Welcome
Welcome to the Department of Integrative Biology and to the Biology MS Program. You are part of an exciting and dynamic team of students, faculty and staff. You will find graduate school and the Biology MS Program challenging, invigorating and rewarding.

Faculty members in the Department are leaders in their fields of specialization. Students graduating from the Biology MS Program go on to careers in medicine, research, teaching, and industry. As an evolving program, the Biology MS Program offers opportunities for students to conduct cutting-edge research, to teach, to present at scientific conferences, to network nationally and internationally with scientists, to publish, and to establish a defined career path or identify a new career. The next 2-3 years will present you with unanticipated opportunities for professional and academic development.

I am looking forward to working with you and to seeing you achieve great successes.

Regards,
Dr. Timberley Roane
Director of the Biology MS Program
Department of Integrative Biology

Director of the Biology MS Program
Dr. Timberley Roane
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Phone: 303-556-6592
Email: Timberley.Roane@ucdenver.edu

Relevant websites
Department of Integrative Biology: http://clas.ucdenver.edu/biology/
College of Liberal Arts and Sciences (CLAS):
http://www.ucdenver.edu/academics/colleges/CLAS/Pages/CLAS.aspx
Graduate School:
http://www.ucdenver.edu/academics/colleges/Graduate-School/Pages/default.aspx

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At a Glance

Research (thesis) MS degree

Minimum credits required: 30

Required coursework:
- 2 semesters of graduate seminar (BIOL 6655-1 cr. each semester)
- 1 semester of Biological Data Analysis (BIOL 6764-3 cr.)
- 1 semester of Principles of Biological Research (BIOL 5705-2 cr.)
- 4 credits of thesis research (BIOL 6950)
- Note: no more than 7 credits of independent study/internship can be applied toward degree

Required exams:
- General Biology Preliminary Exam (when: end of first fall semester in the program)
- Proposal Defense (when: by the end of the second semester in the program)
- Thesis and Thesis Defense (when: last semester in the program)

Minimum required GPA: 3.0

Estimated time to completion: 2-2.5 years

Coursework (non-thesis) MS degree

Minimum credits required: 32

Required coursework
- 2 semesters of graduate seminar (BIOL 6655-1 cr. each semester)
- 1 semester of Biological Data Analysis (BIOL 6764-3 cr.)
- 1 semester of Principles of Biological Research (BIOL 5705-2 cr.)
- Note: no more than 6 credits of independent study/internship can be applied toward degree

Required exams
- General Biology Preliminary Exam (when: end of first fall semester in the program)
- Two specialty Comprehensive Written Exams (when: last 1-2 semesters in the program)
- Oral Comprehensive Exam (when: last 1-2 semesters in the program)

Minimum required GPA: 3.0

Estimated time to completion: 2 years
Research (thesis) Students

Your First Semester
This is likely to be an exciting and crazy time for you---a lot happens this first semester. In addition to taking your first graduate level courses, you may also be teaching, doing research, and trying to balance a personal life. Here are a few things to expect your first semester:

Completion of the Pre-registration Agreement Form
This form (available on the Biology graduate program website) should ideally be completed prior to registering for class your first semester. This form is filled out in consultation with your faculty advisor. It lays out a tentative academic plan for your MS program. It is up to you and your faculty advisor to determine which courses are relevant to your program focus. Your coursework (and research) will center on this area. You and your advisor should keep a copy of the Pre-registration Agreement Form; a copy should also be given to the Director of the Biology MS Program.

Studying for the Biology Preliminary Exam
A study guide for the Biology Preliminary Exam will be sent to all incoming students around mid-October, for an anticipated December/January administration of the exam. While the study guide is not meant to provide a detailed analysis of exam topics, it will provide general exam material. Included in the study guide are relevant chapters in a predetermined general biology textbook. The Biology Preliminary Exam is a 3 hr multiple choice exam. You must pass the exam prior to continuing in the MS Program. Students who fail the exam may be required to leave the Biology MS Program.

Research
You will be expected to begin, if not complete, your research proposal, a written explanation of your proposed thesis project, including background, hypothesis, objectives, protocols and methods, and expected results. Details for the proposal should be discussed with your faculty advisor. However, you will be expected to write your proposal, work through several drafts of your proposal, and prepare your proposal in a professional and academic manner for distribution to your research committee members. Most students will present their proposed research to their committee members* in the first/second semester in the program.

*Composition of the research committee: The research (thesis) committee consists of 3 graduate faculty members (a minimum of 2 must be faculty within the Department of Integrative Biology; a 3rd member may, with the approval of the Department and the Graduate School, be outside the Department). The faculty members chosen for the research committee should be done in consultation with your faculty advisor; and each member (one of which is your faculty advisor) should be able to directly contribute to your research program.
Your Second Semester

Research proposal and defense
In consultation with your faculty advisor, you are required to write up a research proposal and present the proposal to your research committee. The research proposal should address your hypothesis and project objectives; proposed experimentation to address each objective; provide general background information for the project and proposed methods; and include an expected results section. More detailed guidelines and expectations for the proposal and defense can be found under Proposal Guidelines (Appendix A) at the end of this document.

In Between Semesters

Research and meeting with your research committee
You are required to hold regular meetings with your research committee to discuss your research progress. These meetings may be formal or informal, but must include the presence of all committee members at once. For example, most students schedule a formal committee wide meeting once/semester. In between formal meetings, you may meet with individual committee members to discuss various aspects of your research.

Writing your thesis
Putting together the research thesis is a long, involved process. You should not expect to be able to write and complete your thesis within one semester. Throughout your program, you should be reading the literature, conducting research, troubleshooting and interpreting data, and composing various aspects of your thesis. This will make putting together the final version of your thesis a more pleasant and less stressful experience.

Guidelines and the required format for the MS thesis can be found on the CLAS website. Your thesis must undergo Graduate School review prior to completion and final submission. You are responsible for writing your thesis in an accurate and professional manner. You are responsible for the accuracy of its content. Your faculty advisor will help you in the process of putting together your thesis; however, the thesis is ultimately your responsibility. It is a body of work that will be published with your name attached to it. It is not your advisor’s responsibility to write your thesis. That said, your advisor MUST approve of your thesis prior to submission to the Graduate School and any committee members.

Your Final Semester (e.g., end of year 2)
This is likely to be a very stressful semester. Not only will you be completing your academic requirements, but you may also be completing your research, applying to another graduate/professional program or to a job, and defending your thesis. It will be an exciting, but incredibly busy time that will require your utmost dedication and organization.

Submission of Intent to Graduate and Application for Admission to Candidacy Forms
Both forms must be completed and submitted to the Dean’s office prior to the stated deadlines. Submitting either form after the CLAS deadline will result in a one semester delay in your graduation. It is imperative that these forms be filled out on time. These forms and their deadlines can be found on
Thesis completion and oral thesis defense
Your thesis is now close to completion and has been reviewed several times by your faculty advisor for readiness for your research committee members to evaluate. The thesis should be made available to your research committee members no less than 1 week prior to your scheduled oral defense date.

You should work with your faculty advisor on the development and progress of your thesis. For many, the thesis is their first scientific publication. This is a professional document that is used to demonstrate your mastery of your area of specialization and within the context of the field of biology at large. Guidelines for the preparation of and deadlines for the submission of the thesis are available on the CLAS website.

Oral thesis defense: This is an oral PowerPoint presentation of your MS research. Included in your presentation should be, but not limited to, your project goals and objectives, project significance, methods and experimental approaches, results and discussion, and future directions. The oral presentation is an open forum, e.g., many students coordinate their presentations with the Department’s spring seminar series. Following the oral presentation, all non-committee members will be asked to leave the room for a Q&A period with just the student’s committee members present.

Your research thesis defense is a scientific presentation. To your defense, you should dress appropriately and conduct yourself in a professional, scientific manner. Practice your oral presentation several times in advance of your actual defense. Work with your faculty advisor on presentation style and content. You should be able to openly discuss your research, methodologies, results, etc., and be prepared to answer related questions from the audience. The actual oral defense presentation should be approximately 45-50 min with several minutes for questions. No one knows your research better than you. Demonstrate how well you know your own work. No one project is perfect and there are always limitations to the work. This is okay, but be prepared to address any limitations in your work and be prepared to suggest solutions/alternatives. How prepared you are and how you conduct yourself is part of the evaluation of your defense. In preparation for the thesis defense, see the Thesis Defense Guidelines (Appendix B) at the end of this document.

*Prior to the oral defense, a Request for Graduate Examination form MUST be submitted to the CLAS Dean’s office prior to the stated deadline. Forms not submitted on time will not be processed and you will not be able to defend your research and graduate that semester. The form and corresponding deadline is available on the CLAS website.

Coursework (non-thesis) Students

Your First Semester
This is likely to be an exciting and crazy time for you---a lot happens this first semester. In addition to taking your first graduate level courses, you may also be teaching, working, and trying to balance a personal life. Here are a few things to expect your first semester:
Completion of the Pre-registration Agreement Form
This form (available on the Biology graduate program website) should ideally be completed prior to registering for class your first semester. This form is filled out in consultation with your faculty advisor. It lays out a tentative academic plan for your MS program. It is up to you and your faculty advisor to determine which courses are relevant to your program focus. It is important to keep in mind, however, that your two specialty comprehensive exams (see below) will be based on aspects of your area of specialization within the program. Your coursework will center on this area. You and your advisor should keep a copy of the Pre-registration Agreement Form; a copy should also be given to the Director of the Biology MS Program.

Studying for the Biology Preliminary Exam
A study guide for the Biology Preliminary Exam will be sent to all incoming students around mid-October, for an anticipated December/January administration of the exam. While the study guide is not meant to provide a detailed analysis of exam topics, it will provide general exam material. Included in the study guide are relevant chapters in a predetermined general biology textbook. The Biology Preliminary Exam is a 3 hr multiple choice exam. You must pass the exam prior to continuing in the MS program. Students who fail the exam may be required to leave the Biology MS Program.

Your Final Semester (e.g., end of year 2)
This is likely to be a very stressful semester, as you finish your academic requirements and complete the Comprehensive Exams.

Submission of Intent to Graduate and Application for Admission to Candidacy Forms
Both forms must be completed and submitted to the Dean’s office prior to the stated deadlines. Submitting either form after the CLAS deadline will result in a one semester delay in your graduation. It is imperative that these forms be filled out on time. These forms and their deadlines can be found on the CLAS website. Copies of both submitted forms must be submitted to the Director of the Biology MS Program.

Comprehensive exam committee
A minimum of one semester PRIOR to your specialty exams, you MUST have your comprehensive exam committee formed. This committee consists of three Department of Integrative Biology faculty members, including the Director of the Biology MS Program and your faculty advisor. The third member should be able to address your area of specialization. Work with your faculty advisor to compose your comprehensive exam committee.

Comprehensive exams
The comprehensive exams are a series of exams designed to assess your mastery of biological and scientific concepts. These two specialty written and then oral exams assess your mastery of biological information and concepts in your area of specialization. These exams further help you develop your ability to communicate scientific information in both written and oral formats, a skill difficult to teach in the classroom and a skill highly valued by graduate/professional schools and employers. Each exam
within the comprehensive exam series must be passed in order to complete the MS degree. Failure on any aspect of the comprehensive exams will result in remediative action, and failure to pass any aspect of the exam a second time will result in suspension and removal from the MS Program. Failure on multiple aspects of the exam will result in suspension and incompletion of the MS Program. Many students complete their specialty comprehensive exams and oral exam their final semester in the program (generally end of year 2).

*Coursework (non-thesis) students MUST complete the Request for Graduate Examination form by the stated deadline PRIOR to your oral comprehensive exam. This form and its deadline are available on the CLAS website.

After Graduation
Congratulations, you are now an alumnus of the Department of Integrative Biology and the University of Colorado Denver. Keep in touch by providing updated contact information for announcements of special alumni events, Department happenings, and University news. Keeping in touch with the Department post-graduation is one way to keep up with professional and academic contacts and references as you proceed in your career.

Additional Information

Professionalism and demeanor
As a member of the Biology MS Program, you are a professional. You will be treated with professionalism and respect, and likewise the program expects the same from you. Any violations of institutional policies, advisor expectations, or program expectations will be dealt with promptly and severely. Unprofessional and unethical behavior will not be tolerated and will be considered for grounds for removal from the program.

Teaching
Many students choose to teach during their MS program. Teaching provides you with experiences beyond standing in front of a classroom. You learn to communicate information, handle difficult personnel situations, organize materials, keep accurate records, supervise individuals, and think on your feet. Even if you do not plan to go into teaching as a career, employers recognize the skills above and will value you and your experiences even more, as every job requires these skills. Students in the Biology MS Program may teach an individual course or multiple courses.

Travel to professional meetings
Students in the Biology MS Program should seek opportunities to present at scientific meetings. Students should work with their faculty advisors for clarification of these opportunities. Should you travel/present at a meeting, you are representing yourself, the Department and the University. Behave in a professional manner. Any cases of unethical, inappropriate, or unprofessional behavior will be dealt with in accordance to the University’s codes for academic and professional behavior.
Meeting deadlines
There are a number of deadlines to keep track of. Do so. It is your responsibility (not your advisor’s) to keep track of deadlines and make sure you are getting the appropriate paperwork turned in complete and on time. Violations of deadlines and/or missing paperwork are reported to the Department, the CLAS Dean’s office, and the Graduate School. Missing paperwork/deadlines will result in a delay in graduation and can result in suspension from the University and incompletion of the degree.

Transfer credits
Students may take a limited number of courses (a limited number of credits) outside of the Department of Integrative Biology. To take a course in another Department (at UCD or at another institution), you must first discuss this with your faculty advisor. Upon approval by your faculty advisor, you must then discuss this with the Director of the Biology MS Program. Following approval by the Director, you may need to seek approval by the CLAS Dean’s office and the Graduate School. Transfer credits are limited to courses that are (1) an important component of the student’s training and development; (2) not offered on the downtown campus of UCD (courses taken at the Anschutz Medical Campus are considered transfer credits); (3) not offered in the Department of Integrative Biology; and (4) taken at the graduate level. In exceptional cases, a course may be taken outside of the graduate level upon the necessary approval. See the Director of the Biology MS Program for more information.

*A student may not have more than 12 total transfer credits apply toward their MS degree.

Time for completion of the degree
Students must complete the Biology MS degree within 5 years of the start date in the program.
Forms and Deadlines

Always refer to the appropriate website for the most updated forms and deadlines.

Visit the CLAS website (http://www.ucdenver.edu/academics/colleges/CLAS/Pages/CLAS.aspx) for the following:

- Schedule of Deadlines for Master’s Degree Candidates
- CLAS Master’s Students Frequently Asked Questions
- Intent to Graduate Form
- Application for Admission to Candidacy Form
- Request for Graduate Examination Form
- Thesis format submission and guidelines

Visit the Biology MS Program website (http://www.ucdenver.edu/academics/colleges/CLAS/Departments/biology/Programs/MasterofScience/Pages/BiologyMasterOfScience.aspx) for the following:

- Pre-registration Agreement Form
- Proposal and Proposal Defense Guidelines
- Biology MS Program Graduate Student Handbook
- Completion of Proposal Defense Form
- Thesis Defense Guidelines
Appendix A: MS Proposal and Defense Guidelines

The following guidelines are meant to be informative only. Please consult with your faculty advisor for exact requirements and expectations.

The goal of the Research Proposal and Proposal Defense is a formal representation of your proposed thesis research. Prior to the proposal and defense, you should have worked with your faculty advisor in the formulation of your research hypothesis and project objectives.

Your written proposal and proposal presentation will be evaluated as indicated on the form below. The MS Proposal Defense Examination Report will be filled out by your faculty advisor, in consultation with your research committee members. A copy of the form will then be turned in to the Director of the Biology MS Program.

In terms of the proposal format and content, you will need to work very closely with your faculty advisor. While some faculty advisors may have additional requirements, all written proposals should contain the following sections:

- Abstract
- Introduction/Background
- Hypothesis and Objectives
- Methods and Experimental Approach
- Expected Results
- Discussion
- Larger impacts (this section is within the context of integrative biology; and faculty advisors can choose to include specific questions for students to answer)

The proposal defense is an oral presentation of your work to your research committee. The proposal presentation should be a PowerPoint presentation summarizing your proposed research, including introducing methods and anticipated outcomes. The proposal presentation should be approx. 30-40 min. followed by a Q&A session.
MS PROPOSAL DEFENSE EXAMINATION REPORT  
(to be filled out by faculty advisor)

DEPARTMENT OF INTEGRATIVE BIOLOGY  
UNIVERSITY OF COLORADO DENVER

Date of Examination:

Student’s Name:

Committee Chair (print):

Committee Member 1 (print):

Committee Member 2 (print):

The student named above, on the date provided,

_____ Successfully

_____ Unsuccessfully

completed and passed the MS Proposal Defense as deemed by the Committee Members.

Committee Chair (signed):

Committee Member 1 (signed):

Committee Member 2 (signed):

Unsuccessful completion of the Proposal Defense Examination:

An unsuccessful completion of the Exam will be discussed with the student. Possible outcomes of an unsuccessful exam include (multiple outcomes are possible):

• Rewrite of the proposal and resubmission to the committee within 2 weeks of the original exam date.
• Redo of the oral presentation to the committee within 2 weeks of the original exam date.
• Completion of remedial coursework the semester following the original exam date.
• Removal and termination from the Biology MS program
Expectations and learning outcomes of the Proposal Defense Examination:

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<tr>
<th>Evaluation</th>
<th>Excellent</th>
<th>Good</th>
<th>Satisfactory</th>
<th>Poor</th>
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Additional comments:
Examples of the successful student:

(1) **Overall comprehension of subject matter**: The goal of this learning outcome is ensure the student is not only well versed in his/her immediate field of specialization but also within the larger context of systems and integrative biology. The student should be able to demonstrate, e.g., in written and oral communications, an understanding of the background literature in the student’s field. The student should also have an intimate understanding of their own field, as well as how their field/project contributes to the larger understanding of biology and science.

(2) **Knowledge of the scientific method**: The goal of this learning outcome is demonstrated understanding of the scientific method as it applies to the student’s project and applies to biology and science in general. The student should be able to independently explore the scientific literature using scientific databases, e.g., PubMed and Web of Science. The student should be able to read, understand, interpret and analyze primary scientific literature. From the literature and knowledge of the field, the student should be able to form a hypothesis and project objectives. In so doing, the student should also be able to apply information from other related fields, e.g., those outside of the student’s immediate specialty, to the creation, advancement and completion of their project. For example, is the student aware of and can the student apply chemical or physical concepts to their project when applicable? Finally, the student should be able to troubleshoot their project, e.g., failed experiments or misinterpreted data, and take the necessary corrective action.

(3) **Scientific communication**: The goal of this learning outcome is to ensure the student can communicate professionally and scientifically in both oral and written formats. The student should be able to, in a variety of situations, formulate clear, organized thoughts, and should be able to respond to questions in a clear and logical manner. The student should be comfortable expressing information using multimedia, e.g., PowerPoint.

(4) **Demonstration of professionalism**: The goal of this learning outcome demonstrated professional and scientific behavior, including an ability to follow directions, an ability to take and use criticism. The student should also be able to work well with others in a variety of situations, e.g., is the student a team player? The student should also have a demonstrated commitment to their project. This can be demonstrated as, for example, attendance at lab meetings, spending the necessary time working on project, and coming to meetings on time and prepared.
Appendix B: Thesis and Thesis Defense Guidelines

*The following guidelines are meant to be informative only. Please consult with your faculty advisor for exact requirements and expectations.*

In partial completion of the Biology MS degree, students are required to present a final written thesis. The thesis, completed in collaboration with the student’s faculty advisor, is presented to the student’s research committee PRIOR to the thesis defense (the student should ensure that there is sufficient time, e.g., a minimum of one week, for the committee members to review the thesis). The thesis defense is an oral presentation of the thesis, and is presented in an open forum. Following the thesis presentation (a professional PowerPoint presentation), in a closed session the student’s committee members will ask the student questions about his/her research objectives, methodologies, outcomes, etc. Students should be able to integrate their research with biological principles and with other fields in biology. This integration may require studying courses taken by the student. Students should be able to interpret the original literature and synthesize information from various fields of study.

The MS Thesis Defense Examination Report will be filled out by your faculty advisor. You will be evaluated based on the criteria provided below.

The content of the thesis should be determined by you and your faculty advisor; however, all theses must following the University of Colorado Denver Thesis format found on the CLAS website at [http://www.ucdenver.edu/academics/colleges/CLAS/Pages/CLAS.aspx](http://www.ucdenver.edu/academics/colleges/CLAS/Pages/CLAS.aspx).

The thesis defense includes an oral presentation of your thesis research and generally highlights aspects of your written thesis. The thesis defense is a PowerPoint presentation that should be approx. 45 min. long followed by a Q&A session with the audience at large. Following the open Q&A session, a closed session will occur with you and your research committee. Be sure to work closely with your faculty advisor on the content of your oral presentation.
MS THESIS DEFENSE EXAMINATION REPORT
(to be filled out by faculty advisor)

DEPARTMENT OF INTEGRATIVE BIOLOGY
UNIVERSITY OF COLORADO DENVER

Date of Examination:

Student’s Name:

Committee Chair (print):

Committee Member 1 (print):

Committee Member 2 (print):

The student named above, on the date provided,

_____ Successfully

_____ Unsuccessfully

completed and passed the MS Thesis Defense as deemed by the Committee Members.

Committee Chair (signed):

Committee Member 1 (signed):

Committee Member 2 (signed):
Evaluation of the Thesis and Thesis Defense Examination:

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<td><strong>(3) Scientific communication</strong></td>
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<tr>
<td>• Oral: organization, clarity and ability to respond to questions</td>
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<td>• Written: grammar, organization and clarity</td>
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<td><strong>(4) Demonstration of professionalism</strong></td>
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<td>• Work on project done in a timely manner</td>
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<td>• Demonstrated commitment to project</td>
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<tr>
<td>• Work well with others</td>
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<td>• Ability to follow directions and take criticism</td>
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Additional comments:
Examples of the successful student:

(1) **Overall comprehension of subject matter:** The goal of this learning outcome is to ensure the student is not only well versed in his/her immediate field of specialization but also within the larger context of systems and integrative biology. The student should be able to demonstrate, e.g., in written and oral communications, an understanding of the background literature in the student’s field. The student should also have an intimate understanding of their own field, as well as how their field/project contributes to the larger understanding of biology and science.

(2) **Knowledge of the scientific method:** The goal of this learning outcome is demonstrated understanding of the scientific method as it applies to the student’s project and applies to biology and science in general. The student should be able to independently explore the scientific literature using scientific databases, e.g., PubMed and Web of Science. The student should be able to read, understand, interpret and analyze primary scientific literature. From the literature and knowledge of the field, the student should be able to form a hypothesis and project objectives. In so doing, the student should also be able to apply information from other related fields, e.g., those outside of the student’s immediate specialty, to the creation, advancement and completion of their project. For example, is the student aware of and can the student apply chemical or physical concepts to their project when applicable? Finally, the student should be able to troubleshoot their project, e.g., failed experiments or misinterpreted data, and take the necessary corrective action.

(3) **Scientific communication:** The goal of this learning outcome is to ensure the student can communicate professionally and scientifically in both oral and written formats. The student should be able to, in a variety of situations, formulate clear, organized thoughts, and should be able to respond to questions in a clear and logical manner. The student should be comfortable expressing information using multimedia, e.g., PowerPoint.

(4) **Demonstration of professionalism:** The goal of this learning outcome demonstrated professional and scientific behavior, including an ability to follow directions, an ability to take and use criticism. The student should also be able to work well with others in a variety of situations, e.g., is the student a team player? The student should also have a demonstrated commitment to their project. This can be demonstrated as, for example, attendance at lab meetings, spending the necessary time working on project, and coming to meetings on time and prepared.