2.1 Undergraduate Preparation for Admission

The Bioengineering program is expected to draw students from Bioengineering, Chemical and Biochemical Engineering, Electrical Engineering programs, as well as from Physics, Chemistry, Biochemistry and Molecular Biology. The largest pool of applicants is expected to be from Bioengineers interested in pursuing research beyond their undergraduate experiences.

2.1.1 Admissions Procedures and Requirements

All persons seeking admission to graduate standing must submit a formal application for admission. Applicants should utilize the on-line application process. Applications are reviewed by the Admissions Committee, which makes recommendations on admission to Graduate Division. The Dean of Graduate Division makes final decisions on admission.

2.1.2 Application Deadlines for Admission

The deadline for receipt of applications is January 15. Normally applications will be accepted for Fall semester. Enrollment in other semesters will be considered on an individual basis. Applicants are encouraged to contact individual faculty members to discuss their research interests before applying for graduate study.

2.1.3 Materials to be Submitted

Prospective graduate students should submit the following materials

- The complete official application form;
- The application fee;
- All official university/college/junior college transcripts;
- An official Graduate Record Exam (GRE) score report. Only the general tests are required;
- Three letters of recommendation from instructors or supervisors who can comment on the applicant's scholarly ability and promise as a researcher;
- Official score reports from the Test of English as a Foreign Language (TOEFL) if the applicant's native language or language of instruction is other than English;
- Current curriculum vitae;
- Statement of Purpose;
- Personal History.

Admission Criteria

In addition to the requirements outlined herein, all applicants to the graduate degree programs of Bioengineering must meet the general requirements of the Merced Division of the Academic Senate and the UCM Graduate Council as set forth in the UCM General Catalog.

The minimum requirement for graduate admission to UCM is a bachelor's degree; with an undergraduate grade point average no lower than 3.0 on a 4.0 scale. Requests to the Graduate Division to waive this minimum will only be made under circumstances where the applicant has demonstrated strong academic skills subsequent to their undergraduate studies. Performance on the GRE, accomplishments in undergraduate research, and letters of recommendation are also important determinants of an applicant's potential for success in graduate education and will be evaluated by the Admissions Committee. Foreign students from non-English speaking countries are required to attain a minimum score of 550 on the TOEFL exam (paper version) or 80 (computer-based version). Academically qualified students may also be required to complete a telephone or in-person interview with one or more of the BIOE faculty members. Finally, the match of the candidate's skills and interests to Bioengineering research programs will be considered. For this reason, applicants are encouraged to contact participating faculty before applying. As a guideline, Bioengineering graduate students should have adequate background in Chemical and Physical Sciences, which typically involve higher division classes in Thermodynamics, Kinetics, Transport, Molecular Spectroscopy, Organic Chemistry, in Biological Sciences, which typically involve Biochemistry, Molecular and Cell Biology, Genetics, and adequate Mathematics background (Linear Algebra, Differential Equations, Numerical Methods, etc.). A graduate student in Bioengineering can be granted conditional admission pending remedial classes that would allow the student to take graduate classes in the program.

2.2 Foreign Language

There are no additional foreign language requirements specific to the Bioengineering program.

2.3 Program of Study

2.3.1 Specific Fields of Emphasis

Bioengineering is a multidisciplinary field that has emerged to utilize the basic science underlying modern advances in biology in its broadest sense and engineering to develop new knowledge, processes and products. The current Bioengineering faculty members provide research opportunities in the four key research foci as discussed in Section 1.2. With the research experience gained in these areas, Bioengineering graduates can develop successful careers in a wide range of areas including biomedical, health sciences, biotechnological, chemical, agriculture, food, materials, computational sciences, and many other fields.

The Bioengineering Graduate Program at UCM offers a multidisciplinary research and training program for M.S. and Ph.D.-seeking students who want to learn advanced methods for solving biological and biomedical problems at the molecular and cellular levels. Research projects are available on topics ranging from theoretical methods and computational modeling, instrument design and method development in biological imaging to a panoply of experimental approaches in the life sciences including molecular biophysics, protein engineering and design, genetic

engineering, electrophysiology, structural biology, synthetic biology, colloidal and interfacial chemistry, and mechanobiology.

2.3.2 Master's Degree

Students may be admitted to the Bioengineering graduate program to work toward an M.S. degree. The recipient of an M.S. degree will possess knowledge of a broad field of learning that extends well beyond that attained at the undergraduate level, but is not necessarily expected to have made a significant original contribution to knowledge in that field.

The Bioengineering program has established the following requirements for the M.S. degree. Each M.S. student must have a faculty advisor responsible for designing and approving a plan of study detailing all classes to be taken. Two different tracks are recognized as described below. Students may switch from one M.S. plan to another with their faculty advisor's consent.

PLAN I (thesis option)

- Complete at least two semesters of full-time academic residence at UCM.
- Complete at least 27 units of letter-graded graduate course work (see Section 2.3.5).
- Maintain a cumulative GPA of at least 3.0.
- Register for and obtain a Satisfactory (S) grade in one semester of BIOE 291: Bioengineering Seminar Series
- Complete at least 8 units of research.
- Prepare a written thesis describing relevant research in the field that is read and accepted by a thesis committee.
- Defend the M.S. thesis via oral presentation attended and approved by the committee.

M.S. Plan I Thesis and Defense

The student will prepare a written thesis under supervision of their faculty advisor until the work is judged ready for review by the faculty committee. The student must provide a copy of the thesis to each member of the faculty committee and allow each committee member at least two weeks to read and comment on it. If one or more committee members believe that there are significant errors or shortcomings in the thesis or that the scope or nature of the work are not adequate, the student must address these shortcomings before scheduling a defense. Once the student and advisor are in agreement that the thesis is ready to be defended, the defense may be scheduled by the student in consultation with the committee. Once the date of the thesis defense is determined, this information must be reported to the Graduate Dean, and one copy of the thesis must be filed with the Graduate Division no later than one week after the date of the thesis defense.

The thesis defense consists of an open seminar followed by a closed-door examination by the thesis committee. During the examination, the student is expected to explain the significance of the research, justify the methods employed, and defend the conclusions reached.

At the conclusion of the examination, the committee shall vote on whether the thesis and the student's performance on the exam are of satisfactory quality to earn a University of California M.S. degree. A simple majority is required for a pass. Members of the committee may vote to make passing the exam contingent on corrections and/or revisions to the thesis. In this case, the committee will select one member, normally the graduate research advisor, who will be responsible for approving the final version of the thesis that is submitted to the Graduate Division. All members of the thesis committee must sign the final thesis.

PLAN II (non-thesis option)

- Complete at least two semesters of full-time academic residence at UCM.
- Complete at least 30 units of letter-graded graduate course work (see Section 2.3.5). No research effort is required in this plan.
- Maintain a cumulative GPA of at least 3.0.
- Register for and obtain a Satisfactory (S) grade in one semester of BIOE 291: Bioengineering Seminar Series
- Pass an oral comprehensive examination administered by the faculty committee.

M.S. Plan II Comprehensive Examination

The M.S. comprehensive examination is a 2-hour oral test and the content of the exam represents a Capstone requirement that integrates the intellectual substance of the program. The test will be given by three members of the Bioengineering faculty, with the possibility of one member being and invited faculty member from a related program, who will jointly determine the outcome. Possible outcomes are

- Pass
- Fail, with an option to retake the examination upon faculty's recommendation
- Fail, without option to retake the examination

2.3.3 Doctoral Degree

The Doctor of Philosophy degree is granted to students who demonstrate a thorough knowledge of a broad field of learning and have given evidence of distinguished accomplishment in that field. The degree also signifies that the recipient has critical ability and powers of imaginative synthesis as demonstrated by a doctoral dissertation containing an original contribution to knowledge in his or her chosen field of study.

The Bioengineering graduate program has established the following requirements for the Ph.D. degree.

Post M.S.

Students entering the program with an M.S. degree must:

- Complete at least four semesters of full-time academic residence at UCM.
- Complete at least 12 units of letter-graded graduate course work (see Section 2.3.5).
- Maintain a cumulative GPA of at least 3.0.
- Register for and obtain a Satisfactory (S) grade in two semesters of BIOE 291: Bioengineering Seminar Series.
- Serve as a Teaching Assistant for at least one semester.
- Give one open technical seminar on campus or make a presentation at a professional conference.
- Pass a written Preliminary Examination to show mastery of fundamental bioengineering topics.
- Present a written thesis proposal and pass a Qualifying Examination in which the proposed research is presented to the dissertation committee.
- Present and successfully defend a doctoral dissertation containing an original contribution to knowledge in the field.

M.S. and Ph.D.

Students whose degree objective is a Ph.D. but who wish to also receive an M.S. from UCM must complete all requirements for an M.S. degree either Plan I or II (see section 2.3.2) in addition to the requirements for the Post M.S. degree described above.

Direct Ph.D.

Students who directly enter the Ph.D. program with a bachelor's degree and do not intend to pursue an M.S. degree en route to the Ph.D. must:

- Complete at least six semesters of full-time academic residence at UCM.
- Complete at least 32 units of letter-graded graduate course work (see Section 2.3.5).
- Maintain a cumulative GPA of at least 3.0.
- Register for and obtain a Satisfactory (S) grade in two semesters of BIOE 291: Bioengineering Seminar Series.
- Serve as a Teaching Assistant for at least one semester.

- Give one open technical seminar on campus or make a presentation at a professional conference.
- Pass a written Preliminary Examination to show mastery of fundamental bioengineering topics.
- Present a written thesis proposal and pass a Qualifying Examination in which the proposed research is presented to the dissertation committee.
- Present and successfully defend a doctoral dissertation containing an original contribution to knowledge in the field.

2.3.4 Unit Requirements

The unit requirement for each degree is described in the previous section. Graduate students must remain in good academic standing to be awarded an academic graduate degree.

Specific scholarship requirements are as follows

- Only courses in the graduate 200 series in which the student receives grades of "A", "B", or "S" may be counted in satisfaction of the requirements for advanced degrees. A course in which a student receives a "B–", "C", "D", or lower cannot be used to satisfy the unit requirement for the degree but will count in determining the grade point average.
- Candidates must maintain an average of at least three grade points per unit in all graduate courses elected during their residence as graduate students at the University of California. Students must maintain an average grade point of 3.0 for advancement to candidacy and conferral of the degree.
- Courses graded "S/U" will not be counted in determining grade point averages.
- Students must make satisfactory progress on their programs of study as determined by their graduate research advisor.

A student whose cumulative graduate grade-point average falls below the minimum required, or who is judged not to be making satisfactory progress toward the degree by his or her graduate advisor or faculty committee, will be placed on academic probation. The student will then be allowed a maximum of one semester to make up the deficiencies and be returned to good academic standing (beyond the semester they go on probation). Graduate students who fail to make satisfactory academic progress must be officially disqualified from the university in writing by UCM's Graduate Dean after consultation with the student's graduate program faculty. However, in those cases where the student and the graduate program mutually agree that the student will terminate their status as a graduate student (e.g., a decision to end graduate study with a Master's Degree or a decision to withdraw from graduate study for other reasons), then the graduate program and/or student may independently notify the other of this mutual agreement in a meeting between the student, the advisor and the graduate chair or alternate representative of the graduate program.

Upon recommendation of academic disqualification, the student's academic record is reviewed carefully by the Graduate Dean in consultation with the student's faculty graduate advisor. Unless there are indications of procedural error or other substantive mitigating factors to explain the student's unsatisfactory record, the Graduate Dean will notify the student of the impending action in writing, and will provide a reasonable opportunity for the student to alert the Graduate Dean as to erroneous information or academic records, to submit other relevant information or comments in writing, or to request a second review of their academic performance. Guidelines for due process requirements and student appeals are described in the UCM Graduate Policies and Procedures Handbook.

2.3.5 Courses

All Bioengineering graduate students must take the three required courses of the program: BIOE 205- Molecular and Cell Biophysics, BIOE 210 – Biological Thermodynamics, Kinetics and Transport, and BIOE 215 -Biological Imaging and Spectroscopy and BIOE 291 (Bioengineering Seminar Series). No other courses are uniformly required for all Bioengineering graduate students. Students should work with their advisors to determine which additional courses are best suited for their research areas and to satisfy the total unit requirements as set forth in Section 2.3.2 for Master students and Section 2.3.3 for Ph.D. students. Course selection should be discussed with advisors each year at the annual review meeting. This may include any letter-graded graduate level elective BIOE course (200 or higher) as well as graduate level courses in other areas with the consent of the advisor. Examples of graduate courses in other areas that may be applicable to a student's study plan are given in Section 1.4.3.

Normally these courses should be taken during the first two years of graduate study. Requirements for formal course work beyond the minimum are flexible and are determined by the individual student's background and research topic in consultation with the student's graduate research advisor. Exceptions of these requirements due to transference from another graduate program will be analyzed on an individual basis.

2.3.6 Research Requirement

All students in the Bioengineering graduate program must have a graduate research advisor. The student's graduate research advisor (see section 2.4.3), normally in consultation with the student, the graduate program, and other faculty, recommends appointment of faculty members to advise on and supervise the student's thesis or dissertation research, serve on examination committees, and review and pass upon the merits of the thesis or dissertation. Final approval of the membership on these committees rests with the Graduate Dean.

M.S. thesis committees and Ph.D. dissertation committees in the Bioengineering program typically consist of three members, although additional committee members are permitted if warranted by the student's research project. One is the student's graduate research advisor and the two or more others are UCM faculty members in the program (one of whom is appointed as Committee Chair). Under some circumstances one of the committee members can be a UCM faculty member from outside the program or a regular or adjunct faculty member from any UC campus or an individual from outside the University of California who has special expertise and qualifications. In this case, the graduate research advisor should submit a brief statement indicating the appointee's affiliation and title and how the prospective appointee has special expertise or qualifications that are not represented on the campus. In addition to the justification letter from the graduate advisor, a curriculum vita and a letter from the proposed appointee indicating a willingness to serve must be submitted to the Chair of the Bioengineering graduate program for review. External committee members must also be approved by the Graduate Dean. No member participation from outside the program is required for either the M.S. thesis or Ph.D. dissertation committees. However, participation of an external (fourth) member in the Ph.D. dissertation committee is strongly encouraged.

All members of the committee must be in attendance (either in person or remotely) for the M.S. thesis or the Ph.D. dissertation defense. If a committee member's absence from campus for an extended period of time makes scheduling of examinations unreasonably difficult, the student may request that the committee be reconstituted. Reconstitution of the committee may also be justified by a substantial change in the student's thesis topic or may be required by the departure of a committee member from the university. When membership changes must be made, the graduate advisor in consultation with the student should recommend a new committee member, giving the reason for the change. The change must be reviewed and approved by the Chair of the BIOE graduate program and by the Graduate Dean.

2.4 Preliminary Examinations

All students in the Bioengineering Ph.D. program are required to pass a preliminary examination before advancement to candidacy for the Ph.D. degree. Students are encouraged to take the examination in the spring semester of their first year of study, but are required to take it within the first two years of graduate study unless they successfully petition the graduate group chair. The preliminary examination will be offered and administered by the Bioengineering Graduate Program during the spring break each spring semester. A student wanting to take the exam must sign up for it with the Bioengineering Graduate Program no later than 4 weeks before the scheduled date of the exam.

The preliminary examination may be offered also in the fall semester under special circumstances only and subject to Bioengineering faculty approval.

The preliminary examination will cover undergraduate core material in the following areas:

1. Thermodynamics and Kinetics

2. Biochemistry, Molecular and Cell Biology
3. Spectroscopy and Optics

The examination will consist of open-ended questions (with a minimum of three questions in each of the three focus areas) to be posed and graded by a committee of Bioengineering faculty members familiar with the field (Preliminary Examination Committee). The format will be a 4-hour examination. The examination will be followed by a Bioengineering group faculty meeting to evaluate the performance of the candidate. Based on the results of the exam, the Preliminary Examination Committee will discuss a student's overall exam performance and make a determination of one of the possible outcomes:

- Pass- A student has passed when the Preliminary Examination Committee unanimously votes that the student passed the entire examination with scholarship that is at least acceptable. If agreed unanimously by the committee the student may be allowed to make minor modifications prior to submitting the results of the examination.
- Partial Pass - A student has failed but with the option to retake the exam when the Preliminary Examination Committee votes unanimously that the student passed some focus area examinations but failed others. In this instance, the student has the option of taking a second examination, consisting only of the areas that were not passed the first time; the second examination may have a format different from the first, but the substance should remain the same. Students who obtain a partial pass will be required to engage in a focused program of independent study, which may include taking or auditing specific undergraduate courses, before undertaking the required graduate courses.
- Fail - A student has failed when the Preliminary Examination Committee votes unanimously that the student failed the entire examination. This can occur if the overall performance on the exam is such that the committee does not judge that a retake would reflect better performance. An outcome of Fail also applies for a student whose performance on a second attempt of an exam is unsatisfactory, or who does not undertake a second examination within one year of the initial attempts. In either case, this outcome is grounds for requesting that the Graduate Dean initiate the academic disqualification process.

Once a majority decision has been reached, the Bioengineering Graduate Program chair shall inform the student of its decision in one of the forms listed above.

2.5 Research Proposal and Qualifying Examination

After the Preliminary Exam is passed and all the course work is satisfactorily completed and before the end of the fifth semester, Ph.D. candidates are required to write a Research Proposal and then take and pass a Qualifying Examination.

The student will provide to the dissertation committee a written research proposal that describes his or her research topic, summarizes progress to date, and outlines what he or she proposes to do, why it is relevant, and what will be learned. The dissertation committee will receive this document no later than 2 weeks before the scheduled Qualifying Examination. The Qualifying Examination will include two parts: a presentation of the proposal of the research for the dissertation, and a structured oral examination on graduate course materials and topics related to the proposed research. The student must be registered in the semester of the examination.

2.6 Advancement to Candidacy

Upon successful completion of the Research Proposal and Qualifying Examination the student will fill out and submit an application for advancement to candidacy. After the application is signed by the graduate research advisor and graduate program chair, the student pays a candidacy fee and submits the form to the Graduate Division. Upon advancement to candidacy for the degree, the faculty committee is then charged to guide the student in research and in the preparation of the dissertation.

2.7 Dissertation and Defense

The Ph.D. dissertation must be a creative and independent work that can stand the test of peer review. The expectation is that the material will serve as the basis for publication(s) in peer-reviewed journals. The student is encouraged to discuss both the substance and the preparation of the dissertation with members of the dissertation faculty committee well in advance of the planned defense date. Usually, the committee consists of three members, two of whom are from the major area and one from a different area. Detailed instructions on the form of the dissertation and abstract may be obtained from the Graduate Division.

Once the student and advisor are in agreement that the dissertation is ready to be defended, the defense may be scheduled by the student in consultation with the committee. The student must provide a copy of the dissertation to each member of the faculty committee and allow each committee member at least two weeks to read and comment on it. If one or more committee members believe that there are significant errors or shortcomings in the dissertation, or that the scope or nature of the work are not adequate, the student must address these shortcomings before the defense can take place. The scheduled date for the defense must be reported to the Dean of Graduate Studies, and one copy of the dissertation filed, no later than one week after the date of the defense.

The Ph.D. dissertation defense consists of an open seminar on the dissertation work followed by a closed-door examination by the dissertation committee. During the examination, the student is expected to explain the significance of the dissertation research, justify the methods employed, and defend the conclusions reached. At the conclusion of the examination, the committee shall

discuss whether both the written dissertation and the student's performance on the exam are of satisfactory quality to earn a University of California Ph.D. degree. As per the Graduate Policies and Procedures Handbook, the committee shall reach a unanimous recommendation to pass, fail or partial-pass. Partial-pass will be contingent to corrections and/or revisions to the dissertation. In this case the committee will select one member, normally the graduate research advisor, who will be responsible for approving the final version of the dissertation that is submitted to Graduate Division. All members of the dissertation committee must sign the final dissertation.

2.8 Explanation of Special Requirements over and above Graduate Division Minimum Requirements

No special requirements are proposed.

2.9 Relationship of Master's and Doctor's Programs

The master's and doctoral graduate programs are complementary. The master's program provides training for students who are more industry or professionally oriented, and wish to acquire technical skills and knowledge of bioengineering for a career in a broad range of industries. The doctoral program provides training for students who are more interested in advanced research or teaching careers in industry, federal research laboratories or academia.

2.10 Special Preparation for Careers in Teaching

All doctoral candidates are required to serve as a Teaching Assistant for at least one class, and to give at least one open technical seminar or a presentation at a professional conference during their residence in the graduate program. The presentation may be part of a regular seminar series or as a special seminar.

2.11 Sample Programs

Typically, students take graduate courses for the first two years of the degree, enrolling primarily in research units thereafter.

A sample direct Ph.D. course plan for a student entering the program without a M.S. degree is described below.

Year	Fall Semester	Spring Semester
1	BIOE 205: Molecular and Cell Biophysics (4 units) BIOE 232: Nano & Bio Fabrication for IB3 (4)	BIOE 215: Biological Imaging and Spectroscopy (4 units) BIOE 211: Synthetic Biology (3) BIOE 295: Graduate Research (4) BIOE 291: BIOE Seminar Series (1)

	BIOE 230: Computation & Modeling for IB3 (4)	Pass Preliminary Exam
2	BIOE 210: Biothermodynamics, Kinetics and Biotransport (4 units) BIOE 231: Imaging & Spectroscopy for IB3 (4) BIOE 295: Graduate Research (3) BIOE 291: BIOE Seminar Series (1)	CHEM 281: Molecular Dynamics and Biomolecular Simulation (3 units) BIOE 240: Biomolecular Engineering (4) BIOE 291: BIOE Seminar Series (1)
3	BIOE 295: Graduate Research (11 units) BIOE 291: BIOE Seminar Series (1) Complete dissertation research proposal and pass oral Qualifying Exam	BIOE 295: Graduate Research (12 units)
4	BIOE 295: Graduate Research (12 units) Teaching assistant	BIOE 295: Graduate Research (12 units) Open Technical Seminar
5	BIOE 295: Graduate Research (12 units)	BIOE 295: Graduate Research (12 units) Complete and defend dissertation

A sample curriculum for M.S. Plan I is as follows

Year	Fall Semester	Spring Semester
1	BIOE 205: Molecular and Cell Biophysics (4) BIOE 231: Imaging & Spectroscopy for IB3 (4) BIOE 230: Computation & Modeling for IB3 (4)	BIOE 215: Biological Imaging & Spectroscopy (4) BIOE 211: Synthetic Biology (3) BIOE 240: Biomolecular Engineering (4) BIOE 291: BIOE Seminar Series (1)
2	BIOE 210: Biothermodynamics, Kinetics and Biotransport (4) BIOE 295: Graduate Research (8)	BIOE 295: Graduate Research (12 units) Complete and defend M.S. thesis

A sample curriculum for M.S. Plan II is as follows

Year	Fall Semester	Spring Semester
1	BIOE 205: Molecular and Cell Biophysics (4) BIOE 211: Synthetic Biology (3) BIOE 240: Biomolecular Engineering (4) BIOE 291: BIOE Seminar Series (1)	BIOE 215: Biological Imaging and Spectroscopy (4) CHEM 281: Molecular Dynamics and Biomolecular Simulation (3 units) BIOE 291: BIOE Seminar Series (1) BIOE 299: Directed Independent Study (4)
2	BIOE 210: Biothermodynamics, Kinetics and Biotransport (4) CHEM 085: Principles of NMR Spectroscopy (3) BIOE 299: Directed Independent Study (14)	QSB 252: Cancer Genetics and Tumor Biology (3) BIOE 299: Directed Independent Study (9) M.S. comprehensive exam

	BIOE 291: BIOE Seminar Series (1)	

Note: Students in M.S. Plan II may choose to enroll in BIOE 295 Graduate Research even though it is not required. The credits for BIOE 295: Graduate Research and directed independent study (BIOE 299) provide an opportunity for the student to broaden their knowledge and skills by working with faculty. They can also be used for fulfilling the full-time requirement and preparing for the comprehensive examination.

Individual course plans will vary somewhat depending on the interests of the student. Students choose courses in consultation with their faculty advisors.

2.12 Time from Matriculation to Degree

The Bioengineering graduate program places a nominal time limit of two years from entrance to completion of the M.S. degree and five years for completion of the Ph.D. degree for students entering the program without an M.S. degree in Bioengineering or a closely related field. Normative time for the pre-candidacy period is three years, and two years for the candidacy period. Ph.D. students entering with an M.S. degree in bioengineering or a closely related field have a nominal time limit of four years. Extensions beyond these limits can be permitted by the Chair of the Bioengineering Graduate Program in consultation with the Executive Committee of the Program.

2.13 Program Assessment Plan

The Bioengineering program's program learning outcomes and formal assessment plan are attached in Appendix B. We will assess the learning outcomes of our graduate students through publications and patents, performance on the preliminary exam, performance on oral exams and seminars, content of Ph.D. dissertations and Master's theses, and required annual advisor meetings. After each annual meeting, the advisor will complete an evaluation form that specifically addresses each learning outcome. These evaluations will serve to guide the student until the next committee meeting. Additionally, student presentations at professional conferences, measures of student success (attrition rates, number of probationary cases, time to graduation, and placement after graduation) will be used as program assessment tools.

Regular meetings of the Bioengineering faculty will be held in order to discuss program affairs, identify problems and new opportunities, and initiate responses in a timely manner. Annually, the Bioengineering faculty will collect and review all lines of evidence for the target PLO with the support of the Graduate Assessment Coordinator. Results, conclusions, and recommended actions to improve student learning and/or the assessment process will be discussed by the entire faculty and summarized in an annual report. The Bioengineering Program will also undergo periodic program review on a seven-year cycle in accordance with UCM policy.

The program learning outcomes are as follows.

Graduates with a Ph.D. in Bioengineering

1. Are able to identify significant research questions in Bioengineering, and contextualize their research in the current literature of the field.
2. Are able to apply their knowledge of mathematics, physical and life sciences, and engineering to solve a problem, and to design and implement a suitable solution.
3. Are able to design and conduct experiments and/or simulations of biological systems, and to analyze and evaluate solutions in the context of existing technologies.
4. Have lifelong learning skills; are able to acquire and use new engineering techniques, skills, and tools for research and development in Bioengineering, and to develop new methods and discover new knowledge.
5. Exhibit high professional standards in research, demonstrating objectivity, ethical conduct, and integrity.
6. Are able to communicate effectively through oral, visual, and written means, with a broad range of technical audiences.

Graduates with an M.S. in Bioengineering (thesis option)

1. Are able to conduct supervised research in Bioengineering, and can contextualize this research in the current literature of the field.
2. Are able to apply their knowledge of mathematics, physical and life sciences, and engineering to design and implement a solution, under appropriate guidance, to solve a problem.
3. Are able to conduct experiments and/or simulations of biological systems, and to analyze and evaluate these solutions in the context of existing technologies.
4. Have lifelong learning skills; under guidance, are able to acquire or create new engineering techniques, skills, and tools for research and development in Bioengineering
5. Exhibit high professional standards in research, demonstrating objectivity, ethical conduct, and integrity.
6. Are able to communicate effectively through oral, visual, and written means, with a broad range of technical audiences.

Graduates with an M.S. in Bioengineering (non- thesis option)

1. Are able to apply their knowledge of mathematics, physical and life sciences, and engineering to design and implement a solution, under appropriate guidance, to solve a problem.
2. Are able to conduct experiments and/or simulations of biological systems, and to analyze and evaluate these solutions in the context of existing technologies.

3. Have lifelong learning skills; under guidance, are able to acquire or create new engineering techniques, skills, and tools for research and development in Bioengineering
4. Exhibit high professional standards, demonstrating objectivity, ethical conduct, and integrity.
5. Are able to communicate effectively through oral, visual, and written means, with a broad range of technical audiences.

2.14 Selection of Graduate Research Advisor

The heart of the Bioengineering graduate program for Ph.D. and M.S. Plan I students is the completion of a piece of original scientific research leading to the preparation and defense of thesis. To this end, each student should discuss research interests and possible projects with faculty in the program as early as possible, and select a graduate research advisor early during the first year of study. Selection of a graduate research advisor must be approved by the Bioengineering graduate program and must occur before the student's faculty committee can be constituted. The student and the graduate research advisor together will develop a research topic, and research will normally occupy a majority of the student's time after the first year of residence. Interdisciplinary projects are highly encouraged, as are research collaborations with faculty or senior scientists outside UCM. However, the graduate research advisor must be a member of the Bioengineering program. Students will be assigned an initial advisor when they first enroll, unless the student has already chosen an advisor.

All students must schedule an annual review with their research advisor during which they evaluate the progress made during the prior year, discuss any areas that need improvement, identify upcoming milestones towards the degree objective, and outline plans for specific research objectives in the next year. The outcomes of these meetings are documented using the Annual Progress Form and Student Progress Review Form in Appendix G.