THE UNIVERSITY OF ARIZONA

Graduate Interdisciplinary Program
in

Applied Biosciences

(ABS)
Student Handbook

Updated 07/03/2023

Contents

1.0 INTRODUCTION

The Applied Biosciences (ABS) program at the University of Arizona (UA) is a Graduate Interdisciplinary Program (GIDP) under the Graduate College. ABS is a dedicated Master's program that awards a Professional Science Master's degree, and prepares students for careers in the biotechnology and health science industries. It consists of foundational and practical training in various areas of applied biosciences, along with "cross-training" in workplace skills, such as business, research and regulatory affairs. A mandatory internship is an integral part of the ABS experience. During a two-year course of studies, students will gain a strong understanding of the applications of the biological sciences to real world problems, including those faced by public institutions and private industry.

2.0 CONTACT INFORMATION

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3.0 ADMISSIONS

3.1 Prerequisites

Students who wish to apply in Applied Biosciences must have the following minimum qualifications:

- A Bachelors (or equivalent) degree with a major in an area of biosciences from an accredited institution
- A minimum 3.0 GPA
- A desire to pursue a professional career in the applied biosciences
- A GRE is not required.

3.2 Admissions Procedures

Students should apply directly to the specific ABS track that that they wish to pursue. The application should be submitted online only via the Graduate College Graduate Admissions Application website (https://apply.grad.arizona.edu/users/login). Be prepared to submit the following materials:

- All transcripts (official versions must be sent to the Graduate College)
- GRE scores, if available (not mandatory)
- GPA for all undergraduate (and graduate, if any) classes
- A one-page statement of interests, which outlines your background (including any professional experience), your professional goals and why you are a strong candidate for the program
- At least 2 letters of recommendation, preferably from course professors, research directors, or supervisors from employment relevant to the ABS program
- *Acceptable English Proficiency credentials:

- **Test of English as a Foreign Language** (TOEFL) - minimum score of 79 iBT (or 60 on the revised PBT with no section score lower than 15). Individual MyBest scores must also be dated within 2 years of the enrollment term to be considered valid.
- **International English Language Testing System** (IELTS) - minimum composite score of 7, with no subject area below a 6
- **Pearson PTE Academic** - minimum score of 60
- Graduate **English Language Endorsement** from the Center for English as a Second Language (CESL)
- **CEPT Full Academic test** - offered by our Center for English as a Second Language (CESL), minimum Total score of 110.

*Please review the list of countries from the Graduate College website where English Proficiency credentials are required as some countries are exempted from this requirement: https://grad.arizona.edu/catalog/intladmissionsreqs//

4.0 Overall Program Structure

The ABS program is designed to prepare students to competitively enter the scientific workforce. During the two-year course of study, students will gain a strong understanding of the applications of the biological sciences to real world problems, including those faced by public institutions and private industry. A minimum of 36 credit hours (units) is needed to complete this degree; 9 of these units are for the research internship and report. Students have a maximum of 6 years to complete the degree. Students may apply for, and be admitted to any of the six tracks ("sub-plans").

Applied Biosciences Tracks:

- Controlled Environment Agriculture
- Diagnostic Laboratory Sciences
- Industrial Microbial Biotechnology
- Medical Microbiology and Immunology
- Molecular and Cellular Biology
- Sustainable Bioeconomy and Bioenergy

4.1 Curriculum

All Tracks have the following general structure:

Science Module	15 units
Professional Preparation Module	12 units
Internship Module (including the Final Report)	9 units
Total:	**36 units**

Please refer to the descriptions of the individual tracks (Section 5) for the approved lists of courses for these Modules. For new students, please contact the Director of Graduate Studies (DGS) of your track for advice on the selection of courses for your first semester.

4.2 Timeline for a ABS Degree: 2-year Curriculum

Please note that many students complete the Applied Biosciences curriculum as part-time students, or over a longer timetable. However, the time to completion of the ABS degree may not to exceed 6 years, as per the UA Graduate College.

Before the start of the first semester

Prepare a *Tentative Plan of Studies* showing the min. 36 credits you are planning to take over the course of your studies

Discuss your *Tentative Plan of Studies* with the Director of Graduate Studies of your particular track and secure his/her agreement.

First semester

9 units of coursework
Select *Primary Advisor*
Review *Plan of Studies* with DGS and/or Primary Advisor
Review plans for internship

Second semester

9 -12 units of coursework
Assemble the *Graduate Committee*
Submit *Committee Member Approval* Form
Review *Plan of Studies* and internship plans with Graduate Committee
Submit Plan of Studies through GradPath, after activating "Responsible Conduct of Research".
Apply for *Internship*
Submit *Internship Forms (Can be obtained from ABS website)*, register for *Internship (ABS 593A*, departmental approval necessary to register*)*

Summer

8 units of *Research Internship*

Third semester

6-9 units of coursework, including scientific writing requirement
Complete Internship Project, if necessary
Review *Plan of Studies* and plans for *Internship Report* with Graduate Committee

Fourth semester

6-9 units of coursework, including 1 unit of Internship Report
Activate *Master's/Specialist Committee Appointment* form in GradPath
Prepare and submit *Internship Report* to Internship Supervisor for approval
Submit approved *Internship Report* to Graduate Committee
Schedule and complete *Internship Report Presentation*
Finish revisions to *Internship Report* required by Graduate Committee
Graduate Coordinator will submit - Master's Completion of Degree, in GradPath.

4.3 Detailed Steps toward the ABS Degree

1. ***Immediately after admission: Sign and return your admission letter to indicate Intent to Matriculate***

2. ***Immediately after admission: Summarize your career goals. Prepare a Tentative Plan of Studies***
    a. See the list of courses for the relevant ABS track (section 5.0, Track Descriptions and Coursework requirements).
    b. Considering your career goals, assemble a Tentative Plan of Studies that lists all specific courses that you plan to take to complete the Professional Science Master's degree in Applied Biosciences.
    c. A minimum of 36 units must be selected. These units must include:

Science Module	15 units
Professional Preparation Module	12 units
Internship Module (includes Final Report)	9 units

3. ***After admission but before the start of the first semester: Meet with the DGS of your ABS track. Register for classes***

    When admitted, the student's initial Primary Advisor shall be the DGS of their respective track. Before the first day of classes, a meeting shall be held between each student and the respective DGS of ABS. The purpose of this meeting is to review the student's tentative Plan of Study in light of their career goals. The student and the DGS will agree on the courses that the student will take in the first semester. The student will register for the agreed-upon classes for the first semester.

4. ***First semester, before enrollment for second semester: Meet with the DGS of your ABS track (or with the Primary Advisor, if different)***

    The purpose of this meeting is to review study progress in light of the student's Plan of Studies. The courses that the student will take in their second semester will be selected. Plans for selecting an appropriate hosting agency and research topic for the Internship will also be discussed.

5. ***End of first semester: Select Primary Advisor***

    a. Students may select a Primary Advisor different from their DGS, or may retain the DGS as their Primary Advisor upon mutual agreement.
    b. Students may also request to change their Primary Advisor at a later date, upon the consent of the DGS and the ABS Program Chair.
    c. Primary advisors must be selected from the ABS Faculty. If the student would prefer a Primary Advisor who is not a current member of ABS but is a tenured or tenure-eligible faculty or academic professional of the University of Arizona, then the student should request the faculty member in question to apply for faculty membership to ABS.

6. ***Second semester: Selection of Graduate Committee members***

    a. The Graduate Committee is composed of 3 or more members.
    b. The Graduate Committee includes the Primary Advisor and at least two other committee members. The other committee members may be ABS faculty, or special members. At least two members of the Graduate Committee (including the Primary Advisor) must be from the University of Arizona. The composition

of the committee must be approved by the DGS and the Program Chair, and must follow Graduate College rules:
http://grad.arizona.edu/academics/program-requirements/mastersdegrees

c. Special members may be drawn from the ranks of University of Arizona faculty/academic professionals, or from mentors at local industries and internship locations. For example, students doing or planning to do an internship at sites including Roche-Ventana or MSDx may consider inviting the research mentor(s) to sit on their committee. These research mentors may also be added to the Graduate Committee as 4th or additional members at later dates. Special member requests must be agreed to by the DGS, and formally approved by the Graduate College. Please contact the Program Coordinator with your request; gaining approvals may take several weeks.

d. Submit the Committee Member request form in GradPath.

7. *Second semester: Apply for Internship*

Students must complete 8 units of Research Internship. Your Primary Advisor, Committee members, DGS, ABS faculty, and other University of Arizona faculty are good sources for information, but your own research and initiative is absolutely necessary. Companies may or may not advertise internship positions; your best chance is to send out many applications allowing plenty of time for responses. You must start sending out applications early in the semester PRECEEDING the semester you plan to do your Internship (i.e. during early Spring if you plan a summer Internship). Some companies (for example Roche-Ventana) have even longer timelines for scheduling internships.

8. *Second semester: Convene a Graduate Committee meeting*

The purpose of this first full Graduate Committee meeting is to review the career goals, study progress, and Plan of Studies of the student, and to agree on any necessary changes in the Plan of Studies as the Committee sees fit. Another goal of the meeting is to review the student's progress towards selecting a hosting agency and research topic for their Internship.
Submit Master's Plan of Studies in GradPath.

9. *End of second semester: Submit Internship forms, register for internship units (ABS 593A)*

Submit the Internship Work Plan form to the Program Coordinator in time, and register for internship units. You should choose the ABS 593A section of your Primary Advisor. **Signing up for internship units requires ABS consent.** Per applicable UA policy, internship work should only be conducted in the **same semester** when the student is signed up for internship credits (ABS 593A). Students must follow regular enrollment deadlines and bursar's fee policies for the internship course.

10. *Summer: Research Internship*

a. Students typically seek out their internship project during the second semester. However, the timing of this is flexible to meet the needs of the hosting agency and the student. Students should discuss the timing of the internship with the track Director of Graduate Studies, their primary advisor and their Committee.
b. Students must work 45 hours for each unit of internship credit (ABS 593A) earned. Eight (8) units of ABS 593A internship work are required for the successful completion of the ABS Curriculum, equaling a total of 360 hours.
c. Please keep in mind that many internship advisors or hosting agencies require **additional** training time before the start of the actual internship, in procedures specific to their lab and research. Consider this an investment of your time if it helps secure an internship project.
d. Training for research with human subjects, animal subjects, biological samples, radiation, recombinant DNA/RNA species, chemicals and special population groups may be required before the start of the research internship project. Ascertain these requirements with your Primary Advisor and/or Internship Supervisor. Most training is available in UAccess: (http://www.uaccess.arizona.edu/).
e. The internship project may be conducted in a variety of settings. Internships are preferentially conducted at a company, clinic, government laboratory or other external (non-UA) partners approved by the student's Graduate Committee (referred to as "Company Internship"). Internships may also be conducted at a research laboratory within the University of Arizona (referred to as "UA Internship").
f. Internships may be completed within a single semester, or within multiple semesters, as is most appropriate considering the student's Plan of Studies. The requirements of the Hosting Agency / UA Internship Supervisor should be accommodated by the student as best as possible. If the Internship is completed within multiple semesters, the student should register for the appropriate number of Internship units each semester.
g. Internships may be divided to two or more separate blocks conducted at different hosting agencies. Division of the internship into two or more blocks must be approved by the student's Graduate Committee. If the Internship is completed in multiple blocks, the student should register for the appropriate number of Internship units for each block.
h. Day-to-day supervision of the interns is the responsibility of the Internship Supervisor at the host agency (Company Internships) or the UA laboratory (UA Internships). For Company Internships, unit credits are awarded by the Primary Advisor of the student, based on the evaluation provided by the Internship Supervisor at the company, and also on independent observation and evaluation of the student's work by the Primary Advisor. For UA Internships, the Internship Supervisor (who is a UA faculty) will award unit credits.
i. The Evaluation of the Intern form (completed by the Internship Supervisor) must be submitted by the student to the Primary Advisor before the last day of classes each semester when internship unit credits (ABS 593A) are to be awarded. Remember that this form is necessary for your Primary Advisor in order to award Internship unit credits for Company Internships.
j. The Internship Evaluation form (completed by the student) must be submitted by the student to the Program Coordinator before the last day of classes each semester when internship unit credits (ABS 593A) are to be awarded.

k. An Internship Report must be written, submitted to the student's Graduate Committee, defended during an Internship Report Presentation, and revised as required by the Graduate Committee, before the student may graduate with a ABS degree.
l. Internships conducted at the student's ongoing place of employment are acceptable if the student demonstrates to the satisfaction of the ABS program that the work is **outside the scope of the student's ongoing job requirements** and meets the criteria for learning objectives and any other substantive requirements for academic credit. These internships must be discussed with and approved by the Primary Advisor or the DGS of the student's track.
m. All hours of work at an internship for credit must take place on or after the first day of the term in which the student will register and for which the student will receive credit, and be completed on or before the last date of the same term.
n. A syllabus for ABS 593 A is available at the ABS website, Important Forms and Documents: https://abs.arizona.edu/current-students/forms under the heading "Relevant Syllabus."
o. The grades available for Internship courses are limited to S (superior), P (passing), F (failure), I (incomplete), or W (withdraw). While it is possible for a student intern to receive a failing grade for the course, S, P, F grades do not calculate into a student's grade-point-average. However, ABS students may only graduate when they have completed 8 credits of ABS 593A with a **P** grade or better.
p. If an Incomplete is awarded, and the original instructor becomes unavailable, the Primary Advisor of the student must evaluate the student's work upon completion.
q. Students completing an internship abroad are required to register their travel with UA Study Abroad and follow policies and procedures related to international insurance coverage.
r. International students must consult with International Student Services and follow all applicable processes and procedures to obtain appropriate work authorization related to their planned internship, if necessary.

Required Internship Forms (Available on the ABS website)

To be completed and submitted BEFORE departmental consent is given to sign up for internship credits and to start the internship:

- ABS Internship Work Plan

To be completed and submitted BEFORE the end of the semester in which internship credits are to be awarded:

- ABS Internship Evaluation Form (Student)
- ABS Evaluation of the Intern Form (Supervisor)

11. Internship Report

a. A concise report about the Internship must be completed before graduation. Students must sign up for 1 unit of Master's Report (ABS 909) under the section of their Primary Advisor **in the last semester** of their studies. A syllabus for ABS

909 is available at the ABS program website at https://abs.arizona.edu/current-students/syllabus

b. Students must normally be registered for ABS 909 Master's Report only **after** they have already completed all 8 internship credits (ABS 593A). Concurrent registration for ABS 593A and ABS 909 is strongly discouraged. Under exceptional circumstances, concurrent registration for ABS 593A and ABS 909 may be authorized by the DGS or the Program Chair, acting upon the recommendation of the student's Primary Advisor.
c. ABS 909 can only be signed up for with ABS GIDP consent
d. ABS 909 has a **pre-requisite**: Students must complete a minimum of 2 units of a graduate scientific writing class before signing up for ABS 909. A list of approved scientific writing classes is shown in the Core section of the Professional Preparation module.
e. The Internship Report will consist of the following elements:
    - A review of the status of the scientific field related to the research project of the student, and the significance of the research and the contributions of the hosting agency / hosting laboratory to the field;
    - Detailed description of the goals of the student's work and its significance/relationship to the overall goals of the hosting agency / hosting laboratory.
    - Detailed description of the research methodology, and the results achieved by the student.
    - Discussion of the student's results and potential future work needed.
f. The report should be of a minimum of 15 pages, but preferably not exceeding 30 pages if the internship was performed in a single block. If the internship was divided into two or more blocks with different hosting agencies, then the report should be subdivided into concise chapters describing each block of internship.
g. The format of the internship report is specified by the student's Graduate Committee. Most Committees may require a student to submit their internship report in the same format as the one required by the University of Arizona Graduate College for Masters of Science theses. Some Committees may require the report to be written in the format needed for publication in the scientific literature, or in any other appropriate format.
h. The Internship Report must first be evaluated and approved by the student's Internship Supervisor at the hosting agency / UA laboratory where the work had been performed. Please remember that companies and government agencies may have a multi-step chain of command for approving such reports to guarantee that no intellectual property rights or trade secrets are affected by the report. Non-UA host agencies may request certain materials to be redacted from the report, and these requests must be accommodated by the student.
i. The Internship Report must next be submitted to the student's Graduate Committee. The Graduate Committee will have a minimum of two weeks (10 business days) to evaluate the Internship Report. The Committee must approve (or approve pending revision) of the Internship Report by a two-thirds vote before the Internship Report Presentation may be scheduled. Committee members shall indicate whether they need to see the revisions or whether they delegate this responsibility to the Primary Advisor. The Primary Advisor shall notify the Program Coordinator about the decisions of the Committee.
j. Revisions to the Internship Report requested by the Graduate Committee must be completed before the degree can be awarded.

12. Internship Report Presentation

Upon approval (or approval pending revision) of the Internship Report by the Graduate Committee, an oral Internship Report Presentation must be scheduled by the student. The Presentation will consist of two parts:

a. First part: A presentation of the Internship Report in the form of an oral lecture, followed by questions and answers, lasting no more than 1 hour. This section shall be open to the public. ABS students are strongly encouraged to attend the Presentations of their peers, schedules permitting. ABS faculty is encouraged to attend the Presentation, and other guests are welcome.
b. Second part: A closed Graduate Committee section where members of the Committee will further discuss the Internship Report with the student. Specifically, committee members will be inquiring into the scientific principles involved, as well as the technical elements of the internship. Any member may request additional revisions or clarify previous criticisms. The oral examination also allows the members of the Committee and the student to discuss the experiences of the student in the ABS program, including inquiring about how various elements from their academic curriculum relate to their internship. The committee will also likely ask the student to share their future career plans.
c. The Presentation is meant to assess the ability of the student to discuss ideas, think through scientific pitfalls and defend experimental design and rationale. Students are encouraged to seek out input from other students and faculty in preparing for the Presentation through practices, lab meetings, journal clubs, etc.
d. The members of the Graduate Committee shall have a vote (Pass/Fail) evaluating the student's Internship Report Presentation. The Major Advisor records the outcome of the vote and communicates the result towards the student and the Program Coordinator. A Pass requires two-thirds of the Committee members approving the Internship Report Presentation.

13. Final approval of the Internship Report

a. The finished Internship Report, incorporating all revisions required by the Graduate Committee, must be made available to the Primary Advisor at least 3 business days before the deadline of the Graduate College for degree requirements.
b. In cases where members of the Graduate Committee requested to see the revisions, the revised Internship Report must be made available to the Committee members at least 5 business days before the deadline of the Graduate College for matriculation. The Committee members shall notify the Primary Advisor whether the revisions had been made to their satisfaction. At least two-thirds of the Committee shall approve the revised Internship Report for a Pass.
c. The Primary Advisor shall notify the Program Coordinator whether the Internship Report is complete and meets the requirements of the Graduate Committee.
d. The Primary Advisor shall only award the 1 unit of Internship Report credit (ABS 909) when the written Internship Report is completed (with revisions if necessary) and the oral Internship Report Presentation is passed by the student.
e. The final version of the Internship Report, approved by the Graduate Committee, must be submitted to the Program Coordinator at least one business day before the deadline of the Graduate College for matriculation.

14. Graduation

Please see the academic calendar for specific due dates and other steps necessary for graduation with the ABS degree (http://grad.arizona.edu/academics/degree-certification/gradpath).

5.0 COURSEWORK REQUIREMENTS AND TRACK DESCRIPTIONS

In all the ABS tracks, students are required to successfully complete 36 units (credit hours), within a maximum of 6 years. Of the 36 required units, 15 units are Core and Elective sciences courses, 12 units are Professional Preparation classes and 9 units are the Internship and the Internship Report.

Table A contains a list of approved courses in the Professional Preparation Module and the Internship Module. These Modules are common for all five ABS Tracks. Please note that classes with the UND designation are offered by the University of North Dakota and may entail additional fees. Please note that not all classes are offered in every semester, and departments usually require their own students in their programs to be enrolled first in mandatory courses; scheduling classes is a prerogative of the offering department, and ABS has no control over this. Please check the most current online Course Catalog of the UA for class schedules for up-to-date information and ensure to have backup courses planned.

TABLE A

Professional Preparation Module: Choose 12 Units in total. At least 2 of these units must be from the Core list of scientific writing classes, the rest of the 12 units should be selected from the Elective list.			
Core Professional Preparation Classes: Scientific Writing (2 units minimum)			
BE 501	Research Methods in Biosystems Engineering	2	Spring
CBIO 595B	Scientific Writing, Presentations and Bioethics	2	Spring
ENVS 508	Scientific Writing for Environmental, Agricultural and Life Sciences	3	Spring
MSE 502	Research Proposal Preparation	3	Spring
OPTI 597B	Technical writing and communication	3	Fall
Elective Professional Preparation Classes			
ACBS 568A	Bioeconomy, Marketing and Business Principles	3	Check course catalog for availability
ACBS 568B	Bioeconomy, Marketing and Business Principles II	3	Check course catalog for availability
ACBS 571	Risk Assessment, Management and Communication	3	Spring
ACCT 521	Business Law for Accountants	3	Fall/ Spring
ALC 509	Team Organizational Leadership	3	Spring
ALC 510	Entrepreneurial Leadership in Agriculture and the Life Sciences	3	Spring
ALC 511	Principles and Application of Organizational Development	3	Fall

ALC 522	Communicating Knowledge in Agriculture and Life Sciences	3	Fall
AREC 550	Financial Management for Agribusiness	3	Spring
BE 552	Globalization, Sustainability Innovation	3	Spring
BIOS 680	Biostatistical Methods I	3	Spring
BNAD 597B	Advanced Consulting Projects	3-4	Fall
CTS 595C	Responsible Conduct of Research	1	Fall/Spring
ECON 578	Energy, the Environment	3	Discontinued until further notice*
EHS 575	Environmental and Occupational Health	3	Fall/Spring/Summer
ENGR 512A	Management of Technology I	3	Fall/Spring
ENGR 514	Law for Engineers/Scientists	3	Spring
ENGR 595A	Science, Health, and Engineering Policy & Diplomacy	3	Fall
ENTR 506	Introduction to Entrepreneurship	3	Fall
ENTR 515	Strategic Planning	3	Fall
ENTR 548	Healthcare Entrepreneurship	3	Spring
ENTR 557	Project Management *Class Requisites: SIE 305*	3	Fall/Spring
ENTR 581A	Assessing Early Stage Medical Technologies for Commercialization	2	Spring
GRAD 595D	Regulatory Issues in Laboratory Management	3	Discontinued until further notice*
IMB 521	Scientific Grantsmanship	2	Spring
LAW 695D	Regulatory Science	1	Fall
LAW 576A	Drug, Discovery, Development and Marketing Obligations	3	Fall
LAW 578A	Legal and Regulatory Aspects for Health Care Delivery	3	Fall
LAW 589A	Regulatory Science Case Study Project	3	Fall
MCB 695E	Science, Society, and Ethics	1	Spring
MGMT 535	International Management	3	Spring
MGMT 538	Health Organization and Management	3	Spring
MGMT 563	Doing Business In/With Africa	3	Spring
MIS 506	Healthcare Information Systems	3	Fall
MIS 578	Project Management	3	Fall
MKTG 500	Marketing Management	3	Fall
MKTG 560	International Marketing	3	Fall
MKTG 546	Marketing Strategy	3	Spring
MKTG 559	Product Strategy	3	Spring
MSE 502	Research Proposal Preparation	3	Spring
PCOL 584	Fundamentals in Industrial and Environmental Health	3	Fall
PHPM 506	Economic Foundations for Health Sciences	3	Spring
PHPM 562	Health Services Administration	3	Fall
PHPM 569	Fundamentals of Health Budgeting and	3	Fall

	Financial Management		
PHPM 574	Public Health Policy and Management	3	Fall/Spring
PHSC 513	Health Technology Assessment	3	Fall
SIE 515	Technical Sales and Marketing	3	Fall/Spring
SIE 567	Financial Modeling for Innovation	3	Fall
SLHS 649	Survival Skills and Ethics	3	Spring

5.1 Controlled Environment Agriculture Track

The Controlled Environment Agriculture (CEA) track of the ABS GIDP is designed to prepare students who wish to possess a graduate-level education that integrates science and engineering-based approaches to provide specific controlled environments for plant productivity while optimizing resources including water, energy, space, capital and labor, and more specifically incorporates knowledge in management and business. Graduates of this track will be prepared for careers in the controlled environment agriculture industries, academia and government.

The CEA is an agricultural production practice for year round continuous production of nutritionally high quality foods, with crop yields that can exceed field production by as much as 10-fold, and with the potentials to utilize local renewable energy resources, and optimize water, energy, space, capital, and labor resources with efficiency well above field traditional capabilities. This production technology, can employ crop production systems, provide harvest much less dependent on the season, and can generate higher crop yields, quality, safety, and nutritional value with consistency and predictability, while utilizing less land in an environmentally friendly way.

There has been significant advancements in agriculture due to enhanced cultivars by plant breeding, minimized use of chemicals and effects of pests by integrated pest management, improved production quality, produce uniformity and reduced labor via automation and mechanization. These continuous advancements in production practices and technology have maintained an acceptable food quality and low cost food supply, however, resulted in more demand for highly educated and skilled employees. The controlled environment agriculture systems are integrated systems consisting of hydroponics, mechanization and automation, climate control and production management processes, which demand continuous system monitoring and control. Thus, technical understanding and crop production skills are needed for specific crop needs and through understanding of plant and microclimate interactions are needed so the systems can be effectively operated and precisely controlled to improve growth, production quality, and resource use efficiency. This necessitates potential graduates to acquire technical, production, management, people and business skills.

Therefore, the CEA ABS track will prepare students for rewarding employment in the controlled environment agriculture sector with technology, science and engineering, business and management oriented education and training to prepare current and future employees to meet the needs of this important industry segment to successfully compete in the global market place.

In common with other ABS tracks, the CEA track requires the successful completion of 36 units (credit hours), within a maximum of 6 years. The CEA track includes a wide selection of courses. Other classes may be substituted for the classes listed in the attached Table with the agreement of the Director of the Graduate Studies (DGS), or the Primary Advisor and the Graduate Committee of the student. Initial selection of the appropriate courses within each cluster and for the study plan in general will be done by agreement between the student and the DGS, based on a draft study plan assembled by the student and submitted to the DGS. This plan should be based on the particular needs and interests of the student, considering the career path the student is pursuing. Fine-tuning and other necessary changes of the course plan shall be agreed upon by the Primary Advisor and the student's Graduate Committee.

Curriculum: Applied Biosciences - Controlled Environment Agriculture (CEA) Track			
Number	**Title**	**Units**	**Semester Offered**
Science Module: 15 Units Required (9 Core + 6 Electives)			
Core Science Classes: 9 Units			
BE 575A	Physiology of Plant Production under Controlled Environment	3	Spring
BE 579	Applied Instrumentation in Controlled Environmental Agriculture	3	Spring
BE 583	Controlled Environment Systems	3	Fall
MIC 530	Food Microbiology and Biotechnology	3	Spring
Science Electives: Choose 6 Units Courses not listed here may also be chosen but require an agreement with the Director of Graduate Studies or the Graduate Committee.			
BE 513	Applied Biostatistics	4	Fall
BE 523	Biosystems Analysis and Design	3	Spring
BE 547	Sensors and Controls	3	Fall
BE 556	Irrigation System Design	3	Every other Spring
BE 582	Integrated Engineered Solutions in the Food-Water-Energy Nexus	3	Fall
AME 545	Renewable Engineering Systems	3	Spring
CHEE 574	Transport Processes in Environmental Engineering	3	Spring
CHEE 577R	Microbiology for Engineers	3	Fall
CHEE 581A	Engineering of Biological Processes	3	Spring
EIS 597C	Greenhouse Pest Management: Methods and Practice	3	Spring
ENVS 525	Environmental Microbiology	3	Fall
MATH 522	Advanced Applied Mathematics	3	Fall/Spring/Summer
MATH 571B	Design of Experiments *Course Requisites: MATH 223 or equivalent: MATH 571A.*	3	Spring
SIE 531	Simulation Modeling and Analysis	3	Fall/Spring
SIE 545	Fundamentals for Optimization	3	Fall
SLHS 649	Survival Skills and Ethics	3	Spring
Professional Preparation Module and Internship Module (see Table A, pages 13-15)			

5.2 Industrial Microbial Biotechnology

The Industrial Microbial Biotechnology (IMB) sub plan of the Applied Biosciences GIDP is designed to prepare students for careers in the biotechnology industries where microorganisms are used as either tools for manufacturing chemical or biological products, or as environmental or agricultural agents.

Since ancient times, microorganisms have been utilized for what we now recognize as biotechnology applications, starting with beer and wine-making, leavening dough for bread and pastries, and preserving food by pickling. The multibillion dollar modern fermentation and biocatalytic industries that grew out of these practices produce small molecule “natural products” to be used as drugs, pesticides and fine chemicals including biodegradable plastics, and provide us with amino acids, vitamins, solvents and other industrial chemicals. Microbial fermentation and biocatalysis (the use of microorganisms as catalysts for chemical reactions) also represent our best hopes to produce sustainable, environmentally responsible biofuels, and constitute a fast growing segment of the biotechnology industry. Microbial fermentation is also used to produce recombinant proteins such as drugs or industrial enzymes, and can be used to manufacture antibodies and nucleic acids for the diagnosis and treatment of disease. Drug discovery in the pharmaceutical and agribusiness industries, and the development of novel or cheaper industrial chemicals and reagents are unimaginable without utilizing microbial “chemical factories”.

Microorganisms are also used for environmental biotechnology applications, utilizing the unrivaled ability of microbes to biodegrade a wide variety of compounds. Bioremediation of contaminated former industrial sites, cleanup after natural disasters including oil spills, or everyday applications like waste water treatment, rely on chemical reactions catalyzed on the spot by live microorganisms. Similarly, integrated pest management in agribusiness can take advantage of biocontrol by live microorganisms to kill or suppress microbial, insect or nematode pests in an environmentally conscious manner that does not involve toxic chemicals.

The IMB track will prepare students for gainful employment in the fermentation, biocatalysis, drug discovery and manufacture, agribusiness, chemical manufacture, and environmental biotechnology industries where experts with knowledge of microbiology, microbial genetics and biochemistry are in demand. Just like other tracks in the Applied Biosciences program, the IMB track involves a strong component of developing professional skills and understanding the legal and business environment of these industries, and involves a required internship in a professional biotechnology laboratory environment.

In common with other ABS tracks, the IMB track requires the successful completion of 36 units (credit hours), within the course of a minimum of 2 years and a maximum of 6 years.

The IMB track includes a wide selection of courses relevant to the mission of the Applied Biosciences program and the IMB track. These courses are listed in the attached Table. Other classes may be substituted for the classes listed in the attached Table with the agreement of the DGS, or the Primary Advisor and the Graduate Committee of the student. Initial selection of the appropriate courses within each cluster and for the study plan in general will be done by agreement between the student and the DGS, based on a draft plan assembled by the student and submitted to the DGS. This plan should be based on the particular needs and interests of the student, considering the career path she or he is pursuing. Fine-tuning and other necessary

changes of the course plan shall be agreed upon by the Advisor and the student's Committee, in agreement with the DGS.

Curriculum: Applied Biosciences - Industrial Microbial Technology (IMB) Track			
Number	**Title**	**Units**	**Semester Offered**
Science Module: 15 Units Required (9 Core + 6 Electives)			
Core Science Classes: Choose 9 units			
BIOC 565	Proteins and Enzymes	3	Fall
BIOC 568	Nucleic Acids, Metabolism and Signaling *(Prerequisite: 2 semesters of undergrad Biochemistry)*	4	Spring
BIOC 573	Recombinant DNA Methods and Applications	4	Spring
ECOL 553	Functional and Evolutionary Genomics	4	Fall
ECOL 575	Freshwater and Marine Algae	4	Spring
ENVS 525	Environmental Microbiology	3	Fall
MCB 516A	Statistical Bioinformatics and Genomic Analysis	3	Spring
MCB 580	Introduction to Systems Biology	3	Fall
MIC 530	Food Microbiology and Biotechnology	3	Spring
PLP 527R	General Mycology	3	Fall
PLP 528R	Microbial Genetics	3	Spring
PLS 548A	Plant Biochemistry and Metabolic Engineering *(Course Requisites: CHEM 241 A/B or CHEM 242A/B; BIOC 462A/B or BIOC 460 or consent of instructor*	3	Check course catalog for availability
Science Electives: Choose 6 Units Electives can include any course from the Core Science Module as well. Courses not listed here may also be chosen but require an agreement with the Director of Graduate Studies or the Graduate Committee.			
ACBS 556	Aquaculture	3	Spring
BE 502	Fundamentals in Computing Biosystems Analytics	3	Fall
BE 513	Applied Biostatistics	4	Fall
BE 534	Biosystems Analytics	3	Spring
BE 581A	Engineering of Biological Processes	3	Fall
BE 587	Metagenomics: From Genes to Ecosystems	3	Fall
BIOS 576B	Biostatistics for Research	3	Spring
CHEE 577R	Microbiology for Engineers	3	Fall
CHEM 523A	Bioanalytical Chemistry	3	Spring
CHEM 501A	Instrumental Analysis	3	Spring

CHEM 525A	Mass Spectrometry	3	Fall
CMM 518	Fundamental Genetic Mechanisms: from Molecules to Genomes	3	Fall
CMM 533	Cellular & Molecular Medicine	1	Fall/Spring/Summer
CMM 577	Principles of Cell Biology *(Course Requisites: Consent of course coordinator)*	4	Fall
ECOL 510	Microbial Biogeochemistry and Global Change	3	Fall
ENVS 511	Environmental Metabolomics	3	Spring
ENVS 526	Environmental Microbiology Lab	2	Fall
IMB 501	Medical Microbiology and Immunology	4	Spring
IMB 520	Pathogenic Bacteriology	3	Fall
IMB 565	Principles and Molecular Mechanisms of Microbe-Host Interactions *(Course Requisites; For Ph.D. Students: undergraduate degree in Biology related subject or after satisfactory discussion with Instructor).*	3	Spring
MCB 546	Genetic and Molecular Networks *(Course Requisites: Undergraduate genetics course, molecular biology course, and consent of instructor).*	4	Spring
MCB 585	Multidisciplinary Approaches to Solving Biological Problems *(Course Requisites: 1. One year of graduate-level coursework 2. Two core courses required for the MCB, BIOC or CMM PhD 3. At least one additional core course in either of the other two PhD programs).*	4	Fall
PCOL 536A	Chemotherapy of Infectious Diseases	3	Spring
PHSC 530	Introduction to Molecular Therapeutics and Drug Discovery	2	Fall
PHSC 596A	Medicinal and Natural Products Chemistry	1	Fall
PHSC 670	Principles in Drug Discovery, Design, and Development	3	Spring
PLP 528L	Microbial Genetics Laboratory	2	Spring
PLP 550	Principles of Plant Microbiology *(Course Requisites: PLP 305 or consent of instructor.)*	4	Spring (even years, not scheduled for 2020
PLP 575	Advanced Mycology	3	Spring (even years, not scheduled for 2020
PLS 534	Industrial Biotechnology	3	Fall
Professional Preparation Module and Internship Module (see Table A, pages 13-15)			

5.3 Diagnostic Laboratory Sciences

The Diagnostic Laboratory Sciences (DLS) track of the Applied Biosciences GIDP is designed to prepare students for professional careers in the medical and biotechnology diagnostic industries surrounding *in vitro devices* (IVDs), a term used to describe medical devices and diagnostic laboratory test methods regulated by the US Food and Drug Administration (FDA). Graduates may seek employment in a wide variety of medical and scientific settings, including the diagnostics and pharmaceutical industries, the biotechnology industry, clinical and translational research units, and government agencies. Emphasis topics may include development of laboratory management skills, acumen in the legal and business environment of the diagnostic and biotech industries, compliance to federal regulations for healthcare or the diagnostic industry, or knowledge of the *in vitro device* processes and regulations. The track requires that students successfully complete an internship in a medical laboratory, a diagnostic or translational research group, a university compliance office for industry- or agency-funded research, or one of the associated bioscience companies.

Students will work closely with faculty members of the ABS program. These faculty members direct translational research programs and collaborate with partners in the diagnostic and biotech industries. Their research involves the development of novel testing methods for disease detection, as well as basic science research programs that investigate mechanisms of disease, characterization of diseases such as cancer and infections, or development of disease interventions such as vaccines and antitoxins.

Curriculum: Applied Biosciences – Diagnostic Laboratory Sciences (DLS) Track			
Number	**Title**	**Units**	**Semester Offered**
Science Module: 15 Units Required (9 Core + 6 Electives)			
Core Science Classes: Choose 9 Units			
ACBS 543	Research Animal Methods	3	Spring
BIOC 568	Nucleic Acids, Metabolism and Signaling *(Prerequisite: 2 semesters of undergrad Biochemistry)*	4	Spring
BIOS 576A	Biostatistics for Public Health *(Course Requisites: One year of college-level mathematics.)*	3	Fall/Spring
BIOS 576B	Biostatistics for Research	3	Spring
CBIO 515	Mechanisms of Human Diseases	4	Spring
CBIO 552	Cancer Biology	4	Fall
CBIO 595A	Oncogenes and Signal Transduction *(Course Requisites: Open to graduate students in biological discipline).*	1	Fall
CBIO 596H	Cancer Biology Seminar Series	1	Fall/Spring
CBIO 597A	Experimental Design	1	Fall
CMM 501	Human Gross Anatomy	4	Summer
CMM 502	Principles in Neuroanatomy	4	Every other Spring

CMM 504	Cell Biology of Disease	3	Summer
CMM 510	Human Histology: An Intro to Pathology *(Course Requisites: Credit for CMM 510 or CMM 525A but not both.)*	3	Summer/Spring
CMM 525A	Functional Human Histology *(Course Requisites: Credit for CMM 510 or CMM 525A but not both.)*	4	Fall
IMB 501	Medical Microbiology and Immunology	4	Spring
MCB 572A	Cell Systems *(Course Requisites: MCB 304, MCB 305, and consult instructor before enrolling.)*	4	Fall
MIC 530	Food Microbiology and Biotechnology	3	Spring
NRSC 572	Neurodevelopment in Action: How the brain is built, ages, and responds to disease	4	Spring
NRSC 588	Principles of Cellular and Molecular Neurobiology *(Course Requisites: Consult program office before enrolling.)*	4	Fall
PHCL 512	Intro to Pharmacology	3	Fall
PHCL 601A	Pharmacology, General Principles *(Course Requisites: Any course in Biochemistry or Human Physiology.)*	2	Fall
PLP 528R	Microbial Genetics	3	Spring
PSIO 511	Physiology for Biomedical Engineering	3	Spring
Science Electives: Choose 6 Units Electives can include any course from the Core Science Module as well. Courses not listed here may also be chosen but require an agreement with the Director of Graduate Studies or the Graduate Committee. You may take courses from the UND graduate program for transfer but note that additional costs may apply.			
BIOS 576A	Biostatistics for Public Health *(Course Requisites: One year of college-level mathematics)*	3	Fall/Spring
CBIO 550	Drug Disposition and Metabolism *(Course Requisites: PCOL 602A)*	2	Spring
CBIO 596H	Cancer Biology GIDP Seminar Series	1	Fall/Spring
CBIO 630A	Cellular Communication and Signal Transduction *(Course Requisites: BIOC 462A, BIOC 462B, BIOC 511.)*	3	Spring

CBIO 695C	Readings in Cancer Immunology *(Course Requisites: MIC 419).*	1-2	Fall
CMM 565A	Fundamentals of Light Microscopy and Electronic Imaging	3	Spring
CMM 577	Principles of Cell Biology	4	Fall
CMM 579	Art of Scientific Discovery	3	Fall
CMM 595A	Departmental Journal Club *(Instructor Consent Required)*	1	Fall
CMM 595H	Problems in the Biology of Complex Diseases	2	Spring
CMM 596A	Seminar in Cardiovascular Development *(Instructor Consent Required)*	1	Fall/Spring
CMM 696B	Graduate Student Seminar *(Instructor Consent Required. Open to majors only)*	1	Fall/Spring
ECOL 557	Medical-Veterinary Entomology	3	Spring
EPID 573A	Basic Principles of Epidemiology *(Epidemiology major or minor, MPH major, or consent of instructor).*	3	Fall/Spring
EPID 573B	Epidemiologic Methods *(Course Requisites: EPID 573A, BIOS /EPID 576A; prerequisite or concurrent registration, BIOS/EPID 576B)*	3	Fall
EPID 660	Infectious Disease Epidemiology *(EPID 573A; prerequisite, or concurrent registration, EPID 573B, BIOS/EPID 576A).*	3	Spring
IMB 501	Medical Microbiology and Immunology *(Course Requisites: Background in molecular biology, microbiology, or immunology).*	4	Spring
IMB 605	Medical Immunology and Infectious Disease	4	Fall
IMB 519	General Immunological Concepts	4	Fall
MIC 503R	Biology of Animal Parasites	3	Spring
MCB 516A	Bioinformatics and Genomic Analysis *(Course Requisites: Basic statistical knowledge and programming experience).*	3	Spring
MCB 572A	Cell Systems *(MCB 304, MCB 305, and consult instructor before enrolling).*	4	Fall

MCB 573	Recombinant DNA Methods and Applications	4	Spring
PHCL 512	Introduction to Pharmacology	3	Fall
PHCL 553	Neuropharmacology	3	Spring
PHCL 586 B	Introduction to Medical Pharmacology Research	1	Spring
PLP 528L	Microbial Genetics Laboratory	2	Spring
SLHS 649	Survival Skills and Ethics	3	Spring
UND: MLS502	Erythrocytes in Health and Disease	2	Check UND
UND: MLS503	Leukocytes in Health and Disease	2	Check UND
UND: MLS513	Advanced Clinical Immunology for Laboratory Professionals	2	Check UND
UND: MLS518	Molecular Diagnostics	2	Check UND
UND: MLS522	Clinical Bacteriology	2	Check UND
UND: MLS523	Clinical Virology, Mycology and Parasitology	2	Check UND
Professional Preparation Module and Internship Module (see Table A, pages 13-15)			

5.4 Medical Microbiology and Immunology

The primary objective of the Medical Microbiology and Immunology (MMI) track, one of five sub-plans of the Applied Biosciences GIDP, is to instruct and prepare students for an occupation in the diverse field of biomedical sciences. The focus in the MMI track is training students to attain a graduate level biomedical education with an emphasis on medical microbiology, immunology, and virology.

The disciplines of microbiology and immunology started centuries ago with the development of the simple microscope (the 1600's). Using this new scientific tool and the seminal work by major microbiologist's in the 1800's, led to the vanquishing of the theory of spontaneous generation as the source of disease. The ultimate cause of the disease was shown, using hypothesis-based scientific investigations, to be microorganisms or bacteria, and became known as "The Germ Theory" of disease. These foundations in Medical Microbiology led to queries into how one could prevent disease by vaccination and by the use of antisera (antibody). These studies used antibodies raised against the bacterial toxins in animals. The antitoxin serum led to the use of passive immunization to protect and cure infectious diseases and vaccines against these deadly agents. This work was seminal in the development and futures discoveries in the field of immunology. Major research and discoveries in the areas of medical microbiology and immunology have played a major part in the rapid advances in genomics, bioinformatics, and biotechnology. These technologies have also had a major impact on recent advancements in MMI.

This program is unique in incorporating the MMI-biomedical science training along with the linking and integration of important knowledge from the disciplines of management, business, and law. All students in the ABS program are required to complete an internship, in our case, in the area of MMI. Students do internships with biotechnology companies based in the Tucson-Phoenix corridor, or in academic research laboratories, and obtain invaluable on-the-job training, experience, and knowledge. This real world expertise obtained in the internship is unique and different from classroom learning or taking on-line courses.

This innovative curriculum will give students the ability to take various career paths upon graduation. This could include doing research at "the bench", to manage a laboratory at a university or in industry. With knowledge gained in business and legal fields, our trained scholars can also become involved in the business side of biomedical science. Graduates from this track will be ready for such diverse professional vocations in the areas of: biotechnology, biomedical research, pharmaceuticals, local or national government, academic institutions, plus positions in immunologic and microbiologic biotechnology companies.

The MMI subplan is working in alliance with the Certificate Program in Microbiology and Immunity (MIGCP) which is housed within the Department of Immunobiology. Upon admission to the ABS MMI track, the 12 units completed by the student for the MIGCP certificate may be transferred as fulfillment of the Core Science and Science Electives Modules of the MMI subplan.

Curriculum: Applied Biosciences-Medical Microbiology and Immunology (MMI) Track			
Number	**Title**	**Units**	**Semester Offered**

Science Module: 15 Units Required (9 Core + 6 Electives)			
Core Science Classes: Choose 9 Units			
BE 513	Applied Biostatistics	4	Fall
CMM 504	Cell Biology of Disease	3	Summer
IMB 501	Medical Microbiology and Immunology	4	Spring
IMB 519	General Immunological Concepts	4	Fall
IMB 548	Basic Immunological Concepts *(Course Requisites: Students who have taken IMB 605, IMB 501, IMB 519 or have taken undergraduate immunology courses may enroll in this course. Please consult the course director)*	3	Fall
IMB 565	Principles and Molecular Mechanisms of Microbe-Host Interactions *(Course Requisites: For PhD students: undergraduate degree in biology-related subject or after satisfactory discussion with Instructor)*.	3	Spring
IMB/CMM 605	Medical Immunology and Infectious Disease	4	Fall
IMB 696A	Research Seminar *(Course Requisites: Only advanced Immunobiology graduate students within one year of graduation should enroll in this course with the consent of the course director).*	1	Fall/Spring
IMB 520	Pathogenic Bacteriology	3	Fall
Science Electives: Choose 6 Units Electives can include any course from the Core Science Module as well. Courses not listed here may also be chosen but require an agreement with the Director of Graduate Studies or the Graduate Committee.			
BIOC 565	Proteins and Enzymes	3	Fall
BIOC 568	Nucleic Acids, Metabolism, and Signaling *(Prerequisite: 2 semesters of undergrad Biochemistry)*	3	Spring
BIOS 576A	Biostatistics for Public Health *(Course Requisites: One year of college-level mathematics).*	3	Fall/Spring
BIOS 576B	Biostatistics for Research *(Course Requisites: EPID 576A, EPID 573A).*	3	Spring
CMM 504	Cell Biology of Disease	3	Summer
CMM 588	Principles Cellular &Molecular Neurobiology *(Consult program office before enrolling).*	4	Fall
ENVS 525	Environmental Microbiology	3	Fall
EPID 573A	Basic Principals of Epidemiology	3	Fall/Spring/Summer

	(Epidemiology major or minor, MPH major, or consent of instructor).		
EPID 660	Infectious Disease Epidemiology *(EPID 573A; prequisite, or concurrent registration, EPID 573B, BIOS/EPID 576A).*	3	Spring
IMB 696A	Research Seminar	1	Fall/Spring
MIC 503R	Biology of Animal Parasites	3	Spring
MIC 595A	Critical Evaluation of Scientific Literature	1	Spring
MCB 516A	Bioinformatics and Genome Analysis *(Course Requisites: Basic statistical knowledge and programming experience).*	3	Spring
MCB 573	Recombinant DNA Methods and Applications	3	Spring
MIC 528L	Microbial Genetics Laboratory	2	Spring
MIC 528R	Microbial Genetics	3	Spring
MIC 530	Food Microbiology and Biotechnology	3	Spring
Professional Preparation Module and Internship Module (see Table A, pages 13-15)			

5.5 Molecular and Cellular Biology

The Molecular and Cellular Biology (MCB) sub-plan of the Professional Science Master's in Applied Biosciences GIDP is designed for students who wish to possess a graduate-level education that integrates knowledge in the biological sciences, management, business, and law. Students graduating in this track will be prepared for professional careers in government, academia, or in industry in such fields as biotechnology, pharmaceuticals, bioinformatics, medical research, and agriculture.

The discipline of Molecular and Cellular Biology is the study of life processes. What types of activities are carried out by cells, and how do cells make these activities work? Students develop a deep understanding of current ideas and problems in molecular and cellular biology and to build foundational skills in logic, reasoning, self-expression, and communication.

MCB researchers utilize model systems that allow them to query the most basic of questions about nature, whether they be at the molecular level, at the level of a cell or organism, or in the development of clinical application of new human disease therapies. Faculty with specializations in MCB represents a diverse group of faculty members' research interests including cancer biology, neurobiology, heart development and disease, plant development, evolutionary biology, cell signaling, gene expression, RNA biology, genetic networks and systems biology, and genome stability. Professional Science Master's students in the MCB track will be able to select courses corresponding to these fields and other course work for the track, to tailor their studies to their personal preferences and career goals.

Curriculum: Applied Biosciences - Molecular and Cellular Biology (MCB) Track			
Number	**Title**	**Units**	**Semester offered**
Science Module: 15 Units Required (9 Core + 6 Electives)			
Core Science Classes: Choose 9 Units			
BIOC 565	Proteins and Enzymes *(Course Requisites: BIOC 462A, CHEM 480B).*	3	Fall
BIOC 568	Nucleic Acids, Metabolism and Signaling *(Prerequisite: 2 semesters of undergrad Biochemistry)*	4	Spring
BIOC 585B	Biological Structure 2	2	Spring
CBIO 515	Mechanisms of Human Disease	4	Spring
CBIO 552	Cancer Biology	4	Fall
CBIO 553	Advanced Topics in Cancer Biology *(The Cancer Biology overview course is a prerequisite for this course or by permission of the course co-Directors)*	4	Spring
CMM 577	Principles of Cell Biology	4	Fall
ECOL 553	Functional and Evolutionary Genomics *(Course Requisites: Concurrent registration, ECOL 553L for first year IGERT fellows)*	4	Fall
MCB 516A	Statistical Bioinformatics and Genomic Analysis *(Course Requisites: Basic statistical knowledge and programming experience)*	3	Spring
MCB 546	Genetic and Molecular Networks *(Undergraduate genetics course, molecular*	4	Spring

	biology course, and consent of instructor)		
MCB 572A	Cell Systems *Course Requisites: MCB 304, MCB 305, and consult instructor before enrolling.*	4	Fall
MCB 573	Recombinant DNA Methods and Applications	4	Spring
MCB 580	Introduction to Systems Biology *(Course Requisites: MCB 181R, MCB 181L and MATH 129. One upper division biology/biochem course or consent of instructor)*	3	Fall
MCB 695E	Science, Society and Ethics *(Department Consent Required)*	1	Spring (8 weeks)
NRSC 572	Neurodevelopment in Action: How the brain is built, ages, and responds to disease	4	Spring
PLP 528R	Microbial Genetics	3	Spring
Science Electives: Choose 6 Units Electives can include any course from the Core Science Module as well. Courses not listed here may also be chosen but require an agreement with the Director of Graduate Studies or the Graduate Committee.			
CBIO 550	Drug Disposition and Metabolism *(Course Requisites: PCOL602A)*	2	Spring
BIOC 555	Methods of Physical Biochemistry	3	Every other Fall
BIOS 576A	Biostatistics in Public Health *(Course Requisites: One year of college-level mathematics)*	3	Fall/Spring
IMB 519	General Immunological Concepts	4	Fall
IMB 548	Basic and Advanced Immunology	3	Fall
MIC 530	Food Microbiology and Biotechnology	3	Spring
NRSC 588	Principles of Cellular and Molecular Neurobiology *(Course Requisites: Consult program office before enrolling)*	4	Fall
PLS 548A	Plant Biochemistry and Metabolic Engineering *(Course Requisites: CHEM 241A/B OR CHEM 242A/B; BIOC 462A/B or BIOC 460 or consent of instructor)*	3	Check course catalog for availability
PLS 580	Medicinal Plants	3	Every other Fall *(Last offered Fall 2016)*
PHYS 531	Molecular Biophysics	3	Spring
Professional Preparation Module and Internship Module (see Table A, pages 13-15)			

5.6. Sustainable Bioeconomy and Bioenergy (SBB)

The primary objective of the SBB track is to prepare students for jobs as research professionals in the field of bioenergy, biofuels, and novel agricultural systems research as part of a sustainable regional and global bioeconomy. Students will be interested in research towards selecting and improving appropriate feedstock; producing feedstock in a sustainable manner; researching conversion of the feedstock to biofuels, bioenergy and value-added coproducts; and in developing techno-economic and sustainability models to evaluate paths to commercialization and socioeconomic impacts. Students completing the SBB track will seek employment in public or private research organizations (including universities) that conduct research in these fields; private companies (from bioenergy startups to established multinationals in the existing energy industries) that are interested in sustainable bioenergy research and implementation; governmental agencies that regulate the biofuels industry; and in nonprofit organizations that evaluate the environmental and societal impact of these industries.

Just as the other ABS emphases, the SBB track will provide a rigorous but student-tailored and student-centered science training that is complemented by integration of important knowledge from the disciplines of management, economics, business practices, and law. Just as students in the existing tracks, SBB students will complete an internship at a company (preferably in the Tucson-Phoenix corridor) or at a University of Arizona lab appropriate for their career goals, in order to obtain invaluable on-the-job training, experience and knowledge. This real world know-how obtained in the internship is unique and cannot be emulated in the classroom nor by taking on-line courses. As part of their graduate program, students will prepare, present and defend an internship report in lieu of a thesis (ABS is a non-thesis MS degree). This report will describe the field of research the student was engaged in; details their contributions to this field; and discusses future directions such research may take.

Students graduating in the SBB program will typically do research during their professional career “at the bench” (including the “virtual bench” of the computer, in case of research in socioeconomic modeling), with the perspective of eventually managing a laboratory at a university or in industry. With knowledge gained in business and legal fields, our trained scholars can also become involved in the business side of the bioenergy industry, becoming project managers, regulatory agency employees, marketing and analysis professionals.

Curriculum: Applied Biosciences – Sustainable Bioeconomy and Bioenergy (SBB) Track			
Number	**Title**	**Units**	**Semester Offered**
Science Module: 15 Units Required (9 Core + 6 Electives)			
Core Science Classes: Choose 9 units			
BE 523	Biosystems Analysis and Design	3	Spring
BE 582	Integrated Engineered Solutions in the Food/Water/Energy Nexus	3	Fall
CHEE 581A	Engineering of Biological Processes	3	Spring
EIS 536	Agro-Ecology	3	Spring (Last offered Spring 2019))
PLS 548A	Plant Biochemistry and Metabolic Engineering	3	Check course catalog for availability
PLS 549A	Plant Genetics and Genomics	3	Contact department

PLS 575A	Physiology of Plant Production under Controlled Environment	3	Spring
Science Electives: Choose 6 Units Courses not listed here may also be chosen but require an agreement with the Director of Graduate Studies or the Graduate Committee.			
ACBS 556	Aquaculture	3	Spring
BE 513	Applied Biostatistics	4	Fall
BE 534	Biosystems Analytics	3	Spring
BE 555	Soil and Water Resources Engineering	3	Fall
BE 556	Irrigation Systems Design	3	Spring (odd years)
BE 558	Soils, Wetlands and Wastewater Reuse	3	Spring (even Years)
BE 579	Applied Instrumentation for Controlled Environment Agriculture	3	Spring
BE 583	Controlled Environment Systems	3	Fall
BIOC 565	Proteins and Enzymes	3	Fall
BIOC 568	Nucleic Acids, Metabolism and Signaling	3	Fall
BIOS 576A	Biostatistics in Public Health	3	Spring
BIOS 576B	Biostatistics for Research	3	Spring
BME 510	Biology for Biomedical Engineering	3	Fall
ECOL 553	Functional and Evolutionary Genomics	4	Fall
ECOL 575	Freshwater and Marine Algae	4	Spring
ECOL 600B	Fundamentals of Ecology	3	Fall
ENVS 501	Sustainable Management of Arid Lands & Salt-Affected Soils	3	Spring (Last offered Fall 2019)
MCB 516A	Statistical Bioinformatics and Genomic Analysis	3	Spring (even years)
MCB 573	Recombinant DNA Methods and Applications	4	Spring
MCB 580	Introduction to Systems Biology	3	Fall
PLP 528R	Microbial Genetics	3	Spring
PLP 550	Principles of Plant Microbiology	4	Spring (even years)
PLP 560	Advanced Plant Biology	4	Fall
PSIO 572	Quantitative Modeling of Biological Systems	3	Fall
	Total science units required		**15**
	Total units required (professional, science and internship)		**36**
Professional Preparation Module (12 units) and Internship Module (9 units):see Table A, pages 13-15			

6.0 Other Program Requirements

6.1 Advising

When admitted to a track, the student's initial advisor shall be the DGS of that track.

By the beginning of the 2nd semester, the student must select a Primary Advisor (who may be the DGS of the track) and at least two other faculty members who will form his/her committee. The composition of committee must be approved by the DGS and must follow Graduate College rules: http://grad.arizona.edu/academics/program-requirements/masters-degrees/masters-committees

6.2 Master's Plan of Studies

Working with their advisor, students must start a tentative Plan of Studies before they register for their first semester. The Plan of Studies is a living, working document updated and fine-tuned by the student, the Primary Advisor, and the Graduate Committee throughout the studies of the student with the ABS GIDP. The Plan of Studies must be submitted through GradPath in the third semester, and updated later if necessary (http://grad.arizona.edu/degreecert/mpos).

6.3 Credit Transfers

ABS students may take graduate-level online courses at the University of North Dakota (UND) Medical Laboratory Science program as Plus courses or Electives towards their ABS degree. These students should register as "non-degree" students at UND, while maintaining enrollment at the UA. UND credits obtained must then be transferred to the UA. If there is no enrollment at the University of Arizona, the student will need to file a Leave of Absence (LOA).

The Graduate College places ***limits*** on the number and kind of transfer credit that can be applied to the ABS degree. Transfer coursework may come from these three categories:

a) No more than **7 units** may be transfer courses from other institutions (such as UND), and these must be graduate courses at the home institution.
b) No more than **12 units** of UA non-degree graduate coursework are allowed.
c) No more than **6 units** of UA 400-level coursework are allowed, but only if the student was admitted prior to Fall 2014 and the courses had not been counted toward their bachelor's degree.

However, as a general rule, transfer coursework ***may not exceed a total of 12 units*** from any combination of the three above categories**.**

For full descriptions of these limitations please refer to the following:
http://grad.arizona.edu/academics/program-requirements/masters-degrees/credit-requirements

Please note that a special rule was authorized by the UA for ABS students who are pursuing a MLS Categorical Program Certificate at the University of North Dakota:

By special arrangement with the UA Graduate College, students may transfer in ***up to 16 units*** of UND coursework specific to that certificate to be counted as electives towards their ABS master's requirements. This transfer coursework may be undergraduate or graduate level at UND. The courses that these students may transfer must have the MLS course prefix at UND. Please note that students who transfer in 12 or more units of coursework from the UND MLS programs ***cannot use*** any other transfer coursework, coursework taken at UA in non-degree seeking status, or UA 400-level coursework to be counted towards their ABS degrees.

6.4 Graduate College Paperwork

See the following URL for additional Graduate college requirements on Masters Degrees, including important information about paperwork that needs to be filed on a regular basis.
http://grad.arizona.edu/academics/program-requirements/masters-degrees/completion-of-masters-requirements

GradPath (http://grad.arizona.edu/GradPath) is the UA Graduate College electronic degree audit process that makes tracking and monitoring simple. Students are able to fill in and submit forms online through UAccess Student. For example, the Plan of Study and Committee request forms are submitted through Gradpath. The automated workflow engine routes the electronic forms to everyone who needs to see or approve them (primary advisor, DGS, Committee, Graduate College, …). Each approver is notified by email when a form is awaiting review and approval. To access GradPath, you will need to have completed FERPA training. You can do your training online or see the bottom right of the UAccess log-in page. *(more information on GradPath is on page 43)*

6.5 Satisfactory Academic Progress

Each semester, students in the Applied Biosciences must demonstrate satisfactory academic progress towards their degree:

a) ***Students must maintain a minimum 3.0 GPA. If the student falls below this level for two semesters in a row, they will be disqualified.***
b) Students may not take more than 6 years to complete the degree.
c) Students must show that they are making progress towards completing the degree in a timely manner. Students should regularly meet with their advisors (at least once a semester, preferably more). The following benchmarks are a good guide. Petitions to vary from this plan should be with good cause and be submitted in writing for consideration by the Executive Committee of the program. Core required courses should be completed as early as possible in the course of study (See 4.3, Steps to Degree).

6.6 Professionalism Requirements

Students are also expected to prepare certain professional documents to be used for applications to internships and jobs:

- A resume and/or curriculum vitae
- A statement of interests and professional goals (usually about 1 page)

Students are also expected to pursue professional opportunities when possible, such as attending talks by industry leaders; volunteering, participating and presenting at academic or

industry conferences; attending trade shows; attending Student-Industry Networking Events (usually organized by Bio5) etc. Students are encouraged to become members, and attend the regular meetings of BIOSA, the Bioindustry Association of Southern Arizona. Potential employer's value engaged employees and participating in these ways demonstrates your engagement.

7.0 FACULTY IN THE ABS GIDP

7.1 Applied Biosciences Faculty

Directors of Graduate Studies			
Johnson, Michael	Assistant Professor, Immunobiology, Bio5	mdljohnson@email.arizona.edu	626-3779
Riedel-Kruse, Ingmar	Associate Professor, Molecular & Cellular Biology	ingmar@arizona.edu	621-6097
Ahmad, Nafees	Professor, Immunobiology	nafees@mail.arizona.edu	626-7022
Kacira, Murat	Professor, Agricultural and Biosystems Engineering	mkacira@cals.arizona.edu	626-4254
Cuello, Joel	Professor, Agricultural-Biosystems Engineering, Bio5	cuelloj@email.arizona.edu	621-7757

ABS Associated Faculty (or updated list https://abs.arizona.edu/directory/faculty)		
Ahmad, Nafees	Immunobiology	nafees@arizona.edu
Arnold, Anne E.	Professor , School of Plant Sciences	arnold@ag.arizona.edu
Buntzman, Adam	Assistant Research Professor, Bio-5	buntzman@email.arizona.edu
Chen, Qin	Professor, Department of Pharmacology	qchen@email.arizona.edu
Cowen, Stephen	Associate Professor, Psychology	scowe@email.arizona.edu
Cress, Anne	Professor, Cellular & Molecular Medicine	cress@email.arizona.edu
Cuello, Joel	Professor, Agricultural –Biosystems Engineerin	cuelloj@email.arizona.edu
De, Barun	Professor, Dept of Pathology	bkde@email.arizona.edu
Fane, Bentley	Professor, School of Plant Science	bfane@email.arizona.edu
Fitzsimmons, Kevin	Professor, Soil, Water and Environmental Sci.	kevitz@ag.arizona.edu
Gallery, Rachel	Associate Professor, Microbial Ecology	rgallery@email.arizona.edu
Giacomelli, Gene	Professor, Agric & Biosystems Engineering	giacomel@ag.arizona/edu
Gutenkunst, Ryan	Associate Professor , Molecular & Cellular Biology	rgutenk@email.arizona.edu
Harris, David T.	Professor, Immunobiology	davidh@email.arizona.edu

Herman, Eliot	Professor, Plant Sciences	emherman@email.arizona.edu
Triston Hooks	Assistant Professor of Practice, Biosystems Engineering	tristonh@arizona.edu
Luisa Ikner	Water & Energy Sustainable Technology (WEST) Center	ikner@arizona.edu
Johnson, Michael J D.	Assistant Professor, Immunobiology	mdljohnson@email.arizona.edu
Karnes, Jason	Assistant Professor, Pharmacy	karnes@pharmacy.arizona.edu
Ledford, Julie	Assistant Professor, Cellular and Molecular Medicine	jledford@email.arizona.edu
Gerardo Lopez	School of Animal & Comparative Biomedical Sciences	lopezg3@arizona.edu
Madhavan, Lalitha	Associate Professor, Neurology	lmadhavan@email.arizona.edu
Mosher, Rebecca	Associate Professor, Plant Sciences	rmosher@email.arizona.edu
Nagy, Lisa	Professor, Molecular & Cellular Biology	lnagy@email.arizona.edu
Padi, Megha	Assistant Professor, Molecular and Cellular Biology	mpadi@email.arizona.edu
Palanivelu, Ravi	Associate Professor, Plant Sciences	rpalanivelu@email.arizona.edu
Ravishanka, Sadhana	Professor, Animal and Comparative Biomedical Sciences	sadhravi@email.arizona.edu
Schmelz, Monika	Associate Professor, Pathology	schmelz@email.arizona.edu
Schmidt, Monica	Associate Professor, Plant Sciences	monicaschmidt@email.arizona.edu
Schuch, Ursula	Professor, School of Plant Sciences	uschuch@email.arizona.edu
Tax, Frans	Professor, Molecular & Cellular Biology	fetax@email.arizona.edu
Wang, Xinglong	Pharmacology & Toxicology	xwang@pharmacy.arizona.edu
Yao, Guang	Assistant Professor, Molecular & Cellular Biology	guangyao@email.arizona.edu
Zarnescu, Daniela	Associate Professor Molecular and Cellular Biology	zarnescu@email.arizona.edu

7.2 Executive Committee

Name	Email	Affiliation
Ravishankar, Sadhana	sadhravi@arizona.edu	School of Animal & Comparative Biomedical Sciences
Reidel-Kruse, Ingmar	ingmar@arizona.edu	Molecular & Cellular Biology
Ahmad, Nafees	nafees@arizona.edu	Immunobiology
Kacira, Murat	mkacira@arizona.edu	Agricultural and Biosystems Engineering
Johnson, Michael DL	mdljohnson@arizona.edu	Immunobiology

Cuello, Joel	cuelloj@arizona.edu	Agricultural-Biosystems Engineering

8.0 APPENDICES

8.1 Internship Policies and Procedures

8.1.1. ABS 593A Internship in Applied Biosciences –

A syllabus for ABS 593 A is available at the ABS website, Important Forms and Documents https://abs.arizona.edu/current-students/forms under the heading "Relevant Syllabus"

Meeting Time and Place:
TBA

Location: Respective Laboratories of the Instructor or the Hosting Agency

Instructors:
TBA

Course Description and Objectives:

The curriculum of the Applied Biosciences (ABS) Graduate Interdisciplinary Program (GIDP) at the University of Arizona includes a professional internship as one of the requirements for completion of the degree. This professional internship is defined as specialized work or service on an individual basis, consisting of training and practice in actual service in a technical, business, academic or governmental establishment.

The primary goal of the internship is to give students an opportunity to apply lessons learned in the classroom to a real-world experience set in a professional practice-oriented environment, with the intern's work overseen by a professional. In particular, the goal of the internship is to give the student a practical perspective on problems and applications in a growing discipline known as "Applied Biosciences".

The internship has the following secondary goals:
a) To help students compare their abilities and interests with the professional requirements of particular Applied Bioscience fields;
b) To help students evaluate potential employers;
c) To provide students with the possibility to participate in multidisciplinary research teams;
d) To expose students to the business and professional environment;
e) To learn various research methods and professional and business practices.

Learning Outcomes:

Through practical laboratory and/or administrative work, immersion in scientific teams, and mentoring by scientific professionals, students will gain an in-depth understanding of effective ways to:

1. Participate in research, business, regulatory, or customer- and public-relations teams in a professional manner while completing assigned tasks in a timely and efficient way;
2. Discuss the status of the field and the underlying applied biological problems relevant to their internship work;
3. Discuss the business, regulatory, customer relations, and/or educational environment relevant to their internship work;
4. Apply appropriate methods to collect, analyze, interpret and critique data relevant to their internship.

Evaluation Grading Summary:

Internships are evaluated by both corporate/organizational evaluative criteria (if applicable) and academic criteria. The final grade for the class is determined by the Primary Advisor of the student and is based on 1) An independent evaluation of the work performed by the student, 2) Input from the student's Internship Supervisor at the hosting agency or at the University of Arizona laboratory where the internship had been performed. The final grade will be calculated according to the following formula:

Submission of all required forms and documents	5%
Evaluation by Internship Supervisor	65%
Independent evaluation by the Primary Advisor	30%

Absence and Class Participation Policy (required)
The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop. The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy. Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See:
https://deanofstudents.arizona.edu/absences
Course Communications:
University Email and personal interaction in the laboratory.

Required Texts or Readings:
There are no required textbooks.

Final Examination or Project:
There is no final exam for this course.

Grading Scale:
S, P, F grading: For the majority of individual studies courses, one of the grade systems available is the special grades of S, P, F. Grades of S (superior), P (pass), and F (fail) are not included in the calculation of the GPA, nor do they count toward meeting the criteria for dean's list, honorable mention, or academic distinctions.

Classroom Behavior Policy:
To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper,

making phone calls, web surfing, etc.). Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

Threatening Behavior Policy:
Required language: The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Accessibility and Accommodations:
Please visit the Disability Resource Center website at:
http://drc.arizona.edu/instructors/syllabus-statement.

Code of Academic Integrity:
Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See:
http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity.

The University Libraries have some excellent tips for avoiding plagiarism, available at http://new.library.arizona.edu/research/citing/plagiarism.

UA Nondiscrimination and Anti-harassment Policy:
The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy
Recommended language: Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students:
UA Academic policies and procedures are available at http://catalog.arizona.edu/policies
Student Assistance and Advocacy information is available at
http://deanofstudents.arizona.edu/student-assistance/students/student-assistance

Subject to Change Statement:
Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

8.1.2. Policies, Procedures and Best Practice Guidelines for Internships

I. INTRODUCTION

The curriculum of the Applied Biosciences Graduate Interdisciplinary Program (ABS GIDP) at the University of Arizona includes a professional internship as one of the mandatory requirements for completion of the degree.

These policies are designed for the use of the student, Primary Advisor, and the student's Internship Supervisor at the host agency or at the UA laboratory. They shall be considered binding unless a variance is agreed upon by all parties. A petition is approved by the Chair of the ABS GIDP based on recommendations by the Primary Advisor and/or the Director of Graduate Studies of the student.

General procedural questions regarding internship matters should be directed to the program coordinator for the ABS program.

These policies are intended to be consistent with the University of Arizona non-binding guidelines on internships:
https://www.registrar.arizona.edu/sites/registrar.arizona.edu/files/forms/Internship%20Policies-Guidelines%205-6-19.pdf

Where the two documents vary, the ABS program policies shall prevail.

II. PURPOSE OF THE INTERNSHIP

The primary goal of the internship is to give students an opportunity to apply lessons learned in the classroom to a real-world experience set in a professional practice-oriented environment, with the intern's work overseen by a professional. In particular, the goal of the internship is to give the student a practical perspective on problems and applications in a growing discipline known as "Applied Biosciences".

The internship has the following secondary goals:
a) To help students compare their abilities and interests with the professional requirements of particular Applied Bioscience fields;
b) To help students evaluate potential employers;
c) To provide students with the possibility to participate in multidisciplinary research teams;
d) To expose students to the business and professional environment;
e) To learn various research methods and professional and business practices.

III. LEARNING OUTCOMES:

Through practical laboratory and/or administrative work, immersion in scientific teams, and mentoring by scientific professionals, students will gain an in-depth understanding of effective ways to:

1. Participate in research, business, regulatory, or customer- and public-relations teams in a professional manner while completing assigned tasks in a timely and efficient way;
2. Discuss the status of the field and the underlying applied biological problems relevant to their internship work;
3. Discuss the business, regulatory, customer relations, and/or educational environment relevant to their internship work;
4. Apply appropriate methods to collect, analyze, interpret and critique data relevant to their internship.

IV. MINIMUM ELIGIBILITY QUALIFICATIONS FOR STUDENTS

Before applying for an internship, students are required to:

1. Be enrolled in the ABS GIDP.
2. Be in **good academic standing** with the University of Arizona and have maintained at least a 3.00 grade point average (major and cumulative) at the University of Arizona prior to enrolling in an internship.

V. INTERNSHIP POLICIES

1. "Company Internships" may be located at private companies, for-profit organizations, non-profit organizations, governmental agencies, and healthcare facilities. Internships may also be located within an academic organization such as a University, college or school. "UA Internships" may be conducted in a laboratory that is part of the University of Arizona.

2. Internships may be paid or non-paid, regardless of credit awarded. International students should consult with the International Scholar's office before pursuing an internship in order to investigate the visa requirements, including practical training waivers required of them and the effect these requirements will have on their future visa status.

3. Hours of employment. 1 unit = 45 hours of internship work per Arizona Board of Regents (ABOR) policy. ABS Students are expected to complete 8 units for their Degree.
   a) The total number of units may be divided into work contracts (blocks) with different hosting agencies, each worth a minimum of 1 unit.
   b) Internships are typically conducted on a full time basis, but split appointments and part time appointments are also acceptable with permission of the student's Primary Advisor and Degree Committee, in agreement with the Director of Graduate Studies of the appropriate study track, or the Program Chair.

4. The Internship is normally undertaken in the summer between the first and second year. However, the timing of this is flexible to meet the needs of the hosting agency and the student. Students should discuss the timing of the internship with the Primary Advisor, the Graduate Committee or the Director of Graduate Studies.

5. Terms of employment, including duties, pay and other remuneration and costs shall be described in the **ABS Internship Work Plan** form. This letter must be signed by a duly designated representative of the hosting agency, the student, and the Primary Advisor who will act as the Internship Instructor. This letter is not a contract, but is meant to ensure that the expectations of all parties are consistent.

6. ABS students will prepare an Internship Report in partial fulfillment of the mandatory 1-credit ABS GIDP course ABS 909 (Internship Report), normally taken during the last semester of their studies. This portfolio shall include detailed descriptions of the work they performed in the course of their duties as an intern. In the event that the internship involves work on (1) patented material, (2) corporate secrets or (3) governmentally clearance-restricted material, then the agreement letter should include any clearance/secrecy documents that the Committee has to sign, and a *clear* statement of the limitations on the access to information. Any clearance/secrecy documents proposed by the Hosting Agency will be reviewed by the appropriate legal offices of the University of Arizona, and faculty or committee members will only be permitted to sign such document after the approval of the appropriate UA authorities. While the Hosting

Agency's need for confidentiality of the student's work will be accommodated to the maximum extent possible, the student's Graduate Committee still must be provided with sufficient materials so that they can judge the quality of the student's work.

7. Students are expected to be good corporate citizens and perform as directed by their supervisor at the hosting agency. Importantly, hosting agencies are expected to assign no more than 10% of the student's time to clerical or other duties not directly related to ABS Learning Objectives. The student's duties and responsibilities should be commensurate with his/her experience and training.

9. Internship-related work that involves research involving human subjects or involving animals must be approved by the appropriate subcommittee of the Office for the responsible conduct of research: http://orcr.vpr.arizona.edu/.

VI. APPLICATION PROCEDURE

1. In the semester before the internship begins the student should discuss potential hosting agencies for the work with their Primary Advisor. The student should contact the potential hosting agency to inquire about internship availability and terms and agree with the hosting agency to conduct the internship.

2. At the soonest possible time **but before the applicable registration deadline** for the semester in which the internship is conducted, the student and the Internship Supervisor at the hosting agency / UA host lab should complete the **ABS Internship Work Plan** form**.** This form should contain a clear statement of duties, costs, remuneration, and any patent/secrecy/confidentiality restrictions on the work as detailed above. The Internship Work Plan should identify the Internship Supervisor (Site Supervisor) of the student at the hosting agency (Company Internship), or the UA tenured or tenure eligible faculty member or academic professional who will act as the Internship Supervisor (UA Internship). For UA Internships, the Primary Advisor may also serve as the Internship Supervisor.

3. Students shall discuss with their Internship Supervisor at the work site the possible risks and dangers associated with the planned internship. The Student and the Internship Supervisor shall also review and discuss the Insurance Coverage Disclosure section of the ABS Internship Work Plan form.

4. The student should submit the **ABS Internship Work Plan form**, signed by the student and the Internship Supervisor, to the Primary Advisor for approval and signature. If the Internship Supervisor is a UA faculty member, the student would be enrolled under the Internship Supervisor for ABS 593A. If the Internship Supervisor is not UA-affiliated, the student will be enrolled under their Primary Advisor. If the Internship Supervisor is different from the instructor whom the student will be enrolled under, the instructor of ABS 593A must sign the bottom of the work plan.

5. The student will then submit the signed **ABS Internship Work Plan** form to the Program Coordinator. Submission of this form is required before the student may register for internship units (ABS 593A). Registration for the ABS 593A units must be completed by the applicable registration deadline for the semester in which those credits will be earned. **Internship credits will not be awarded retroactively for internship duties**

performed at an earlier time.

6. The student should pay any registration fees and tuition associated with the credits to be earned, and if they receive financial aid, consult with the Financial Aid and/or Scholarship Office prior to registering.

7. If the student's internship involves doing research with human subjects (including interviewing, collecting data and similar), the student and faculty advisor are jointly responsible for ensuring that the proposed research follows all applicable University of Arizona requirements of the Human Subjects Protection Program, including project review (if necessary) and Human Subjects training as appropriate to the student's assignment. Check the Human Subjects Protection Program to determine if training is needed: http://www.irb.arizona.edu/faqs.html

VII. EVALUATION.

1. Before the end of the semester during which the internship was carried out, the student should make arrangements with their Internship Supervisor (Site Supervisor) for completing the ***Evaluation of the Intern form***.

2. No later than the last day of classes for the semester during which the internship was carried out, the student shall complete and submit to the Program Coordinator an ***Internship Evaluation form.***

3. No later than the last day of classes for the semester during which the internship was carried out, the student shall submit to their Primary Advisor the ***Evaluation of the Intern form*** that has been completed by their Internship Supervisor at the hosting agency or at the UA laboratory where the work was performed.

4. On the basis of the information provided in the ***Evaluation of the Intern form***, and the independent observations of the work of the student by the Primary Advisor, the Primary Advisor will assign one of the following grades:

   S-superior performance
   P-pass, average performance
   F-fail

   The grade of **I** may be awarded only at the end of a term, when all but a minor portion of the work has been satisfactorily completed. The grade of I is not to be awarded in place of a failing grade or when the student is expected to repeat the course; in such a case, a grade other than I must be assigned. Students should make arrangements with the Primary Advisor (or in case of UA Internships, the Internship Supervisor) to receive an incomplete grade before the end of the term.

   Letter grades of S, P do not count towards the student's GPA. However F grades are considered to be unacceptable for a master's level student, and will not be counted towards the fulfillment of the requirement for ABS593a towards graduation. Such poor performance may also result in sanctions from the program, particularly if they are coupled with poor performance in other requirements in the program.

3. The student and hosting agency evaluations may be used by the program in the matching of future interns and agencies and to improve the internship as a learning experience.

VIII. SUPERVISION

1. For UA Internships, day-to-day supervision of the internship is carried out by the UA tenured or tenure eligible faculty or academic professional who acts as the Internship Supervisor. For UA Internships, the Primary Advisor may also act as the Internship Supervisor. For Company Internships, day-to-day supervision is provided by the company representative who is named as the Internship Supervisor (Site Supervisor) by the hosting agency in the ABS Internship Work Plan form.

2. The Primary Advisor and the Internship Supervisor should maintain communication during the internship. Any problems should be quickly resolved by communication among the student, the Primary Advisor and the Internship Supervisor.

2. The intern should report to the Primary Advisor periodically throughout the internship. This informal report should include (a) a brief comment on the allocation of the intern's time during that period (b) progress toward objectives, and (c) discussion of any significant difficulties or concerns with the internship.

IX. SUGGESTIONS FOR THE INTERN

1. The internship is an essential part of the ABS Program. It is intended to provide a bridge between theory and practice, by giving students an opportunity to test classroom knowledge and skills in an operating environment.

2. An internship gives the agency an opportunity to get to know the student, but it carries no presumption of leading to a permanent position/employment in that agency.

3. The student, in consultation with the Primary Advisor and the Internship Supervisor, is responsible for preparing for the internship, including, if required a proposal with specific task objectives. These objectives should be detailed in the ABS Internship Work Plan form.

4. An intern should not be viewed as either an outside consultant or an insulated researcher, but as a regular employee with a special, temporary work assignment. As such, the intern is expected to meet at least the same standards of performance as other agency employees.

5. The development of good working relations with supervisors and associates is a necessity for a successful internship. The intern and supervisor should also remember, however, that the internship is part of the ABS program of study, and therefore has academic goals which must also be met.

6. The intern should keep daily notes to assist in preparation of the final Internship Report.

7. Regular informal reports to the Primary Advisor will help keep the intern on track toward a satisfactory final report, and will give the intern a chance to benefit from the Primary Advisor's knowledge and experience in a timely manner.

8. The intern must recognize that they are representing The University of Arizona as an ambassador to the community and abide by the Student Code of Conduct and Code of Academic Integrity.

9. The intern should understand and follow the policies, procedures, rules and regulations of the hosting agency.

10. The intern should be prepared to perform their internship duties for the hours and duration specified. Completion of any non-academic requirements imposed by the sponsoring organization supervisor is by agreement between the student and the supervisor.

11. The student should talk to the Internship Supervisor regarding expected University holidays. Keep in mind many organizations do not follow the University calendar.

12. The student should ensure that their Internship Supervisor is able and willing to submit an evaluation on their behalf. Some organizations have personnel policies prohibiting supervisors from providing a written intern evaluation. If this is the case, special arrangements must be made for their Internship Supervisor to speak directly with the Primary Advisor about their performance.

X. SUGGESTIONS FOR THE HOST AGENCY

An internship provides organizations with effective outreach to qualified and motivated students. The primary goal of the internship, as stated above, has educational and mentoring components that can be satisfied only through a formal partnership between the Organization and the ABS GIDP of the University of Arizona. It is the intent of the program that this partnership provides a meaningful learning experience to students as prospective professionals. In this manner, the organization becomes an important asset in the development of interns. As a secondary benefit, the organization has access to well-qualified students as potential candidates for full-time employment after graduation. As a tertiary benefit, the program allows supervisors to evaluate prospective long-term employees under actual work conditions at minimal cost. Initial contacts through the internship may lead to recruitment and eventual hiring, upon graduation, of an employee who has experience with the employer’s operating procedures. In addition, multiple internships with the same student over his/her academic career may enable the intern to function at a higher level that will free full-time professional staff for more complex work.

By accepting an intern, the host agency recognizes that it shares responsibility for the success of the internship. The intern will rely on the agency's active participation and support, and will expect to receive assistance, advice and guidance.

By accepting an intern, the host agency agrees to complete, in agreement with the student, the ABS Internship Work Plan form which sets out the terms of the internship and assigns an Internship Supervisor to the student.

The following suggestions will help ensure a successful internship:

1. Provide relevant education/training to the intern if it extends beyond the skills they have acquired in the ABS program.

2. Maintain the intern status of the student, to be distinguished from employment status.

3. In the early stages of the internship, the intern should get a comprehensive overview of the agency's goals, products, and philosophy, including an introduction to its major policies and procedures.

4. The agency Internship Supervisor should inform agency personnel of the purpose, role and expected performance of the intern.

5. The intern should be organizationally placed near the agency Internship Supervisor, to aid in observation of, and participation in, a wide range of activities. Whenever possible, the intern should be permitted to attend meetings of senior staff and research teams.

6. Intern work assignments should be educational and challenging, as well as useful for the agency. The intern should not be assigned routine office or clerical work, unless such work is a necessary, subordinate part of a more responsible assignment that fulfills the required Learning Objectives of the ABS GIDP.

8. The intern should be supervised by a responsible professional to whom there is reasonable access. If possible, the intern should be assigned a desk and other office facilities near the supervisor.

9. The Internship Supervisor should contact the Primary Advisor of the student or the Chair of the ABS program whenever the progress of the internship is in question.

10. At the end of the internship, the hosting agency supervisor should complete and sign the **Evaluation of the Intern** form and send it with the student to the Primary Advisor in a closed envelope, or email it directly as a PDF attachment. If this violates the hosting agency's policies, an alternative means of evaluation should be worked out in advance with the Primary Advisor of the student.

XI. ROLE OF THE ABS PROGRAM.

The internship reflects the essential partnership between faculty and those practicing the profession in the larger community. The program's role in the partnership is to send students who will be good UA ambassadors to the community and to ensure that students will have a quality "hands on" learning experience. An internship also enhances the lines of communication between faculty and professionals in business, industry and government. The internship is an excellent complement to the program's curriculum.

1. The ABS program should communicate internship opportunities to all eligible graduate students, and should develop and maintain relationships with appropriate agencies. However, finding appropriate internships is primarily the responsibility of the student.

2. The program must ensure that program and university level internship policies are followed, including:

a) Selecting students who are in good academic standing.
b) Ensuring that students are NOT awarded internship credit for previous positions.
c) Ensure that interns are NOT used as free labor in for-profit organizations/facilities that are owned or operated by the faculty member who will award the internship credit and grade. If internships are permitted in such a facility, the interns should be compensated as an employee of the organization.
d) Inform students of the necessity of complying with pertinent program and workplace policies and procedures.
e) If the student's internship involves doing research with human and animal subjects make sure that ORCR training is provided as appropriate to the student's assignments.
f) Require Primary Advisors to document communications with the student and with the work supervisor regarding internship activities.
g) Notify the student that, unless other agreements are made between the parties, the Primary Advisor and program will not be responsible for any financial obligations incurred by the student for his/her participation; this includes, but is not limited to, travel and housing arrangements.
h) Notify the student that neither the instructor nor the University will be responsible for the payment of any medical care for injuries alleged to have resulted from the student's work experiences.

XII. PRIMARY ADVISOR'S SUPERVISORY RESPONSIBILITIES:

1. The Primary Advisor should maintain regular communication about the student's work activities during the internship with the Internship Supervisor at the hosting agency or UA laboratory. Any conflicts should be quickly resolved by communication among the student, Primary Advisor and Internship Supervisor.

2. The Primary Advisor should ensure that the internship experience is related to the curriculum and to the ABS GIDP Learning Goals, by building regular interactions with the student into their schedule. Communication with the student is an important component that elevates the work to a meaningful learning experience.

3. The Primary Advisor should maintain vigilance in overseeing the student's internship experience, regardless of the work location. Periodic on-site visits are preferable, but if personal visits are not feasible, the Primary Advisor should regularly converse with the intern via phone or e-mail.

4. The Primary Advisor should require the intern to report on a regular basis throughout the Internship. These reports should include:
   - a brief comment on allocation of the intern's time during the period,
   - progress toward objectives,
   - discussion of any significant difficulties or concerns with the internship.

5. Primary Advisors must be responsive to informal interim internship reports. Reports should be reviewed on a timely basis, and the faculty advisor's reaction should be communicated to the intern and if necessary, the intern's supervisor.

7. The Primary Advisor determines the unit grades (S,P,F) at the end of each semester when internship work is performed by the student. The grade is based on the ***Evaluation of the Student Intern form***, completed by the Internship Supervisor, but will also take into account interim reports and other relevant information about the student's work and professional conduct.

INTERNSHIP WORK PLAN

ABS 593A INTERNSHIP IN APPLIED BIOSCIENCES

Student Information

*First Name*_____*Last Name* _____

*Student ID Number*_____*Phone*_____*Email*_____

*Course Prefix:*_____*Term:* ☐ *Summer 2019* ☐ *Fall 2019* ☐ *Winter 2019* ☐ *Spring 2020*

☐ *Summer 2020 Course Number:*_____*Campus:* ☐ *Main Campus* ☐ *UA Online* ☐ *Distance* ☐ *UA South*

Number of Units Desired _____

UA policy requires a minimum of 45 hours of work on-site or to complete course assignments per unit of credit earned. The minimum of 45 hours per unit must be met during the dates of the term for each unit of credit desired.

Plans for Contact Hours: Please note that all contact hours counted toward internship credit must occur during the official dates of the UA term for which credit is requested. You can verify term dates at Date and Deadlines page of registrar.arizona.edu.

*Start Date:*_____ *End Date:* _____

*Duration (# of Weeks):*_____ *Expected Hours Per Week:* _____

International Student: ☐ *Yes* ☐ *No*

International students may be required to apply for and receive work authorization approval from International Student Services (ISS) before participating in an internship. More information can be found on the ISS website under F-1 Student Employment or J-1 Academic Training pages

Site Supervisor / Preceptor Information

*Name:*_____

*Agency:*_____

*Work Phone:*_____*Email:*_____

Physical Office Address City: _____

*State:*_____*Zip Code* _____

Mailing Address (if different than physical office address) _____

*City*_____*State*_____*Zip Code*_____ *Country* _____

Students completing an internship abroad are required to register their travel with UA Study Abroad and follow policies and procedures related to international insurance coverage.

Student's Goals for the Internship: The student should identify one to three professional goals explaining what s/he wants to gain from the internship experience.

Student's Justification of Site: The student is required to provide a short paragraph about how an internship at this site will assist with attaining his/her career goals and will be a learning experience that enhances the academic program.

Purpose Statement:.

Internship Purpose, Learning Objectives and Proposed Activities: The student should work with the site to develop a mutually-agreeable internship purpose, three to five learning objectives, and a list of related activities that will be completed during the internship. It is recommended that the student discuss with the site supervisor his/her goals and progress toward objectives at the start, mid-point and end of the internship. For examples, see the final page of the work plan.

Section to be completed by the Preceptor/Site Supervisor

Note: At the discretion of the academic department, a formal letter of offer on organizational letterhead or organizational email bearing the supervisor's signature may be attached in lieu of this section. A position description may also serve as useful documentation of expected activities and qualifications.

Learning Objectives (Minimum of three)	Proposed Activities (Typically no more than five activities per learning objective)

Status of Intern (a brief description of the intern's status within the agency – for example, expected number of hours worked/weekly, any wages or benefit compensation)	
Intern Minimum Qualifications (for example, major, previous work experiences, other special skills)	
Training Plans (for example, orientation to site and responsibilities)	
Requirements for the Intern (for example, any expectations regarding job functions, office conduct, attendance policies)	
Identifying possible risks (for example, any significant obvious and non-obvious risks of participation)	
Other	

Confidentiality and secrecy requirements (completed by the Site Supervisor)

In the event that the internship involves work on (1) patented material, (2) corporate secrets or (3) governmentally clearance-restricted material, then the Hosting Agency should indicate any clearance/secrecy/confidentiality documents that the Committee has to sign, and a clear statement of the limitations on the access to information. Any clearance/secrecy/confidentiality documents or agreements proposed by the Hosting Agency will be reviewed by the appropriate legal offices of the University of Arizona, and faculty or committee members will only be permitted to sign such document after the approval of the appropriate UA authorities. While the Hosting Agency's need for confidentiality of the student's work will be accommodated to the maximum extent possible, the student's Graduate Committee still must be provided with sufficient materials so that they can judge the quality of the student's work.

Clearance/secrecy/confidentiality requirements:

By signing this document as the site supervisor for an intern earning University of Arizona academic credit, I understand that the work plan outlines the mutually agreed upon proposed activities which the intern will be responsible for fulfilling and which the site will be responsible for providing as a part of the experience. Changes to work plans are a normal part of any internship, and are permissible as long as the activities remain with a relevant learning focus and all parties agree to the changes.

SITE SUPERVISOR: _____

DATE: _____

By signing this document, I understand that I am responsible for fulfilling the proposed activities at the internship site plus all assigned coursework in order to earn academic credit for this internship experience. I acknowledge that I have reviewed and understand the University of Arizona Risk Management Disclosure: Insurance Coverage for University Internships for Credit (pages 6-8 of this document).

STUDENT**:** _____

DATE: _____

Reminder: Students will not be added into the internship units until the signed work plan is also approved by the Internship instructor.

INTERNSHIP INSTRUCTOR NOTES:

INTERNSHIP INSTRUCTOR APPROVAL: _____

DATE: _____

RISK MANAGEMENT SERVICES
University Services Annex 300B
220 W Sixth St., East Building 2nd Floor
PO Box 210300
Tucson, Arizona 85721-0300

Ofc: (520) 621-1790
Fax: (520) 621-3706

http://risk.arizona.edu/

DISCLOSURE:

INSURANCE COVERAGE FOR UNIVERSITY INTERNSHIPS FOR CREDIT

INTRODUCTION

This document is prepared to provide guidance to students and academic programs regarding the types of insurance coverage available to students enrolled in university internship opportunities. The University of Arizona participates in a statutory program of insurance administered by the Arizona Department of Administration, Risk Management Division, as authorized in Arizona Revised Statutes §41-621 *et seq*.
Insurance coverage described herein is governed by the provisions outlined in this statutory insurance program.

WHAT ARE INTERNSHIPS?

An internship is a guided learning experience offered by an organization with the student's academic program and preparation for future employment in mind. An internship is a temporary practical assignment, usually lasting only 1-2 academic terms, with no guarantee of ongoing or future employment. To award credit for internships, academic departments require academic assignments, assess learning, and determine whether/how much academic credit is due.

Students must coordinate with the designated individual within their academic department to determine if the internship will be eligible for academic course credit, and what documentation will be required to support award of credit. The nature of the for-credit internship, and the arrangement in place between the UA and the training site will also influence the availability of one or more types of insurance coverage listed below.

INTERNSHIP DOCUMENTATION

Insurance coverage for university internships for credit may be applicable if there is written approval from the academic advisor or faculty member that documents a connection between the training opportunity and the student's academic program curriculum. The University of Arizona recommends that this approval be documented by the UA Student Intern Work Plan form and include acknowledgement by the student of receipt of this insurance disclosure.

A training affiliation agreement between the UA and the training site is the preferred method to document an ongoing relationship, and establish the responsibilities of all parties, when the training site does not consider student interns to be employees of their organization.

Affiliation agreements specify which party provides insurance coverage, and the type and extent of that coverage. If there is an expectation that an internship relationship with a training site will be continuing, and the site does not consider interns to be employees of the organization, the academic program should consider formalizing an affiliation agreement with the training organization. Contact Sponsored Projects and Contracting Services or Arizona Health Sciences Contracting for guidance.

If there is no written approval documentation establishing a UA connection to the internship or training activity as a part of the student's academic program, such as the UA Student Intern Work Plan form, UA insurance is NOT APPLICABLE to that activity. In such cases, the student participant assumes all risk of participation.

TYPES OF INSURANCE

Several types of insurance may be applicable to an internship opportunity. These are listed and discussed in detail below:

Liability Insurance (General and Professional Liability) – This coverage insures an individual or an organization against claims alleged to be the result of negligent acts or omissions. An intern, acting in the course of their authorized duties, is insured by the State of Arizona for liability claims that allege injury or harm caused by the negligence of the intern. Liability insurance pays for legal counsel to defend that claim, and pays damages awarded to the claimant either through settlement or jury award if the case goes to trial. The statutory insurance program described above covers both general and professional liability.

Worker's Compensation – This insurance covers on-the-job injuries to employees, including authorized medical treatment expenses and lost wages if the injury requires missing work. If an internship training site hires a student intern as an employee, then that employer is responsible for providing worker's compensation coverage.

International Insurance – University insurance covers international travel only when it is conducted as a part of official university business. University processes for travel authorization and itinerary registration must be followed to identify the travel as having an official UA purpose, and to ensure rapid access to insurance and assistance if needed while abroad. Most internship experiences are not considered university business.
Students registered for Study Abroad units are automatically enrolled in an international insurance program that provides emergency medical care, emergency evacuation, etc. All other students interning internationally are responsible for their own travel and emergency coverage. Contact UA Study Abroad for guidance.

Health Insurance – University students are expected to arrange for their own health insurance through Campus Health, through a family relationship, or directly from a health insurance provider.

UA Risk Management Services (RMS) coordinates university insurance coverage with the State of Arizona, and can assist university departments with coverage questions, and determining which type of insurance is applicable to a particular situation. Contact RMS at 520-621-1790 or risk@email.arizona.edu for assistance.

EXAMPLES OF GOALS, PURPOSE, LEARNING OBJECTIVES AND ACTIVITIES

Goals: Long-term aims that the intern wants to accomplish.

Purpose Statement: The reason that the intern and agency are collaborating.

Learning Objectives: Concrete attainments that can be achieved by following a certain number of activities.
Goals, purpose statements, and objectives are often used interchangeably, but the main difference comes in their level of concreteness. Learning objectives are very concrete, whereas goals and purpose statements are less structured.

When formulating Learning Objectives for the Internship, please consider the Learning Outcomes of the ABS GIDP:

> Through practical laboratory and/or administrative work, immersion in scientific teams, and mentoring by scientific professionals, students will gain an in-depth understanding of effective ways to:
> 1. Participate in research, business, regulatory, or customer- and public-relations teams in a professional manner while completing assigned tasks in a timely and efficient way;
> 2. Discuss the status of the field and the underlying applied biological problems relevant to their internship work;
> 3. Discuss the business, regulatory, customer relations, and/or educational environment relevant to their internship work;
> 4. Apply appropriate methods to collect, analyze, interpret and critique data relevant to their internship.

Activities: The specific steps or actions the intern will take to achieve the objectives. (Note to intern: these activities can be steps/actions you will take on your own AND/OR steps/actions you will take *with* your preceptor or team from your agency.)

Example Goals:

- I hope to gain knowledge about the development of future diagnostic tools applicable to Alzheimer's disease. Early diagnosis of Alzheimer's is an important health issue which has a direct impact on the patient and the community.
- I would like to develop laboratory skills such as designing, conducting, documenting and reporting on experiments. This will improve my chances of getting a job with a healthcare or biotechnology company after graduation.
- I plan to increase my professional network by making positive connections at my internship site and partner organizations.

Example Purpose: The intern and agency will collaborate to (1) increase the intern's knowledge and skills in the development of diagnostics tools for various diseases, including Alzheimer's disease; (2) benefit the agency by generating experimental data on such diagnostic tools currently under development at the agency.

Example Learning Objectives	**Example Proposed Activities**
Research and describe the following: what are diagnostic tools; what diagnostic tools are available for Alzheimer's disease; and the current status of development of such tool at the agency	• Conduct a literature review to understand what diagnostic tools are and how they benefit healthcare delivery • Review tools for diagnosing Alzheimer's disease • Review the characteristics that are specific and distinguishing for the diagnostic tool under development at the agency • Prepare and deliver a presentation on my findings for my internship agency
Evaluate the diagnostic tool using an in vitro cell culture model	• Design the experiment • Collect data • Analyze data • Discuss the findings and make recommendations for future work •
Communicate my findings to the stakeholders and the community	• Prepare a report and presentation on the findings that my internship agency may use for setting further development goals and objectives • Prepare an Internship Report for the ABS GIDP • Prepare and deliver an oral Internship Report presentation

University of Arizona
Internship Evaluation Form
(To be completed by the Intern)

ABS 593A Internship in ABS

This form is for the student to assess the internship experience. ***Complete this form before the last day of classes at the semester when the internship is performed and ABS 593A units are to be accrued. Give the form to the Program Coordinator.***

Intern Name: _____

Sponsoring Organization: _____ **Sponsoring Supervisor:** _____

Place an X in the box of the number that best reflects your level of agreement/disagreement with each of the following statements. **5 = Strongly Agree; 1 = Strongly Disagree**

I achieved my learning goals during the internship.	**1**	**2**	**3**	**4**	**5**
I received training in a profession/field related to my studies.	**1**	**2**	**3**	**4**	**5**
I experienced some of the realities of working in the profession/field.	**1**	**2**	**3**	**4**	**5**
I successfully completed my assigned responsibilities and duties.	**1**	**2**	**3**	**4**	**5**

Evaluate the following aspects of your internship by placing an X in the box of the number that best reflects your experience. If the aspect does not apply, leave it blank**.**
1 = Outstanding; 5 = Unsatisfactory

Work Environment:

Clarity of organizational structure	**1**	**2**	**3**	**4**	**5**
Access to necessary materials and/or equipment	**1**	**2**	**3**	**4**	**5**
Collegiality/friendliness of the employees	**1**	**2**	**3**	**4**	**5**
Attitude of respect for interns	**1**	**2**	**3**	**4**	**5**

Support and Feedback:

From your supervisor	**1**	**2**	**3**	**4**	**5**
From other employees with whom you interacted	**1**	**2**	**3**	**4**	**5**

Opportunity to be Creative:

Willingness of others consider to your ideas	**1**	**2**	**3**	**4**	**5**

Interaction with Others:

Opportunity to contribute to a team project	**1**	**2**	**3**	**4**	**5**
Questions were encouraged and answered.	**1**	**2**	**3**	**4**	**5**
Access to one or more mentors (supervisor or employees)	**1**	**2**	**3**	**4**	**5**

Overall Evaluation of Internship (circle one)**:**

Superior **Excellent** **Satisfactory** **Unsatisfactory**

Additional comments:

_____

Intern's Signature ***Date***

University of Arizona
Evaluation of the Intern Form

This form, **to be completed by the intern's on-site supervisor**, is meant to provide constructive feedback to the student and course instructor about the student's relative strengths and weaknesses as demonstrated in the internship. Please complete the form, enclose it in an envelope, and send it with the student to the Primary Advisor. The deadline is the last day of classes of the semester in which the internship was performed.

Student Name: _____ Semester(s) of Internship: _____

Sponsoring Organization: _____ Organization Supervisor:_____

The supervisor should evaluate the intern as objectively as possible by circling the number in each range that best describes the intern's performance for that characteristic. If the quality in question is irrelevant to the work the student has been performing, please circle "N/A" (not applicable).

Work hours completed by the student during this internship: _____ hrs/week for _____ weeks, totaling _____ hrs.

1	**Attitude**	Excellent	5	4	3	2	1	Poor	N/A
2	**Dependability**	Excellent	5	4	3	2	1	Poor	N/A
3	**Quantity of Work**	Excellent	5	4	3	2	1	Poor	N/A
4	**Relations with Others**	Excellent	5	4	3	2	1	Poor	N/A
5	**Initiative**	Excellent	5	4	3	2	1	Poor	N/A
6	**Flexibility**	Excellent	5	4	3	2	1	Poor	N/A
7	**Ability to Learn**	Excellent	5	4	3	2	1	Poor	N/A
8	**Creativity**	Excellent	5	4	3	2	1	Poor	N/A
9	**Organizational Skills**	Excellent	5	4	3	2	1	Poor	N/A
10	**Attendance**	Excellent	5	4	3	2	1	Poor	N/A
11	**Punctuality**	Excellent	5	4	3	2	1	Poor	N/A
12	**Observance of Rules, Policies and Procedures**	Excellent	5	4	3	2	1	Poor	N/A
13	**Leadership**	Excellent	5	4	3	2	1	Poor	N/A
14	**Responsiveness to Criticism**	Excellent	5	4	3	2	1	Poor	N/A
15	**Skills and Accuracy in Work**	Excellent	5	4	3	2	1	Poor	N/A
16	**Quality of Work**	Excellent	5	4	3	2	1	Poor	N/A
17	**Communication Skills – Written**	Excellent	5	4	3	2	1	Poor	N/A
18	**Communication Skills - Oral**	Excellent	5	4	3	2	1	Poor	N/A
	Other Skills Unique to Position								
	1.	Excellent	5	4	3	2	1	Poor	N/A
	2.	Excellent	5	4	3	2	1	Poor	N/A
	3.	Excellent	5	4	3	2	1	Poor	N/A

What are the student's outstanding STRENGTHS? _____

_____

_____

_____

In what areas does the student need IMPROVEMENT? _____

_____

_____

_____

How often did you provide feedback to the intern about his/her work?

Weekly _ Monthly _ 1-2 times _____ Never _____

Verification that student has worked a minimum of _____ hours per week at this internship.

Has this evaluation been discussed with the intern? Yes _____ No _____

Comments: _____

_____

_____

_____ _____

Organization Supervisor's Signature Date

_____ _____

Student's Signature (if jointly completed) Date

9.2 GradPath User's Guide

Introduction

GradPath is the new system for creation, routing and approval of Graduate College degree certification forms. All forms that graduate students are required to submit to the Graduate College will now be in GradPath, replacing the paper forms that had been used.

How to access GradPath

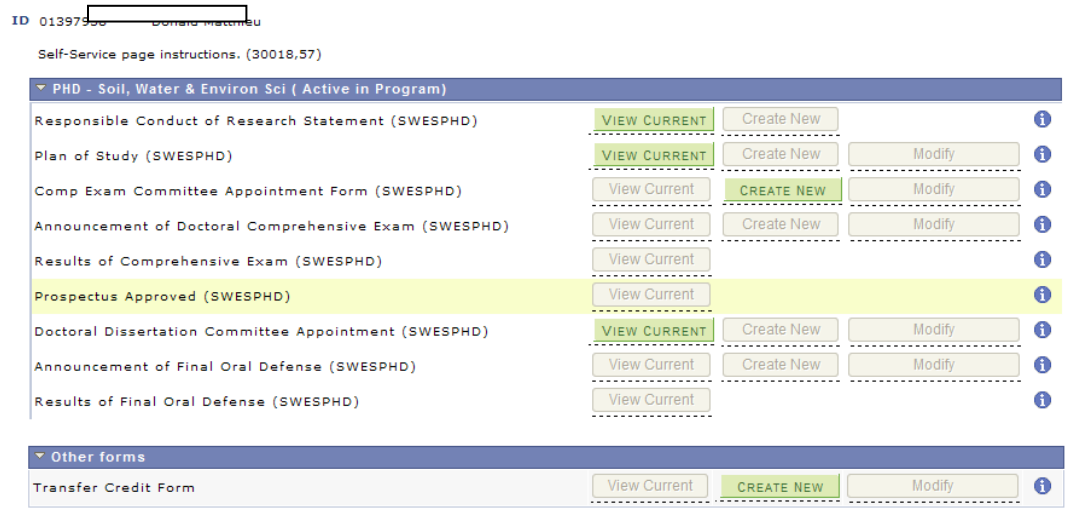
Students, graduate coordinators and faculty will all use GradPath in different ways, so they have different ways to get into GradPath, within UAccess Student. This is a quick overview of the ways each type of user accesses GradPath.

Students

Students will enter GradPath using a link on the UAccess Student Center, the main page used by students. A student entering GradPath using this link will first open a "landing page" with information about GradPath and other topics of general interest. The Graduate College can also use this page to convey timely information to the graduate student population.

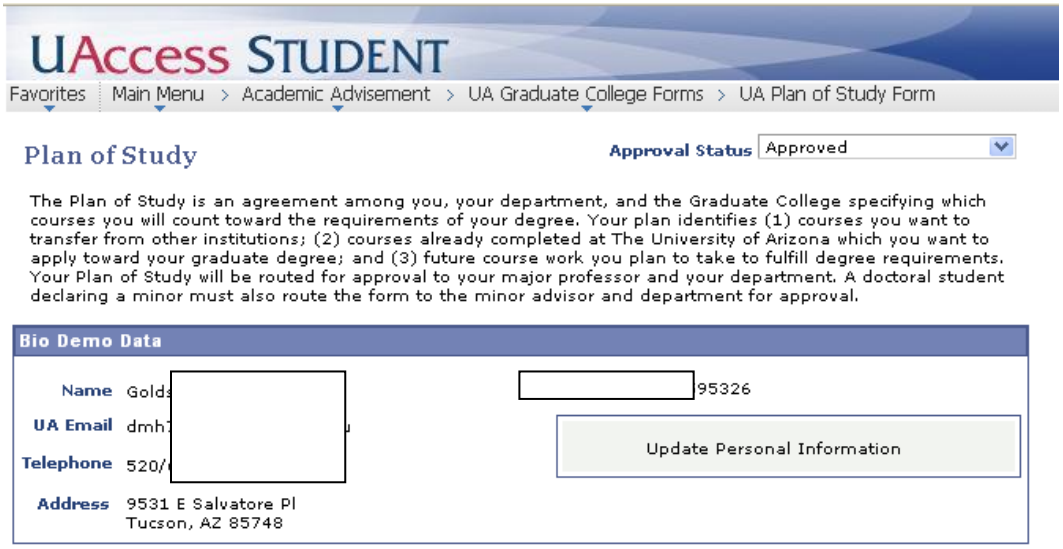
When the student proceeds from the landing page into the GradPath forms, he or she sees the "navigation page," on which the set of required forms for their degree is listed. For each form the student has three buttons: View Current, Create New and Modify. Some forms have prerequisites, so they would not have a "live," clickable button on the navigation page until the prerequisites have been met. (Example: To submit the doctoral defense committee appointment form, a student must have passed the oral comprehensive exam and have a Plan of Study filed.) The student can open and view any form he or she has created or submitted in GradPath – a saved form that was not submitted can be edited for submission. (The system recognizes which steps a student completed on paper, but those forms are not visible in GradPath.)

Note – A student must complete and submit the Responsible Conduct of Research confirmation form in GradPath before any of the other required forms will be available. The RCR confirmation "self-approves" – it does not need to be routed for anyone to approve. As soon as a student completes the RCR form and submits it, he or she can return to the navigation page to access the other forms.
Navigation page:



GradPath Forms – General features

When you open a form prepared by a student in GradPath, the first thing you will notice is the form's status, displayed in the upper right corner. Each form has text describing the form and its use. Below that every form displays the student's personal information, including ID number.



Below this information, each form will display the student's Program Data, showing the degree for which the form has been submitted, as well as the expected graduation term reported by the student.

Most forms have a box below the Program Data where the student is prompted to enter the expected graduation term. (For doctoral students we ask the student to report the expected graduation term earlier in their program than in the past.) The expected graduation term on the student's record is updated when the form has final approval. The student is also provided the contact information for his or her degree auditor.

While each form of course collects different information, one other feature common to all GradPath forms is that any user (the student or anyone reviewing or approving/denying the form) can leave a comment for the student and other users. Any comment saved on a form stays with the form, and may be viewed by the student, other reviewers, or the graduate coordinator or degree auditor. Students also have a "Return" button on each form that returns them to the navigation page.

Finally, when you view any GradPath form, at the bottom of the form you will see the routing "monitor," which is essentially a flow chart showing the approval path the form must follow. If a form is pending a decision from an approver, you can see whose approval is pending. You can also click on any of the approvers displayed in the monitor to see the e-mail address where the notification message was sent.

NOTE: If a student cannot find/select the person they need to select as advisor or a member of their committee, please contact your degree auditor. In some cases, faculty members' names on their HR record (and thus in UAccess/GradPath) appear differently than the name they commonly use – e.g. Jim Smith may be officially Richard J. Smith. You or your degree auditor may be able to help a student find a name in the system that could not be located. Otherwise, your degree auditor can explain whether a special member request is needed or if a different step should be taken.

Important Changes to Degree Certification Procedures

Master's/Specialist students:

i. All master's and specialist students **must** submit the Master's/Specialist Committee Appointment form, even if the student **does not** have a committee. We need to review and approve the thesis committee for a student completing a thesis. Other students will have the opportunity to report a committee if they have one; otherwise they will simply confirm the advisor reported on the Plan of Study is still accurate.

ii. The procedure for the department/program to report completion of degree requirements has changed. The committee members and director of graduate studies/department head will **not** need to approve or report anything. Completion of degree requirements will simply be reported by the **graduate coordinator**. The procedure is described below in the "GradPath Forms Not Submitted by Student" section.

Students Who Began with Paper Forms

A student who has filed one or more Degree Certification forms on paper, following the old procedures, **does <u>not</u>** need to re-submit those forms in GradPath. While all students must submit the Responsible Conduct of Research form in GradPath in order to open the rest of the forms, a student who has had paper forms approved should find the subsequent form(s) available in GradPath once the RCR form is completed. If you or any of your students notice that this is not working correctly, please contact your degree auditor.