that all application materials are submitted to the online application system by the deadline of December 15th of the previous year.

Admission requires an undergraduate degree (B.S. or B.A.) in a biological science. Students must also demonstrate an aptitude and enthusiasm for research, which should include experience as an active participant in an independent research project supervised by a faculty member.

A GPA of 3.0 or greater (on a 4.0 scale) for undergraduate courses is generally required. UC Davis Graduate Studies mandates that international students who have not studied at an institution where English was the language of instruction must obtain the minimum university required score on the TOEFL or IELTS before applying for admission.

A. Prerequisites
Candidates should have taken course work in most of the following areas: calculus (MAT 17A-C), general physics (PHY 7A-C), general chemistry (CHE 2A-C), organic chemistry (CHE 118 A-C), biochemistry (BIS 102-103) with a laboratory (MCB 120L), general genetics (BIS 101), general biology with a laboratory (BIS 2A-C), and general microbiology (MIC 102) with a laboratory (MIC 102L). Upper division courses in cell biology (BIS 104), microbial physiology (MIC 140) and genetics (MIC 150), virology (MIC 162 or PMI 128), or immunology (MMI 188 or PMI 126) are also encouraged.

B. Deficiencies
Course work deficiencies should be made up by the end of the first academic year following initial enrollment by taking courses approved by the academic advisors and earning a letter grade of B or better.

C. Transfer Students:
Requests to transfer into the MGG program will be reviewed by the Admissions committee, whose recommendation will be considered by the Executive Committee. All students admitted to the MGG Ph.D. program from another graduate institution or another UC Davis graduate program must demonstrate proficiency in general subject matter equivalent to MGG students already enrolled at UC Davis. The graduate advisor will determine whether a transfer student has taken equivalents of MGG-required courses at another institution. If not, the student must take the required courses at UC Davis. The graduate advisor will prepare a report to the student and the Dean of Graduate Studies specifying which portion of the degree requirements previously met at another institution will be accepted in partial fulfillment of the MGG requirements and which degree requirements remain to be fulfilled at UC Davis.
MGG Degree Requirements

A transfer student is required to take an MGG oral qualifying examination. The student must have a UC Davis GPA of 3.2 to take the qualifying examination.

2) Dissertation Plan

The degree of Doctor of Philosophy is given under dissertation Plan B which specifies a three member (minimum) dissertation committee, and an optional final oral examination (made on an individual student basis by the dissertation committee). All students are required to present an exit seminar.

3) Course Requirements: 31 units

a) Core courses (a list is presented in Attachment 1): 14 units

The following required core courses must be completed with a grade of B- or better unless the course is offered only S/U:

- MIB 200A Microbial Biology (3 units)
- MIC 215 Recombinant DNA (3 units) or MCB 211 Macromolecular Structure and Interactions (3 units)
- MMI 200D Mechanisms for microbial interactions with hosts (3 units)
- BCB 214 Molecular biology (3 units)
- Two units of non-participatory seminars (fall, winter 1ST year)
- MIC 291 OR MMI 291

All of the core course requirements can be completed within one year.

b) Lab rotations: 10 units

MIB 201L- Advanced microbiology laboratory rotations (5 units), twice for 10 units total.

Students must participate in four, 5-week rotations in a minimum of three different labs during fall and winter quarters of the first year. At the end of each rotation, each student will give a short oral presentation on the project to the other first-year students, the instructor in charge and any others who wish to attend. The student will also submit a short written report.

c) Elective courses (a list of potential courses is presented in Attachment 2): 3 units

At least 3 units of a graded, graduate elective course(s) to be selected in consultation with the academic advisor and major professor. The required elective course(s) should provide depth in the student’s area of research. Additional elective courses may be taken for depth and breadth. A list of potential elective courses is provided to all incoming students.

d) Participatory seminars (a list of potential seminars is presented in Attachment 3):

4 units

Four graduate-level seminar courses in which each student makes at least one presentation during the quarter. At least three of the seminars must focus on critical analysis of the scientific literature. A list of potential seminars is provided to all incoming students.
MGG Degree Requirements

e) Summary
14 units of core coursework, 10 units of lab rotations, 3 units of electives and 4 units of participatory seminars are required for a total of 31 units.

All course requirements must be fulfilled by the end of the quarter in which the qualifying exam is taken.

Full-time students must enroll for 12 units per quarter including research, academic and seminar units. Courses that fulfill any of the MGG course requirements may not be taken S/U unless the course is normally graded S/U. Once course requirements are completed, students can take additional classes as needed, although the 12 units per quarter are generally fulfilled with a research class (299) and perhaps seminars.

MGG students must have a GPA of 3.2 when taking the oral qualifying examination. Students must maintain a GPA of 3.0 or better to be eligible for appointment in a graduate student academic title. A minimum 3.0 GPA is required to be eligible for a living allowance/stipend fellowship, an in-state fee fellowship, or a non-resident tuition award. If the GPA falls below 3.0, the student is placed on academic probation. After two consecutive terms on academic probation, a student is subject to disqualification by the Dean of Graduate Studies.

A student earning a grade of C+ or lower in a required course will receive an "Unsatisfactory" progress evaluation and must retake the course and earn a grade of B- or better. If the student does not earn a grade of B- or better the second time, s/he will receive an "Unsatisfactory" evaluation. Two "Unsatisfactory" evaluations are grounds for disqualification from the MGG program.

4) Special requirements
Teaching experience: MGG strongly recommends that students acquire teaching experience by working as a Teaching Assistant for a quarter in a laboratory or discussion course. This experience is helpful in preparing for the oral qualifying examination. More advanced students considering careers involving teaching are encouraged to seek an opportunity to give a formal lecture in an undergraduate course, with guidance and feedback from the course instructor. Participatory seminars on developing teaching strategies are available from time to time and students are encouraged to attend.

English Language Requirement: Students who have not obtained a previous degree at an approved English-medium institution or demonstrated English-language proficiency through an appropriate exam (e.g. TOEFL) are required to complete appropriate English-language courses, as described in the policy on Graduate Student Course Requirements – English as Second Language (GC2018-02). Courses taken in satisfaction of this requirement do not count towards the units required for graduation.

5) Committees
a) Admissions Committee: Once the completed application, all supporting material, and the application fee have been received, applications are submitted to the Admissions Committee. The committee is composed of 5 to 6 appointed graduate group faculty and a
MGG Degree Requirements

Based on the committee’s review of the entire application, a recommendation is made to accept or decline an applicant’s request for admission. Applicants will be interviewed before acceptance into the program. The Admissions Chair functions as the admissions adviser and has signature authority; in this person’s absence, the Chair of the MGG has signature authority. The recommendation is forwarded to the Dean of Graduate Studies for final approval of admission. Notification of admissions decisions is sent by Graduate Studies.

b) Student Welfare and Advising Committee: Admitted students are assigned a graduate academic advisor who is one of six faculty members of the Student Welfare and Advising Committee. The advisors meet prior to the start of classes to review entering student transcripts, assess preparedness for the core graduate courses, and develop recommendations for any necessary remedial courses. Before the start of fall quarter classes, entering students meet with the MGG master advisor and other graduate advisors for an orientation where the MGG Ph.D. curriculum is presented. A plan for a first quarter course of study is presented at this meeting. The student may additionally elect to meet individually with his or her assigned advisor prior to the start of classes. It is recommended that students meet quarterly during the first year with their advisors to design course plans that include the required core courses, elective courses, and participatory seminars. Advisors will recommend additional elective and seminar courses based on each student’s proposed dissertation project and prior academic course work. After the first year, students meet with their academic advisors as necessary to sign forms, and at least once a year to review progress and complete reports to Graduate Studies.

c) Qualifying examination committee: Four members of the MGG or other qualified faculty serve on the examination committee. The major professor, who will serve as chair of the student's dissertation committee, may not serve on the qualifying exam committee. The candidate, together with the major professor, selects two members; ideally, these two members will also serve on the dissertation committee, but this is not required. The student must obtain the agreement of these individuals to serve in this capacity prior to submitting their names to the Educational Policy Committee. An additional two members of the MGG are selected by the Educational Policy Committee. The student may choose any one of the examination committee members who is a member of the MGG to serve as Chair. The student may review the list of examiners, and, with sufficient cause, the Educational Policy Committee may alter the membership of the qualifying examination committee. Within a week of its decision, the Educational Policy Committee informs prospective committee members of their appointment and ascertains their general availability. The recommended composition of the qualifying examination committee is then submitted to Graduate Studies, which appoints the committee in accordance with Graduate Council policy. (In June 2009, MGG was granted an exception to the requirement to have a member external to the Group on its students’ QE committees.)

d) Dissertation committee: Upon advancement to candidacy, a committee of three faculty members is appointed by the Dean of Graduate Studies to direct the student in the dissertation research and to approve the dissertation. The chair of the dissertation committee is the student's major professor, who must be a member of the MGG, and must be immediately involved with the planning and execution of the experimental work done
MGG Degree Requirements

to formulate the dissertation. The other two dissertation committee members need not be members of the MGG. The student’s graduate academic advisor must approve the nomination of a committee member who is not in the MGG. If a nominee is not a member of Academic Senate or Academic Federation, then a current curriculum vitae must be submitted to Graduate Studies with a memo explaining why that person is best suited to be on the committee. Under certain circumstances, a committee member from outside the University of California who has special expertise and qualifications may be nominated to serve on a dissertation committee. The graduate advisor must submit a brief statement indicating the appointee's affiliation and title, degrees held, and describing the special expertise that cannot be duplicated on the campus. A curriculum vitae and letter from the nominated person indicating willingness to serve must also be submitted.

6) Advising Structure and Mentoring

The **Major Professor** is a faculty member belonging to MGG who supervises the student’s research and dissertation. The major professor’s laboratory is usually the setting for most of the student’s research activities and the major professor serves as chair of the student’s dissertation committee. The major professor advises on details of course work and other aspects of the academic program that are tailored to suit the individual student’s programmatic needs and career goals. **Mentoring guidelines** from Graduate Council can be found in the MGG student handbook.

Selection of the major professor is normally accomplished by the end of the winter quarter of the first year, by mutual consent of the student and the intended major professor. The chair of MGG sends a letter to each first year student, which is copied to the academic advisor, requesting that the student identify a major professor who is willing to take the student into the laboratory and provide the necessary financial support. The MGG executive committee approves and makes final assignments upon confirmation of the major professor’s agreement to accept and support the student.

A student may rotate through additional laboratories during spring quarter of the first year, if this is necessary to identify a major professor. Satisfactory progress during the first year in the MGG program depends upon assignment of a major professor by the end of spring quarter. A student needing to rotate further during the summer must petition the Executive Committee for permission to do so.

A student’s **Graduate Advisor** is an MGG faculty member appointed by the group chair to the Student Welfare and Advising committee. The graduate advisor acts as the student’s first source of academic information and provides assistance with fulfilling the requirements of the MGG. This includes choosing a major professor, planning coursework (including any courses necessary to fill in gaps in background), preparing for the qualifying exam and conducting annual reviews of progress. Graduate advisors approve and sign petitions such as those for Planned Educational Leave and filing fee status as well as forms for advancement to candidacy. The graduate advisor may not be the student’s major professor. A student should turn to the graduate advisor should problems arise with the major professor.

Students meet with their graduate advisors upon entering the MGG, quarterly for advice during the first year, as necessary to obtain signatures on forms, and at least once a year to review progress and complete reports to Graduate Studies.
The **Master Advisor** for MGG is appointed by the Dean of Graduate Studies to serve as a deputy in matters affecting individual graduate students and their academic programs. The Master Advisor in MGG chairs the Student Welfare and Advising Committee, oversees the individual graduate advisors, and provides uniformity in student advising. The master adviser maintains records of each student’s performance.

7) **Progress in the MGG Program**

Graduate advisors must file an annual progress report with Graduate Studies on each student's progress towards a degree. The report informs the student of the remaining steps necessary to attain the degree and assesses progress as satisfactory, unsatisfactory, or marginal. The student initially fills out the report together with the major professor, who evaluates progress, explains the evaluation, and signs the report. The student then takes the Graduate Studies form and, if advanced to candidacy, a copy of the MGG dissertation committee meeting report, to a meeting with his or her graduate advisor. The advisor reviews the reports, discusses the student’s progress, and ensures that the student clearly understands what is necessary to complete the degree.

When progress is satisfactory, the report is placed in the student’s MGG file. Copies are sent to the student, the student’s graduate advisor, and the student’s major professor.

When progress is marginal (e.g. academic difficulties or inadequate progress on research), the graduate adviser must share the information with the student and the student’s major professor. The graduate advisor informs the student in writing what must be done to regain satisfactory status. The graduate adviser sends the report to the MGG staff program assistant, who sends it to Graduate Studies to be placed in the student’s file. Copies are sent to the student, the student’s graduate advisor, and the student’s major professor.

When progress is unsatisfactory (e.g. academic difficulties, insufficient progress on research, failure to fulfill previous recommendations to maintain satisfactory progress), the graduate adviser must share the information with the student and the student’s major professor. The graduate advisor, MGG master advisor and major professor, and optionally the MGG chair, review the situation with the student and decide upon a course of action, which must be communicated to the student in writing. This information, along with a copy of the annual progress report, is sent by the graduate adviser to the MGG staff program assistant, who sends it to Graduate Studies to be placed in the student’s file and also sends copies to the graduate advisor, the student, and the major professor. Graduate Studies places the student on academic probation. The Dean of Graduate Studies sends the student a notice delineating the work that must be completed to attain a satisfactory evaluation and the time limit for completing the work.

If the student fails to meet the requirements for satisfactory progress, the graduate advisor will request that Graduate Studies place a hold on the student’s registration for the next quarter. If a student fails to meet the requirements specified in the letter from the Dean, the student is subject to disqualification from further study in the MGG program.

8) **Qualifying Examination Requirements**

To be eligible for the qualifying examination, the student must have completed all MGG course requirements, removed any deficiencies on the transcript, and attained at least a 3.2 GPA in all work undertaken while in graduate standing. The qualifying examination must be
MGG Degree Requirements

taken by the end of fall quarter of the student’s third year (7th quarter). Exceptions to this
deadline may be requested from the Chair of the Graduate Group. The candidate must have
conducted a minimum of three months experimentation on the proposed thesis research
project prior to the examination. The student must be registered during the quarter in which
the qualifying exam is taken.

The purpose of the qualifying examination is to determine that: 1) the student has acquired
sufficient knowledge, in breadth and depth, of microbiology and related areas, and 2) the
student has identified a dissertation research topic that asks a significant question in
microbiology. The latter includes demonstration that the student has completed a literature
review of that topic, has identified a set of achievable goals and has designed appropriate
experimental approaches to accomplish those goals. Basic knowledge and breadth
requirements are further addressed in an alternative proposal.

Format of the examination: The exam consists of written and oral presentation and defense of
a dissertation research proposal and an alternate research proposal. A general knowledge of
microbiology is expected and will be addressed by the committee during the exam. The
dissertation research proposal should describe work that will provide a substantial and
original contribution to the field of microbiology. The candidate develops this proposal in
close consultation with the major professor. The alternate proposal is meant to challenge
the candidate’s creativity and establish his or her ability to identify a significant
microbiological question and develop a rational approach to answering the question. To
promote the acquisition of breadth in microbiology, the alternate project cannot be on a
research topic currently or previously addressed in the student’s home laboratory or on a
topic the student has previously investigated in any laboratory. The main research subject of
the alternate proposal must be a microbe. The subject and every aspect including
approaches and techniques to be used must differ from those in the dissertation research. The
student’s work on the alternate proposal must be done independently of the dissertation
advisor.

The candidate should develop an excellent understanding of the research projects and a
thorough knowledge in any areas (existing literature, experimental approaches and
procedural mechanics) directly associated with the projects. A general understanding of the
fields of knowledge that represent integral portions of the projects is expected. In addition,
the candidate should be prepared to answer questions concerning the experimental approach,
including how the experimental approach will answer the questions posed in the objective(s),
any potential experimental difficulties, and alternative approaches that could be used to
achieve the desired aims.

Pre-Proposals:
In December of the second year in the program, a candidate must complete a form listing
titles for a dissertation proposal and an alternate proposal, as well as the names of two faculty
members to serve on the oral examination committee, one of whom will be the Chair of the
committee. The two members nominated by the candidate will usually become members of
the Dissertation Committee. After the academic advisor has signed and dated the form, the
candidate submits the form along with a one-page outline of each proposal to the MGG
graduate program assistant. The candidate must submit this material by December 15th. The
Educational Policy Committee reviews the proposal outlines no later than early January.
1) Pre-proposal for the projected dissertation research project

The dissertation research proposal should describe work that will provide a substantial and original contribution to the field of microbiology. You should develop this proposal in close consultation with your major professor.

A summary (1 full page, excluding references) of your dissertation research project will be submitted to the Microbiology Graduate Group Educational Policy Committee for review and approval. The format is that of an NIH postdoctoral fellowship proposal: 11 point Arial font, 0.5 inch margins. Organize sections of the research pre-proposal to include: 1) Title; 2) Hypothesis (What idea are you testing?); 3) Background and significance (What is already known and why is the study important?); 4) Objectives (What do you intend to do?); 5) Experimental approach (How are you going to do the work and what have you already done?); 6) References.

2) Pre-proposal for an alternate research project conceived by the candidate.

The alternate project is meant to challenge your creativity and establish your ability to identify a significant microbiological question and develop a rational approach to answering the question. To promote the acquisition of breadth in microbiology, the alternate project cannot be on a research topic currently or previously addressed in your home laboratory or on a topic you have previously investigated in any laboratory. The approaches and techniques to be used must differ from those in the dissertation research. The proposal should serve as a foundation for a challenging and interesting exchange of ideas in the actual oral qualifying examination.

The alternate proposal must be completely different from the dissertation proposal in every way. The main research subject of the alternate proposal must be a microbe.

A summary (1 full page, excluding references) of your alternate research project will be submitted to the Microbiology Graduate Group Educational Policy Committee for review and approval. Proposals that are deemed to be too close to the primary proposal (or other research in the major professor's laboratory) will not be approved by the Educational Policy Committee. The format is that of an NIH postdoctoral fellowship proposal: 11 point Arial font, 0.5 inch margins. 1) Title; 2) Hypothesis (What idea are you testing?); 3) Background and significance (What is already known and why is the study important?); 4) Objectives (What do you intend to do?); 5) Experimental approach (How are you going to do the work); 6) References. The formatting requirements will be strictly enforced; proposals not adhering to them will be returned without review.

Proposals:

Upon approval of the pre-proposals, the student prepares expanded proposals (not to exceed 4 pages, excluding references and figures) using the following format. Proposals must be submitted to the members of the qualifying examination committee a minimum of one week prior to the examination date.

Your major professor should be closely involved in preparation of the thesis research proposal, while development of the alternate proposal is to be done independently.
MGG Degree Requirements

The format is that of an NIH postdoctoral fellowship proposal. Use NIH style format for proposals: 11 point Arial font, 0.5 inch margins. Sections of the research proposal should be organized as described below. DO NOT EXCEED 4 PAGES FOR SECTIONS 2-5 below. The formatting requirements will be strictly enforced.

1. Title

2. Specific Aims: What do you intend to do?
Start with a paragraph containing a synopsis of the general problem to be addressed and clearly stating the hypothesis to be tested. This is necessary for the specific aims to make sense. Then, list the specific aims.

3. Background/Significance: Why is the work important?
Briefly sketch the background to the proposal. Critically evaluate existing knowledge, and identify the gaps that the project is intended to fill. Concisely state the importance of the proposed research by relating the specific aims to the broad, long-term objectives.

4. Preliminary Studies: What has already been done?
Thesis research: describe the work you have already accomplished that is relevant to the proposal or the work in your lab that forms the rationale for your proposal. **Alternate proposal:** describe the work from the published scientific literature that forms the rationale for the proposal.

5. Experimental Design: How are you going to do the work?
List the aims again. Under each aim, explain the rationale for each experiment necessary to accomplish the aim, the experimental design, the interpretation of different types of results, and necessary methods (without intricate details). Include the means by which data will be collected, analyzed and interpreted. Describe any new methodology and its advantage over existing methodologies. Discuss the potential difficulties and limitations of the proposed procedures along with alternative approaches to achieve the aims. Provide a tentative sequence for the investigation. At the end, **summarize** how your experimental results will test your hypothesis.

(6) References: quote references in the text (Author[s], date) and then collect them in alphabetical order at the end. Each citation must include the names of all authors, title of the article, name of the book or journal, volume number, page numbers and year of publication.

Five key references should be highlighted in each proposal.

Qualifying examination committee: Refer to Page 4, item C

Examination Procedures:
The candidate establishes an examination date that can be accommodated by all examiners. The candidate is encouraged to communicate individually with the committee members about their expectations about the examination. These meetings are not pre-examinations of the student on the research proposals. Student should not ask for, nor should committee
MGG Degree Requirements

members provide, comments on weaknesses, potential problems, and errors in the research proposals

The qualifying examination consists of the dissertation research proposal, the alternate research proposal and breadth questions about general microbiology. For each proposal, the candidate is given a short time to present a chalk talk outlining the overall objectives and experimental approach. The committee’s evaluation of dissertation proposals is to be based on the candidate's research promise, not on research accomplishments or publications to date. Breadth is addressed in association with the dissertation proposal and is an emphasis during the examination on the alternate proposal. Material taught in the core courses and covered in electives the student has taken is part of breadth in microbiology.

The chair of the qualifying examination committee is expected to ensure that the student receives a fair examination and that short breaks are taken as appropriate. Generally, the exam lasts no longer than 3 hours. Both portions of the exam must be completed.

Qualifying Examination Evaluation. The student's previous academic record, performance on specific parts of the examination and overall performance/potential for scholarly research are evaluated in determining the outcome of the examination. One of three outcomes is reached by unanimous decision of the examination committee. “Pass” advances the student to candidacy for the Ph.D. (no conditions may be appended to this decision). “Not Pass” means that the student is required to retake all or part of the examination or to satisfy a particular requirement(s) established by the committee within a specified time frame. When a second examination is mandated, it will be administered by the same committee and must be scheduled within a specified time frame. The conditions must be described in the report of the chair of the qualifying examination committee and also communicated to the student. Satisfactory completion of a second examination or specified requirement will result in a “Pass” and the student may advance to candidacy. Only one retake of the qualifying examination is allowed. “Fail” on the first or second attempt at the qualifying examination means that the student is recommended for disqualification from the MGG Ph.D. program.

9) Advancement to Candidacy

The student is eligible for Advancement to Candidacy after successfully completing all graduate program requirements except for the dissertation and exit seminar, and after passing the qualifying examination. A student’s application for advancement to candidacy form is signed and dated by the chair of the qualifying examination committee. The student, in conjunction with the major professor, identifies two other faculty members to serve on the dissertation committee, obtains their consent, and obtains signatures of the major professor and the graduate advisor. After payment of the candidacy fee, the student files the form with Graduate Studies. The committee of three faculty members is appointed by the Dean of Graduate Studies to direct the student in the dissertation research and to approve the dissertation.

MGG students are expected to advance to candidacy by the end of their seventh quarter of academic enrollment. A student must have advanced to candidacy by the beginning of the tenth quarter of academic enrollment to be eligible for continued appointment as a graduate student researcher or teaching assistant.
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10) Dissertation Requirements

The degree of Doctor of Philosophy is given under dissertation Plan B, which specifies a three member (minimum) dissertation committee, and optional final oral examination (made on an individual student basis by the dissertation committee). All students are required to present an exit seminar.

**Dissertation committee:**
Refer to page 4, item D

**Dissertation committee meetings:**
Yearly meetings of the student and dissertation committee are required. A written report must be filed with the MGG staff program assistant and academic advisor after each meeting. The report includes a 1-page form summarizing the committee’s assessment of progress and recommendations for the next year. In addition, the student must write a 2-page progress report summarizing the work of the previous year and listing future goals. The report must be sent to dissertation committee members within 1 week before the committee meeting.

**Dissertation:**
The research conducted by the student must be of such character as to show ability to pursue independent research. The dissertation reports a scholarly piece of work of publishable quality that solves a significant scientific problem in microbiology and is carried out under the supervision of a member of MGG while the student is enrolled in the MGG program. The chair of the dissertation committee must be a member of the MGG and must be immediately involved with the planning and execution of the experimental work done to formulate the dissertation. The major professor’s laboratory is the setting for most of the student’s research activities, unless an alternative site and immediate supervisor are approved in advance by the MGG Executive Committee.

The dissertation must be submitted to each member of the dissertation committee at least one month before the student expects to submit to graduate studies, in order to make requested revisions. Informing committee members of progress as writing proceeds helps the members to plan to read the dissertation and provide feedback within this time frame. The dissertation must be approved and signed by the dissertation committee before it is submitted to Graduate Studies for final approval.

The dissertation must be filed in a quarter in which the student is registered or on filing fee. Instructions on preparation of the dissertation and a schedule of dates for filing the dissertation in final form are available from Graduate Studies; the dates are also printed in the UC Davis General Catalog and in the Class Schedule and Registration Guide issued each quarter.

**Exit seminar:**
Each student must present a public seminar on the dissertation research. The seminar is arranged through the major professor and advertised by the MGG office. Satisfaction of this requirement should be verified by the dissertation committee chair.
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11) Normative Time to Degree:
A student should plan on at least 5 years to satisfy all requirements of the degree. Normative time to advancement to candidacy is 7 quarters. Normative time to complete the Ph.D., measured from the time a student begins graduate study in the MGG, is 6 years.

12) Typical Time Line and Sequence of Events

**First Year**

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>MIB 200A Microbial Biology (3 units)</td>
</tr>
<tr>
<td></td>
<td>MIC 215 - Recombinant DNA (3 units) or MCB 211 Macromolecular Structure and Interactions (3 units)</td>
</tr>
<tr>
<td></td>
<td>MIB201L - Research rotations (5 units)</td>
</tr>
<tr>
<td></td>
<td>Participatory or non-participatory seminar (1 unit)</td>
</tr>
<tr>
<td>Winter</td>
<td>MMI 200D - Mechanisms for microbial interactions with hosts (3 units)</td>
</tr>
<tr>
<td></td>
<td>MIB201L - Research rotations (5 units)</td>
</tr>
<tr>
<td></td>
<td>Participatory seminar (1-2 units)</td>
</tr>
<tr>
<td></td>
<td>Elective course, possibly (3 units)</td>
</tr>
</tbody>
</table>

**Students should join a lab at the end of this term. Notify the staff program assistant of your identification of a major professor.**

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring</td>
<td>BCB 214 Molecular biology (3 units)</td>
</tr>
<tr>
<td></td>
<td>Participatory seminar (1-2 units)</td>
</tr>
<tr>
<td></td>
<td>Elective course (3-4 units)</td>
</tr>
<tr>
<td></td>
<td>Research (MIB 299 or home dept. 299) or additional 201L (Research rotations)</td>
</tr>
</tbody>
</table>

All students are expected to have joined a lab by the end of this quarter to make satisfactory progress in the program.

June 30 Annual progress assessment of coursework and research by major professor and graduate adviser. Reviewed by MGG Executive Committee.

Important:
- Complete core courses with grades of B- or better before the oral qualifying exam.
- At least 3 units of graded graduate elective courses and 4 participatory seminars are required before you take your oral qualifying exam.
- A non-participatory seminar (e.g. MIC 291, MMI 208, etc.) where you will hear about research of guest speakers is suggested every quarter.
- **You must have a 3.2 GPA to be eligible to take your oral qualifying exam.**

**Second Year**

<table>
<thead>
<tr>
<th>Term</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Submit pre-proposals for dissertation research and alternate topic including orals proposals form. Nominate two members of qualifying exam committee Participatory seminar (total of 4 required) / Elective Dissertation research</td>
</tr>
</tbody>
</table>

Winter/Spring Participatory seminar (total of 4 required) / Elective Dissertation research
MGG Degree Requirements

Spring/Summer  Annual progress report due June 30
  Prepare and take oral qualifying exam.
  Finalize dissertation committee, file advancement to candidacy form.
  Continue dissertation research.
  Meet with dissertation committee.

Third through Fifth Years  Continue dissertation research.
  Annual dissertation committee meeting.
  Annual progress reports due May 30.
  Fifth year and beyond: on the dissertation committee report, include a plan and a
timetable for completion of degree requirements.

Fifth or Sixth Year  Submit dissertation to committee.
  Exit seminar on dissertation research.
  File dissertation with Graduate Studies.

13) Sources of Funding
During their first two quarters, students are supported financially through MGG funding
(block grant) plus internal and external fellowships. Thereafter, students are supported
through a combination of internal and external fellowships, training grant stipends, graduate
student researcher positions with their major professors, and teaching assistantships.

14) PELP, In Absentia, and Filing Fee Status
Information about the Planned Educational Leave Program (PELP), In Absentia (reduced
fees when conducting research out of state), and Filing Fee status can be found in the
Graduate Student Handbook on the Graduate Studies website.
http://www.gradstudies.ucdavis.edu/publications

15) Leaving the Program Prior to Completion of the Ph.D.
Should a student leave the program prior to completing the requirements for the Ph.D., he or
she may be eligible to receive the M.S. degree if all the requirements have been fulfilled. (see
Master’s requirements). The Change of Degree Objective form is available from the
Registrar’s Office:
http://registrar.ucdavis.edu/PDFFiles/D065PetitionForChangeOfGraduateMajor.pdf
MGG Degree Requirements

MASTER'S DEGREE REQUIREMENTS

1) Admissions
Students are accepted into the M.S. program in Microbiology by two routes. The first is by directly applying for admission under the supervision of a specific mentor. The mentor must provide the MGG admissions committee with a letter stating willingness to accept the student. If accepted into the program, the applicant will be informed that the MGG does not assume responsibility for financial support. All costs are the responsibility of the applicant.

The second route occurs when a Ph.D. student’s plans or circumstances change so that an M.S. degree is desirable. To initiate this change, the student must file a Petition For Change of Degree Objective.

Admission requires an undergraduate degree (B.S. or B.A.) in a biological science, which should include adequate course work in most of the following areas: calculus, general physics, general chemistry, quantitative analysis, organic chemistry, biochemistry with a laboratory, general genetics, general biology with a laboratory, and general bacteriology or microbiology with a laboratory. Upper division courses in cell biology, microbiology, microbial physiology and genetics, and immunology are also encouraged. Students must also demonstrate an aptitude and enthusiasm for research, which should include active participation in an independent research project supervised by a faculty member.

A GPA of 3.0 or greater (on a 4.0 scale) for undergraduate courses is generally required. UC Davis Graduate Studies mandates that international students who have not studied at an institution where English was the language of instruction must obtain the minimum university required score on the TOEFL or IELTS before applying for admission.

A. Prerequisites
Candidates should have taken course work in most of the following areas: calculus (MAT 17A-C), general physics (PHY 7A-C), general chemistry (CHE 2A-C), organic chemistry (CHE 118 A-C), biochemistry (BIS 102-103) with a laboratory (MCB 120L), general genetics (BIS 101), general biology with a laboratory (BIS 2A-C), and general microbiology (MIC 102) with a laboratory (MIC 102L). Upper division courses in cell biology (BIS 104), microbial physiology (MIC 140) and genetics (MIC 150), virology (MIC 162 or PMI 128), or immunology (MMI 188 or PMI 126) are also encouraged.

B. Deficiencies
Course work deficiencies should be made up by the end of the first academic year following initial enrollment by taking courses approved by the academic advisors and earning a letter grade of B or better.

2) Master’s Degree and Master’s Plan
The MGG offers the Master of Science degree under Plan I (Thesis). Plan I specifies a minimum of 30 units of graduate and upper division courses (the 100 and 200 series only) and a thesis. At least 12 of the 30 units must be graduate work in the major field.
3) Course Requirements: 30 units

a) Core courses (a list is presented in Attachment 1): **14 units**
The following required core courses must be completed with a grade of C or better unless the course is offered only S/U:

MIB 200A Microbial Biology (3 units)
MIC 215 - Recombinant DNA (3 units) or MCB 211-Macromolecular Structure and Interactions (3 units)
MMI 200D Mechanisms for microbial interactions with hosts (3 units)
BCB 214 (or its equivalent replacement) Molecular biology (3 units)

All of the core course requirements can be completed within one year.

b) Elective courses (a list of potential courses is presented in Attachment 2): **14 units**
To earn 30 units of credit, the M.S. student must take at least 14 additional units of coursework. At least 3 units of a graded, graduate elective course(s) must be selected in consultation with the academic advisor and major professor. This required elective course(s) should provide depth in the student’s area of research. Additional graduate or upper division undergraduate elective may be taken for depth and breadth. A list of potential elective courses is provided to all incoming students. Research units (xxx 299) may

c) Participatory seminars (a list of potential seminars is in Attachment 3): **2 units**
Two graduate-level seminar courses focusing on critical analysis of the scientific literature, in which each student makes at least one presentation during the quarter, are required. A list of potential seminars is provided to all incoming students.

d) Summary:
A total of 30 units of upper division (100-series) and graduate-level (200-series) courses is required. At least 19 units (core courses, elective course, and participatory seminars) of the 30 must be graduate work specified by MGG. Any deficiencies in course work must be rectified with a grade of B- (or Satisfactory) or better prior to the submission of the thesis. The student must have an overall GPA of 3.0 to advance to candidacy and to file the thesis.

4) Special Requirements

**English Language Requirement:** Students who have not obtained a previous degree at an approved English-medium institution or demonstrated English-language proficiency through an appropriate exam (e.g. TOEFL) are required to complete appropriate English-language courses, as described in the policy on Graduate Student Course Requirements – English as Second Language (GC2018-02). Courses taken in satisfaction of this requirement do not count towards the units required for graduation.
MGG Degree Requirements

5) Committees
   a) Admissions Committee: Once the completed application, all supporting material, and the application fee have been received, applications are submitted to the Admissions Committee. The committee is composed of 5 to 6 appointed graduate group faculty and a graduate student. Based on the committee’s review of the entire application, a recommendation is made to accept or decline an applicant’s request for admission. The Admissions Chair functions as the admissions adviser and has signature authority; in this person’s absence, the Chairperson of the MGG has signature authority. The recommendation is forwarded to the Dean of Graduate Studies for final approval of admission. Notification of admissions decisions is sent by Graduate Studies.

   b) Student Welfare and Advising Committee: Admitted students are assigned a graduate academic advisor who is one of six faculty members of the Student Welfare and Advising Committee. The advisors meet prior to the start of classes to review entering student transcripts, assess preparedness for the core graduate courses, and develop recommendations for any necessary remedial courses. Before the start of fall quarter classes, entering students meet with the MGG master advisor and other graduate advisors for an orientation where the MGG curriculum is presented. A plan for a first quarter course of study is presented at this meeting. The student may additionally elect to meet individually with his or her assigned advisor prior to the start of classes. Students meet quarterly during the first year with their advisors to design course plans that include the required core courses, elective courses, and participatory seminars. The advisor will recommend additional elective and seminar courses based on the student’s proposed dissertation project and prior academic course work. After the first year, students meet with their academic advisors to sign forms, and at least once a year to review progress and complete reports to Graduate Studies.

   c) Thesis committee: When the student submits the advancement to candidacy form to the adviser for a signature, an accompanying letter from the major professor recommends two other faculty members to serve as additional members of the three-person thesis committee. The latter two faculty need not be members of the MGG. The topic of the thesis should be acceptable to all members of the committee when they agree to serve. The thesis committee is appointed by the Dean of Graduate Studies.

6) Advising Structure and Mentoring
   The Major Professor is a faculty member belonging to MGG who supervises the student’s research and thesis. The major professor serves as chair of the student’s thesis committee and the major professor’s laboratory is usually the setting for the student’s research activities. The major professor advises on details of course work and other aspects of the academic program that are tailored to suit the individual student’s programmatic needs and career goals. The major professor must be immediately involved with the planning and execution of the experimental work done to formulate the thesis. Mentoring Guidelines from Graduate Council can be found on the MGG and Graduate Studies websites.

   Selection of the major professor occurs prior to enrollment for students applying to enter the M.S. program. The prospective mentor must provide the MGG admissions committee with a letter stating willingness to accept the student and to help the student identify sources of financial support.
MGG Degree Requirements

A student’s Graduate Advisor is an MGG faculty member appointed by the group chair to the Student Welfare and Advising committee. The graduate advisor acts as the student’s first source of academic information and provides assistance with fulfilling the requirements of the MGG. This includes choosing a major professor, planning coursework (including any courses necessary to fill in gaps in background), and conducting annual reviews of progress. Graduate advisors approve and sign petitions such as those for Planned Educational Leave and filing fee status as well as forms for advancement to candidacy. The graduate advisor may not be the student’s major professor. A student should turn to the graduate advisor should problems arise with the major professor.

Students meet with their graduate advisors upon entering the MGG, quarterly for advice during the first year, as necessary to obtain signatures on forms, and at least once a year to review progress and complete reports to Graduate Studies.

The Master Advisor for MGG is appointed by the Dean of Graduate Studies to serve as a deputy in matters affecting individual graduate students and their academic programs. The Master Advisor in MGG chairs the Student Welfare and Advising Committee, oversees the individual graduate advisors, and provides uniformity in student advising. The master adviser maintains records of each student’s performance.

7) Advancement to Candidacy

Advancement to candidacy: The student must file an official application for Candidacy for the Degree of Master in Science (Plan I Thesis) after completing at least one-half of the course requirements for the degree and at least one quarter before completion of all degree requirements. The student must have a grade point average of 3.0 to be eligible for advancement. The candidacy application must be signed by the thesis chairperson (major professor) and the student’s graduate adviser. Students are expected to advance to candidacy by the end of the sixth quarter of enrollment.

8) Thesis Requirements

Thesis committee meetings: The candidate and major professor should meet at least once a year with the other members of the thesis committee to discuss progress and any changes in research objectives.

Thesis: Research for the Master's thesis is to be carried out under the supervision of a faculty member of the MGG and must represent an original contribution to knowledge in microbiology. The thesis research must be conducted while the student is enrolled in the MGG program. The thesis is submitted to the thesis committee at least one month before the student plans to make requested revisions. All committee members must approve the thesis and sign the title page before the thesis is submitted to Graduate Studies for final approval.

The thesis must be filed in a quarter in which the student is registered or on filing fee. Instructions on preparation of the thesis and a schedule of dates for filing the thesis in final form are available from Graduate Studies; the dates are also printed in the UC Davis General Catalog and in the Class Schedule and Registration Guide issued each quarter.

A student must have a GPA of 3.0 for the M.S. degree to be awarded.
9) **Normative Time to Degree**  
Students can complete all of the course work requirements within four quarters. Master’s degree students typically fulfill the thesis requirement in two to three years (six to nine academic quarters).

10) **Typical Time Line**

**First Year**

**Fall**  
MIB 200A -Microbial Biology (3 units)  
MIC 215 - Recombinant DNA (3 units) or MCB 211-**Macromolecular Structure and Interactions** 3 units)  
MIC 291 - Selected topics in microbiology (1 unit non-participatory seminar)  
or a participatory seminar (1-2 units)  
MIB 299 or home dept. 299 – Research (to bring total to 12 units)

Winter  
MMI 200D - Mechanisms for microbial interactions with hosts (3 units)  
Participatory seminar (1-2 units)  
Elective course, possibly (3 units)  
MIB 299 - Research (to bring total to 12 units)

Spring  
BCB  214 (or its equivalent replacement) - Molecular biology (3 units)  
Participatory seminar (1-2 units)  
Elective course (3-4 units)  
MIB 299 - Research (to bring total to 12 units)

June 30  
Annual progress assessment of coursework and research by major professor and graduate adviser. Reviewed by MGG Executive Committee.

**Important:**
- Complete core courses with grades of C or better.
- At least 3 units of graded graduate elective courses and 2 participatory seminars are required.
- A non-participatory seminar (e.g. MIC 291, MMI 208, etc.) where you will hear about research of guest speakers is suggested every quarter.
- **You must have a 3.0 GPA to be eligible to advance to candidacy for the M.S. and to be awarded the M.S.**

**Second Year**

**Fall**  
File advancement to candidacy form; nominate two members of thesis committee.  
Participatory seminar (total of 2 required) / Elective  
Thesis research

**Winter/Spring**  
Participatory seminar (total of 2 required) / Elective  
Thesis research  
Meet with thesis committee.  
Annual progress report due June 30
MGG Degree Requirements
Summer  Thesis research

**Second – third year**  Finish thesis research.
Submit thesis to committee.
File thesis with Graduate Studies.

11) **Sources of Funding**
MGG does not assume responsibility for financial support. All costs are the responsibility of the applicant.

12) **PELP, In Absentia, and Filing Fee status.** Information about PELP (Planned Educational Leave), In Absentia (reduced fees when researching out of state), and Filing Fee status can be found in the Graduate Student Guide: [http://www.gradstudies.ucdavis.edu/publications/](http://www.gradstudies.ucdavis.edu/publications/)
Course requirements for the Ph.D. in Microbiology

**Core Courses** normally taken during the first year of the program:

**Fall**
- MIB 200A - (3 units) Microbial Biology
- MIC 215 - Recombinant DNA (3 units) or MCB 211-Macromolecular Structure and Interactions (3 units)
- MIB 201L - (5 units) Laboratory Rotation Course - Laboratory Rotations 1 and 2

**Winter**
- MMI 200D - (3 units) Mechanisms for microbial interactions with hosts
- MIB 201L - (5 units) Laboratory Rotation Course - Laboratory Rotations 3 and 4

**Spring**
- BCB 214 - (3 units) Molecular Biology

**Graduate Electives**
Students are expected to take at least 3 units of graded graduate courses to be selected in consultation with the academic advisor and major professor. The required elective course(s) should provide depth in the student’s area of research. They must be completed before the student takes the oral qualifying examination. Additional elective courses may be taken for depth and breadth; these may be taken at any time during the student’s graduate career.

**Participatory Seminars**
At least 4 participatory seminars are required before the student takes the oral qualifying examination. These are usually journal clubs and small-group seminars designed to engage students in a critical understanding of current literature in microbiology and related fields. At least three of the seminars must focus on critical analysis of the scientific literature. The student must make a presentation at least once during the quarter for the seminar to qualify as participatory.
MGG Degree Requirements

Course requirements for the M.S. in Microbiology

Core Courses normally taken during the first year of the program:

Fall
MIB 200A - (3 units) Microbial Biology
MIC 215 - Recombinant DNA (3 units) or MCB 211-Macromolecular Structure and Interactions (3 units)

Winter
MMI 200D - (3 units) Mechanisms for microbial interactions with hosts

Spring
BCB 214 - (3 units) Molecular Biology

Graduate Electives
Students are expected to take at least 3 units of graded graduate courses to be selected in consultation with the academic advisor and major professor. The required elective course(s) should provide depth in the student’s area of research. Additional elective courses may be taken for depth and breadth.

Participatory Seminars
At least 2 participatory seminars are required. These are journal clubs and small-group seminars designed to engage students in a critical understanding of current literature in microbiology and related fields. The student must make a presentation at least once during the quarter for the seminar to qualify as participatory.
### POTENTIAL GRADUATE ELECTIVE COURSES FOR MGG STUDENTS

The best source of information about courses is the UC Davis General Catalog, which is available in the bookstore, in department offices, and on-line (registrar.ucdavis.edu). Relevant courses are listed under departments (note that departments in the schools of Engineering, Medicine and Vet Medicine are sub-listed under “E,” “M” and “V,” respectively, in the catalog) or under graduate groups (e.g. Genetics, Immunology).

Five weeks prior to the start of every quarter, the Class Schedule & Registration Guide can be obtained in the same places. Confirm the availability of graduate courses, which may differ from the listings in the General Catalog.

**Watch for new courses announced by posted fliers and e-mail**

Graduate-level courses are numbered 200-299.
Undergraduate, upper division courses are numbered 100-199. Many are good for background, especially in areas you might not have covered as an undergraduate. They will not count toward the requirement for 3 units of graded, graduate elective courses.
Both graduate and upper division undergraduate courses are counted in your GPA.

#### Microbial pathogenesis and host response

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>GGG 210</td>
<td>Horizontal gene transfer</td>
<td>F</td>
</tr>
<tr>
<td>IMM 201</td>
<td>Introductory immunology</td>
<td>F</td>
</tr>
<tr>
<td>IMM 293</td>
<td>Current concepts in immunology</td>
<td>W</td>
</tr>
<tr>
<td>IMM 294</td>
<td>Comparative clinical immunology (alternate years)</td>
<td></td>
</tr>
<tr>
<td>IMM 297</td>
<td>Mucosal immunology</td>
<td>S</td>
</tr>
<tr>
<td>BCB 257</td>
<td>Cell proliferation and cancer genes</td>
<td>F</td>
</tr>
<tr>
<td>MIC 262</td>
<td>Advanced general and molecular virology</td>
<td>W</td>
</tr>
<tr>
<td>MMI 215</td>
<td>Medical parasitology</td>
<td>F</td>
</tr>
<tr>
<td>MMI 280</td>
<td>Our microbial self: The endogenous microbiota in health and disease</td>
<td>S</td>
</tr>
<tr>
<td>PHR 212</td>
<td>Epidemiology of the zoonoses</td>
<td>W</td>
</tr>
<tr>
<td>PLP 210</td>
<td>Biochemistry and molecular biology of plant-microbe interaction</td>
<td>F</td>
</tr>
<tr>
<td>PLP 224</td>
<td>Advanced mycology</td>
<td>S</td>
</tr>
<tr>
<td>PLP 230</td>
<td>Plant virology</td>
<td>W</td>
</tr>
<tr>
<td>PMI 270</td>
<td>Advanced immunology</td>
<td>S</td>
</tr>
<tr>
<td>PMI 228</td>
<td>Plant Bacteriology</td>
<td>F</td>
</tr>
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</table>

#### Microbial physiology and genetics / applied and environmental microbiology

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Time</th>
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<tbody>
<tr>
<td>ECI 248</td>
<td>Biofilm processes (S): interface of microbiological sciences and engineering</td>
<td></td>
</tr>
<tr>
<td>FST 204</td>
<td>Advanced food microbiology</td>
<td>S</td>
</tr>
</tbody>
</table>
### MGG Degree Requirements

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Offered</th>
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<tbody>
<tr>
<td>FST 205</td>
<td>Industrial microbiology (S)</td>
<td></td>
</tr>
<tr>
<td>MCB 263</td>
<td>Biotechnology fundamentals and applications (W)</td>
<td></td>
</tr>
<tr>
<td>MIC 200B</td>
<td>Advanced bacteriology (W) Must take MIC 298 concurrently (1 unit)</td>
<td></td>
</tr>
<tr>
<td>MIC 250</td>
<td>Biology of yeasts (W)</td>
<td></td>
</tr>
<tr>
<td>PLP 228</td>
<td>Plant bacteriology (F, alternate years)</td>
<td></td>
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<tr>
<td>PLP 217</td>
<td>Molecular genetics of fungi (W)</td>
<td></td>
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<tr>
<td>SSC 211</td>
<td>Advanced soil microbiology (S)</td>
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#### Advanced biochemistry, cell biology

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<tr>
<th>Course</th>
<th>Title</th>
<th>Offered</th>
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<tbody>
<tr>
<td>BCB 211</td>
<td>Macromolecular structure and interaction (F)</td>
<td></td>
</tr>
<tr>
<td>BCB 212</td>
<td>Cell biology (W)</td>
<td></td>
</tr>
<tr>
<td>BCB 213</td>
<td>Developmental Biology (W)</td>
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#### Genetics, Genomics, Bioinformatics

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Offered</th>
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<tbody>
<tr>
<td>ECS 124</td>
<td>Theory and Practice of Bioinformatics (S)</td>
<td>[not graduate level]</td>
</tr>
<tr>
<td>GGG 201A</td>
<td>Advanced genetic analysis (F)</td>
<td></td>
</tr>
<tr>
<td>GGG 201B</td>
<td>Genomics (F)</td>
<td></td>
</tr>
<tr>
<td>PHA 250</td>
<td>Functional genomics (S)</td>
<td></td>
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</tbody>
</table>
**POTENTIAL PARTICIPATORY SEMINARS FOR MGG STUDENTS**

Participatory = students must participate by making a presentation during the quarter. Focus is on critical analysis of the scientific literature.  
May be a journal club, but must have a course designation and the student must present during the quarter.  
Offerings vary by quarter and year. Watch for posted notices and for e-mail notices each quarter.  
Check current class schedule and room directory on the registrar’s web site.

### Microbial pathogenesis and the host response

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BCB 298</td>
<td>Eukaryotic Cell Signaling Systems (S)</td>
<td></td>
</tr>
<tr>
<td>ENT 291</td>
<td>Current topics in medical and veterinary entomology (FWS)</td>
<td></td>
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<tr>
<td>FST 290</td>
<td>Seminar in Food Science (if appropriately structured)</td>
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<tr>
<td>GGG 293</td>
<td>Seminar in animal genetics (S)</td>
<td></td>
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<tr>
<td>GGG 294</td>
<td>Seminar in human genetics (W)</td>
<td></td>
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<tr>
<td>GGG 295</td>
<td>Seminar in molecular genetics (F)</td>
<td></td>
</tr>
<tr>
<td>IMM 292</td>
<td>Immunotoxicology seminar (F)</td>
<td></td>
</tr>
<tr>
<td>IMM 296</td>
<td>Advanced topics in immunology (F)</td>
<td></td>
</tr>
<tr>
<td>MCB 295</td>
<td>Literature in molecular and cellular biology (FWS)</td>
<td></td>
</tr>
<tr>
<td>MMI 298</td>
<td>Current topics in host-microbe interaction (FWS)</td>
<td></td>
</tr>
<tr>
<td>MMI 210A</td>
<td>Critical Analysis of Contemporary Research on Animal Models of Human (W) S/S only</td>
<td></td>
</tr>
<tr>
<td>PMI 291A</td>
<td>Seminar in immunology (FWS)</td>
<td></td>
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<tr>
<td>PBI 223</td>
<td>Special topics in scientific method (F)</td>
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</tr>
<tr>
<td>PMI 293A</td>
<td>Seminar in infectious diseases (FWS)</td>
<td></td>
</tr>
<tr>
<td>PLP 291</td>
<td>Seminar in molecular plant pathology (FW)</td>
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</tr>
<tr>
<td>PLP 201A</td>
<td>Impacts, Mechanisms and Control of Plant Disease (W)</td>
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</tr>
<tr>
<td>PLP 295</td>
<td>Seminar in mycology (S)</td>
<td></td>
</tr>
<tr>
<td>SSC 290</td>
<td>Special topics in soil science (FS)</td>
<td></td>
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</tbody>
</table>

### Microbial physiology and genetics / applied and environmental microbiology

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>GEL 250</td>
<td>Advanced geochemistry seminar (F)</td>
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</tr>
<tr>
<td>MIC 274</td>
<td>Seminar in genetic recombination (FWS)</td>
<td></td>
</tr>
<tr>
<td>MIC 275</td>
<td>Seminar in DNA repair and recombination (FWS)</td>
<td></td>
</tr>
<tr>
<td>MIC 292</td>
<td>Seminar in bacterial physiology and genetics (FWS)</td>
<td></td>
</tr>
<tr>
<td>VEN 270</td>
<td>Critical evaluation of scientific literature (WS)</td>
<td></td>
</tr>
</tbody>
</table>