THE UNIVERSITY OF ARIZONA

Graduate Interdisciplinary Program
in

Applied Biosciences

(ABS-GIDP)
Student Handbook

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A. INTRODUCTION

The Applied Biosciences (ABS) program at the University of Arizona (UA) is a Graduate Interdisciplinary Program (GIDP) under the Graduate College. ABS-GIDP 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-GIDP experience. During a 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 the private industry.

B. CONTACT INFORMATION

1) Website and Email Addresses

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C. AVAILABLE RESOURCES ON CAMPUS

Wellness is an integral part of graduate school life. Like many other graduate programs, there are many resources available to ABS-GIDP students. Please note that these are not all the resources at the UA:

- **This handbook** Containing all-you-need-to-know information in this program. Please read through the handbook carefully before reaching out to DGS, Program Coordinator, and Program Chair.
- **Coffee Hour**, usually hosted every Friday 1-2 pm via Zoom by the Program Chair to answer any questions related to the program. Please check your email from the Program Coordinator for the meeting link.
- **The Graduate College**, where students can access general policies, contacts, and useful information about resources and deadlines.
- **The Graduate Center**, a hub that ensures the success of graduate students through building connections, training, and workshops.
- **Graduate & Professional Student Council (GPSC)**, the student council for all graduate and professional students at the University of Arizona.
- **Counseling and Psych Services (CAPS)**, in-person and virtual mental health services for the campus community.
- **International Student Services (ISS)**, a helpful resource for international students, including immigration documentation and events tailored for the Global Wildcats.
- **Campus Community Connections (CCC)**, promoting and empowering students, staff, and faculty belongingness.
- **Disability Resource Center (DRC)**, leading UA campus in a progressive and proactive approach to accessibility.
- **Campus Pantry** and **Campus Closet**, increasing access to supplemental grocery and clothing at the University of Arizona.
- **University of Arizona Catalog**, an important resource for browsing courses available on campus.
- **Student Engagement & Career Development (SECD)**, a place to look for job opportunities and internships.
- **Dean of Students (DOS)**, containing important information regarding the Student Code of Conduct and Academic Integrity.
- **UA Research Laboratory & Safety Services (RLSS)**, a UA unit that protects and provides services and support to the campus research community
- **SafeCats**, a new UA app that provides updated safety information on campus.

Furthermore, the students enrolled in the ABS-GIDP are responsible for familiarizing themselves with the current policies of the ABS-GIDP and the Graduate College to ensure degree completion in a timely manner.

D. ADMISSIONS

1) Pre-requisites

Students applying to the program must have these minimum qualifications:

- A Bachelor's (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.

2) Admission Procedures

Students should apply directly to the specific ABS-GIDP track that they wish to pursue. The application should be submitted online via the Graduate College GradApp 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 prior employment relevant to the ABS-GIDP;
- Acceptable English Proficiency credentials:

Test Credentials	Requirements
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
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
CESL Graduate Endorsement	Offered by the Center for English as a Second Language (CESL)
CEPT Full Academic test	Offered by the Center for English as a Second Language (CESL), a 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/

E. FUNDING FOR ABS-GIDP STUDENTS

1) Overall

The ABS-GIDP does not have formal funding in the form of Graduate Assistantships to cover tuition. However, depending on the program funding during the school year, Graduate Tuition Scholarship (GTS) and Graduate College Fellowship (GCF) can be offered, ranging from a few hundred dollars to thousands of dollars.

If any ABS student is interested in Graduate Assistantship positions in teaching or research, it is highly recommended that they seek out and contact the respective UA departments for these positions.

2) Other Funding Sources

Students are encouraged to apply for scholarships through Scholarship Universe, the UA's scholarship-matching tool for UA students. More information can be found via this link: https://financialaid.arizona.edu/ScholarshipUniverse

Students are also encouraged to apply for grants from the UA Graduate & Professional Student Council (GPSC). Depending on your funding needs, GPSC provides several types of grants, including the Basic Needs Micro Grant, Completion Grant, Professional Opportunities Development Grant, Promising Practice Grant, Research and Project Grant, and Travel Grant. Students will be submitting their application via Submittable using their UA NetID and will be responsible for the respective deadlines. More information on GPSC grants can be found at: https://gpsc.arizona.edu/grantsawards

F. OVERALL PROGRAM STRUCTURE

The ABS-GIDP is designed to prepare students to enter the scientific workforce competitively. 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 final 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 as listed below:

- Controlled Environment Agriculture (CEA)
- Diagnostic Laboratory Sciences (DLS)
- Industrial Microbial Biotechnology (IMB)

- Medical Microbiology and Immunology (MMI)
- Molecular and Cellular Biology (MCB)
- Sustainable Bioeconomy and Bioenergy (SBB)

1) Curriculum Structure

All tracks have the following general structure:

Modules	Units
Science Module	15
Professional Preparation Module	12
Internship Module	9
Total	36

Please refer to the descriptions of the individual tracks (Section F) 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.

2) Timeline for the ABS-GIDP 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 exceed 6 years, as per the UA Graduate College.

When?	What to do?
Before the start of the first semester	● Prepare a *Tentative Plan of Study* showing the minimum 36 credits you are planning to take over the course of your studies ● Discuss your *Tentative Plan of Study* with the Director of Graduate Studies of your track and secure their agreement
First semester	● 9 units of coursework ● Select *Primary Advisor* ● Review *Plan of Study* with DGS and/or Primary Advisor ● Review plans for the internship
Second semester	● 9 to 12 units of coursework ● Assemble the *Graduate Committee* ● Submit *Committee Member Approval* Form ● Review the *Plan of Study* and internship plans with the

	Graduate Committee ● Submit the *Plan of Study* through GradPath after activating "Responsible Conduct of Research" ● Apply for an *Internship* ● Submit *Internship Work Plan* Form (obtained from the ABS website) and register for *Internship* (ABS 593A)
Summer	● 8 units of *Research/Professional Internship*
Third semester	● 6-9 units of coursework, including the scientific writing requirement ● Complete Internship Project, if necessary ● Review the *Plan of Study* and plans for the *Internship Report* with the Graduate Committee
Fourth semester	● 6-9 units of coursework, including 1 unit of *Internship Report*; *Writing* (ABS 909) ● Activate the *Master's/Specialist Committee Appointment* form in GradPath ● Prepare and submit the *Internship Report* to the Internship Supervisor for approval ● Submit the approved *Internship Report* to the Graduate Committee ● Schedule and complete the *Internship Report Presentation (defense seminar)* ● Finish revisions to the *Internship Report* required by the Graduate Committee. The Graduate Coordinator will submit the Master's Completion of Degree in GradPath.

3) Detailed steps toward the ABS-GIDP degree

a) <u>Step 1 - Immediately after admission: Sign and return your admission letter to indicate Intent to Matriculate</u>

b) <u>Step 2 - Immediately after admission: Summarize your career goals and prepare a tentative Plan of Study</u>

Students should see the list of courses for the relevant ABS-GIDP track in section **G. Coursework Requirements and Track Description** and assemble a Tentative Plan of Study that lists all specific courses that you plan to take to complete the Professional Science Master's degree in Applied Biosciences. Students in the ABS program should complete a total of 36 credits (see sub-section 1 of section F).

c) Step 3 - After admission but before the start of the first semester: Meet with the DGS of your ABS track or the Program Chair and 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-GIDP. 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.

d) Step 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 Study. 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.

e) Step 5 - End of the first semester: Select Primary Advisor

Students may select a Primary Advisor different from their DGS or may retain the DGS as their Primary Advisor upon mutual agreement. They may also request to change their Primary Advisor later, upon the consent of the DGS and the ABS Program Chair.

Primary advisors must be selected from the ABS-GIDP Faculty. If the student would prefer a Primary Advisor who is not a current member of ABS-GIDP 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-GIDP.

f) Step 6 - Second semester: Selection of Graduate Committee members

The Graduate Committee is composed of 3 or more members, in which:

- The first member is your Primary Advisor
- The other two committee members may be ABS faculty or special members.
- **However, 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: https://grad.arizona.edu/degree-services/degree-requirements/masters-degrees

Special members may be drawn from the ranks of the University of Arizona faculty/academic professionals or 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 a later date. 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; obtaining approvals may take several weeks. Students will submit the Committee Member request form in GradPath.

g) Step 7 - Second semester: Apply for an Internship

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

h) Step 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 Study of the student, and to agree on any necessary changes in the Plan of Study 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. The student will submit the Master's Plan of Study in GradPath.

i) Step 9 - End of second semester: Submit Internship forms, register for internship units (ABS 593A)

The student must 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-GIDP 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). The student must follow regular enrollment deadlines and the bursar's fee policies for the internship course. **Keep in mind, you are not allowed to enroll in two internships (or two ABS 593A courses) in the same semester; instead, the student will have to sign up for both ABS 593A and ABS 599 (Independent Study).** Students who wish to be registered for ABS 599 are required to file paperwork before enrolling.

j) Step 10 - Summer: Research Internship

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 students. Students should discuss the timing of the internship with the track Director of Graduate Studies, their primary advisor, and their Committee. Per Arizona Board of Regents (ABOR) policy, 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-GIDP curriculum, equaling a total of 360 hours. 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.

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/).

- The internship project can be conducted in various settings. Internships are preferentially undertaken 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").
- Internships may be completed within a single semester or multiple semesters, as is most appropriate considering the student's Plan of Study. 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.
- Internships may be divided into 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.
- 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 member) will award unit credits.

- 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 to award Internship unit credits for Company Internships.
- 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.
- 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 an ABS-GIDP degree.
- Internships conducted at the student's ongoing place of employment are acceptable if the student demonstrates to the satisfaction of the ABS-GIDP 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.
- 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.
- 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, and F grades do not calculate into a student's GPA. However, ABS-GIDP students may only graduate when they have completed 8 credits of ABS 593A with a **P** grade or better. 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.
- 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.
- 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.
- A syllabus for ABS 593A is available at the ABS website, as well as Important Forms and Documents: https://abs.arizona.edu/current-students/forms

Required Internship Forms (Available on the ABS-GIDP website):

- **ABS Internship Work Plan:** To be completed and submitted BEFORE departmental consent is given to sign up for internship credits and to start the internship

- **ABS Internship Evaluation Form (Student)** and **ABS Evaluation of the Intern Form (Supervisor):** To be completed and submitted BEFORE the end of the semester in which internship credits are to be awarded

k) Step 11: Internship Report (ABS 909)

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-GIDP website: https://abs.arizona.edu/sites/default/files/2022-08/ABS%20909%20Syllabus.pdf

Students should 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 (more than 3 units) 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. ABS 909 can only be signed up for with ABS-GIDP consent and has a prerequisite: **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 **Table A**.

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, the significance of the research, and the contributions of the hosting agency or the 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; and
- A detailed description of the research methodology and the results achieved by the student, with a discussion of the student's results and potential future work, is needed.

The report should be a minimum of 30 pages. If the internship was divided into two or more sections with different hosting agencies (or professional and scientific internships within the same hosting agency), then the report should be subdivided into concise chapters describing each section of the internship. 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 Master of Science theses. Some Committees may require the report to be written in the format needed for publication in the scientific literature or any other appropriate format.

The Internship Report must first be evaluated and approved by the student's Internship Supervisor at the hosting agency or UA laboratory where the work was

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.

The Internship Report should be submitted to the student's Graduate Committee following approval by the Internship Supervisor. The Graduate Committee will have a minimum of two weeks (10 business days) to evaluate the Internship Report. Following the Internship Report Presentation by the student, the Committee must approve (or approve pending revision) the Internship Report by a two-thirds vote. 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. Revisions to the Internship Report requested by the Graduate Committee must be completed before the degree can be awarded.

l) Internship Report Presentation

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

- First part: A Presentation of the Internship Report in the form of a defense seminar, followed by questions and answers, lasting about 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 are encouraged to attend the Presentation, and other guests are welcome.
- 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 the academic curriculum relate to the internship. The committee will also likely ask the student to share their future career plans.

The Presentation is meant to assess the ability of students 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.

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 to the student and the Program Coordinator. A Pass requires two-thirds of the Committee members to approve the Internship Report Presentation.

m) Final approval of the Internship Report

- 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.
- 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 registration. The Committee members shall notify the Primary Advisor whether the revisions have been made to their satisfaction. At least two-thirds of the Committee shall approve the revised Internship Report for a Pass.
- The Primary Advisor shall notify the Program Coordinator whether the Internship Report is complete and meets the requirements of the Graduate Committee.
- 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.
- The final version of the Internship Report, approved by the Graduate Committee, must be submitted to the Program Coordinator at least one (1) business day before the deadline of the Graduate College for matriculation.

n) Graduation

Please see the academic calendar for specific due dates and other steps necessary for graduation: https://grad.arizona.edu/degree-services/gradpath

G. COURSEWORK REQUIREMENTS AND TRACK DESCRIPTION

In all the ABS tracks, students are required to 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 courses, and 9 units are the Internship (8 units) and the Internship Report (1 unit).

1) Professional Preparation Module

Table A contains a list of approved courses in the Professional Preparation Module. These Modules are common for all six ABS Tracks. **Please note that not all classes are offered every semester, and departments typically require students in their programs to be enrolled first in mandatory/core courses. Scheduling classes**

is a privilege of the offering department, and the ABS-GIDP program 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 courses; the rest of the 12 units should be selected from the Elective list.

Course	Course Name	Units	Usually In
Core Professional Preparation Course: Scientific Writing (2 units minimum)			
BE 501	Research Methods in Biosystems Engineering	2	Spring
ENGL 530	User Experience Research in Professional and Technical Writing	3	Fall
ENVS 508	Scientific Writing for Environmental, Agricultural and Life Sciences	3	Spring
MIC 595A	Critical Evaluation of Scientific Literature	3	Spring
MSE 502	Research Proposal Preparation	3	Spring
OPTI 597B	Technical Writing and Communication *(Instructor on sabbatical for Fall 2025 and will resume in Fall 2026)*	3	Fall
Elective Professional Preparation Courses			
ACBS 568A	Bioeconomy, Marketing and Business Principles	3	Check the course catalog
ACBS 568B	Bioeconomy, Marketing and Business Principles II	3	Check the course catalog
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 522	Communicating Knowledge in Agriculture and Life Sciences	3	Fall/Spring
AREC 550	Financial Management for Agribusiness	3	Spring

BE 552	Globalization, Sustainability and Innovation	3	Spring
BIOS 680	Biostatistical Methods I	3	Spring
BNAD 597B	MBA Advanced Field Projects	3-4	Spring
CTS 595C	Responsible Conduct of Research	1	Fall/Spring
EHS 575	Environmental and Occupational Health	3	Fall/Spring/ Summer
ENGR 514	Law for Engineers/Scientists	3	Spring
ENGR 595A	Science, Health and Engineering Policy & Diplomacy	3	Fall
HSD 649	Survival Skills and Ethics	3	Spring
LAW 515	Health Care Ethics	3	Fall/Spring
LAW 575A	Clinical Research Ethics	3	Spring
LAW 575D	Leadership and Equity in the Life Sciences	3	Spring
LAW 576A	Drug Discovery, Development and Innovation to Reach the Marketplace	3	Fall/Spring/ Summer
LAW 577A	Development and Innovation in Biologics, Devices, and Diagnostics	3	Spring
LAW 578A	Legal and Regulatory Aspects for Health Care Delivery	3	Fall
LAW 579B	Legal and Regulatory Fundamentals of Health Care Business	3	Fall/Spring
LAW 580	Introduction to Privacy	3	Spring
LAW 580A	Liability and Regulation of Health Care Professionals	3	Fall/Spring/ Summer
LAW 580B	Data Privacy and Cybersecurity in Health Care	3	Spring
LAW 580C	Health Information Technology	3	Fall
LAW 580D	Telehealth Law & Policy	3	Summer
LAW 584A	Aging in America	3	Fall

LAW 584C	Technology and Aging: Legal and Ethical Developments	3	Fall
LAW 584D	Law and the Elderly	3	Fall
LAW 588A	Translational Pathways for Medical Devices	3	Summer
LAW 589A	Regulatory Science Case Study Project	3	Fall/Spring
LAW 608A	Public Health Law and Ethics	3	Spring
MCB 695E	Science, Society and Ethics	1	Spring
MGMT 535	International Management	3	Spring
MGMT 538	Health Organization and Management	3	Spring
MIS 506	Healthcare Information Systems	3	Fall
MIS 578	Project Management	3	Fall/Summer
MKTG 500	Marketing Management	3	Fall
MKTG 530	Management of Marketing Communications	3	Fall/Summer
MKTG 542	Marketing Visual Analytics	3	Spring
MKTG 546	Marketing Strategy	3	Spring
MKTG 559	Innovation and New Product Strategy	3	Spring
PCOL 584	Fundamentals in Industrial and Environmental Health	3	Fall
PHPM 506	Economic Foundations for Health Sciences	3	Spring
PHPM 562	Heath Services Administration	3	Fall
PHPM 569	Fundamentals of Health Budgeting and Financial Management *(Consent of Instructor Required)*	3	Fall
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

2) Controlled Environment Agriculture Track (CEA)

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 potential to utilize local renewable energy resources, and optimize water, energy, space, capital, and labor resources with efficiency well above traditional field capabilities. This production technology can employ crop production systems, provide harvests much less dependent on the season, and generate higher crop yields, quality, safety, and nutritional value with consistency and predictability, while utilizing less land in an environmentally friendly way.

There have 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, 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 and also 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. A thorough understanding of plant and microclimate interactions is needed so the systems can be effectively operated and precisely controlled to improve growth, production quality, and resource use efficiency. This necessitates potential graduates acquiring 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 marketplace.

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 or the Primary

Advisor and the Graduate Committee of the student. Initial selection of the appropriate courses within each cluster and for the Plan of Study 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 to the course plan shall be agreed upon by the Primary Advisor and the student's Graduate Committee.

TABLE B. Curriculum for the CEA Track

Course	Course Name	Units	Usually In
Core Science Courses: Complete 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
CHEE 581A	Engineering of Biological Process	3	Spring
EIS 536	Agro-Ecology	3	Spring
MIC 530	Food Microbiology and Biotechnology	3	Spring
PLS 548A	Plant Biochemistry and Metabolic Engineering	3	Fall
PLS 549A	Plant Genetics and Genomics	3	Spring
Elective Science Courses: Complete 6 units Courses not listed here may also be chosen, but require approval from the Director of Graduate Studies and the Program Chair			
AME 545	Renewable Energy Systems	3	Spring
BE 513	Applied Biostatistics	3	Fall
BE 523	Biosystems Analysis and Design	3	Spring
BE 534	Biosystems Analytics	3	Spring
BE 547	Sensors and Controls	3	Fall
BE 556	Irrigation System Design	3	Spring

BE 558	Wastewater Treatment Operations and Reuse	3	Spring
BE 582	Integrated Engineered Solutions in the Food-Water-Energy Nexus	3	Fall
BIOS 576A	Biostatistics in Public Health	3	Fall
BIOS 576B	Biostatistics for Research	3	Spring
CHEE 574	Fate and Transport Processes in Environmental Engineering	3	Spring
CHEE 577R	Microbiology for Engineers	3	Fall
EIS 597C	Controlled Environment Agriculture IPM	3	Spring
ENVS 525	Environmental Microbiology	3	Fall/Spring
MATH 522	Advanced Applied Mathematics	3	Fall/Spring/ Summer
MATH 571B	Design of Experiments	3	Spring
SIE 531	Simulation Modeling and Analysis	3	Fall/Spring
SIE 545	Fundamentals of Optimization	3	Fall
Professional Preparation Module: Complete 12 units. See Table A			

3) Industrial Microbial Biotechnology Track (IMB)

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 wastewater 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 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.

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 approval from the DGS and the Program Chair. Initial selection of the appropriate courses within each cluster and for the Plan of Study 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 to the course plan shall be agreed upon by the Advisor and the student’s Committee, in agreement with the DGS.

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.

TABLE C. Curriculum for the IMB Track

Course	Course Name	Units	Usually In
Core Science Courses: Complete 9 units			
BIOC 565	Proteins and Enzymes	3	Fall
BIOC 568	Nucleic Acids, Metabolism and Signaling	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	Bioinformatics and Functional Genomic Analysis *(Requisite: Basic knowledge and programming experience)*	3	Spring
MCB 580	Introduction to Systems Biology	3	Fall
MIC 530	Food Microbiology and Biotechnology	3	Spring
MIC 530L	Advanced Food Science and Microbiology Laboratory	2	Spring
PLP 527R	General Mycology	3	Fall
PLS 528R	Microbial Genetics	3	Spring
PLS 548A	Plant Biochemistry and Metabolic Engineering	3	Fall
Elective Science Courses: Complete 6 units Courses not listed here may also be chosen, but require approval from the Director of Graduate Studies and the Program Chair.			
ACBS 556	Aquaculture	3	Spring
BE 502	Fundamentals of Computing in Biosystems Analytics	3	Fall
BE 513	Applied Biostatistics	3	Fall

BE 534	Biosystems Analytics	3	Spring
BE 581A	Engineering of Biological Processes	3	Spring
BE 587	Metagenomics: From Genes to Ecosystems	3	Fall
BIOS 576A	Biostatistics in Public Health	3	Fall/Spring/ Summer
BIOS 576B	Biostatistics for Research	3	Spring
CBIO 515	Mechanisms of Human Disease	4	Spring
CHEE 577R	Microbiology for Engineers	3	Fall
CHEM 501A	Instrumental Analysis	3	Spring
CHEM 523A	Bioanalytical Chemistry	3	Spring
CHEM 525A	Mass Spectrometry	3	Spring
CMM 518	Fundamental Genetic Mechanisms: from Molecules to Genomes	3	Fall
CMM 533	Cellular and Molecular Medicine	1	Fall/Spring/ Summer
CMM 577	Principles of Cell Biology *(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	Fall/Spring/ Summer
IMB 520	Pathogenic Bacteriology	3	Fall

IMB 565	Principles and Molecular Mechanisms of Microbe-Host Interactions	3	Spring
MCB 546	Genetic and Molecular Networks	4	Spring
MCB 585	Multidisciplinary Approaches to Solving Biological Problems *(Course Requisites:* *1. One year of graduate-level coursework* *2. Two core courses are 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	Faculty Perspectives on Contemporary Topics in Drug Discovery, Pharmaceutics and Molecular Toxicology	3	Spring
PHSC 596A	Medicinal and Natural Products Chemistry	1	Spring
PHSC 670	Principles in Drug Discovery, Design and Development	3	Spring
PLP 528L	Microbial Genetics Laboratory	2	Spring
PLP 550	Principles of Plant Microbiology	3	Spring
PLP 575	Advanced Mycology	3	Spring
PLS 525	Plant Products and Biotechnology	3	Spring
PLS 534	Industrial Biotechnology	3	Fall
Professional Preparation Module: Complete 12 units. See Table A			

4) Diagnostic Laboratory Sciences Track (DLS)

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 the development of laboratory management skills, acumen in the legal and business environment of the diagnostic and biotech industries, compliance with federal regulations for healthcare or the diagnostic industry, or knowledge of the *in vitro* device processes and regulations. The track requires that students 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 disease mechanisms, characterize diseases such as cancer and infections, and develop disease interventions, including vaccines and antitoxins.

TABLE D. Curriculum for the DLS Track

Course	Course Name	Units	Usually In
Core Science Courses: Complete 9 units			
ACBS 543	Research Animal Methods	3	Spring
BIOC 568	Nucleic Acids, Metabolism and Signaling	4	Spring
BIOS 576A	Biostatistics in Public Health	3	Fall/Spring
BIO 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	1	Fall
CBIO 597A	Experimental Design	1	Fall
CMM 501	Human Gross Anatomy	4	Summer
CMM 502	Principles in Neuroanatomy	4	Spring
CMM 504	Cell Biology of Disease	3	Summer
CMM 510	Human Histology: An Intro to Pathology *(Requisites: Credit for CMM 510 or CMM 525A but*	3	Fall

	not both)		
IMB 501	Medical Microbiology and Immunology	4	Fall/Spring/ Summer
MCB 572A	Cell Systems	4	Fall
MIC 530	Food Microbiology and Biotechnology	3	Spring
MIC 530L	Advanced Food Science and Microbiology Laboratory	2	Spring
NRSC 588	Principles of Cellular and Molecular Neurobiology *(Requisites: Consult program office before enrolling)*	4	Fall
PHCL 601A	Pharmacology: General Principles *(Requisites: Any course in Biochemistry or Human Physiology)*	2	Fall
PLP 528R	Microbial Genetics	3	Spring
PSIO 511	Physiology for Biomedical Engineering	3	Spring
Elective Science Courses: Complete 6 units Courses not listed here may also be chosen, but require approval from the Director of Graduate Studies and the Program Chair			
BIOS 576A	Biostatistics for Public Health	3	Fall/Spring
CBIO 550	Drug Disposition and Metabolism *(Requisites: PCOL 602A)*	2	Spring
CBIO 596H	Cancer Biology Seminar Series	1	Fall/Spring
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/Spring
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/minor, MPH major, or consent of instructor)*	3	Fall/Spring
EPID 573B	Epidemiologic Methods *(Requisites: EPID 573A, BIOS/EPID 576A; Prerequisite or concurrent registration, BIOS/EPID 576B*	3	Spring
IMB 519	General Immunological Concepts	4	Fall
IMB 605	Medical Immunology and Infectious Disease	4	Fall
MIC 503R	Biology of Animal Parasites	3	Spring
MCB 516A	Bioinformatics and Functional Genomic Analysis *(Requisite: Basic knowledge and programming experience)*	3	Spring
MCB 572A	Cell Systems	4	Fall
MCB 573	Recombinant DNA Methods and Applications	4	Spring
PHCL 512	Introduction to Pharmacology	3	Fall
PHCL 553	Neuropharmacology	3	Spring
PHCL 586B	Introduction to Medical Pharmacology Research	1	Spring
PLP 528L	Microbial Genetics Laboratory	2	Spring
Professional Preparation Module: Complete 12 units. See Table A			

5) Medical Microbiology and Immunology Track (MMI)

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 1600s). Using this new scientific tool and the seminal work by major microbiologists in the 1800s 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 (antibodies). 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 to produce vaccines against these deadly agents. This work was seminal in the development and future 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 MMI-biomedical science training along with 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 academic research laboratories, and obtain invaluable on-the-job training, experience, and knowledge. This real-world expertise obtained in the internship is different from classroom learning or taking online courses.

This innovative curriculum will give students the ability to take various career paths upon graduation. This could include doing research at “the bench,” or 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 biomedical science. Graduates from this track will be ready for diverse professional vocations in the areas of biotechnology, biomedical research, pharmaceuticals, local or national government, academic institutions, as well as for positions in immunological and microbiological areas in 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.

Table E. Curriculum for the MMI Track

Course	Course Name	Units	Usually In
Core Science Courses: Complete 9 units			
BE 513	Applied Biostatistics	3	Fall
CMM 504	Cell Biology of Disease	3	Summer
CMM 577	Principles of Cell Biology	4	Fall
IMB 501	Medical Microbiology and Immunology	4	Fall/Spring/ Summer
IMB 519	General Immunological Concepts	4	Fall
IMB 548	Basic and Advanced Immunology	4	Fall
IMB 565	Principles and Molecular Mechanisms of Microbe-Host Interactions	3	Spring
IMB 605	Medical Immunology and Infectious Disease	4	Fall
IMB 696A	Research Seminar	1	Fall/Spring
MIC 520	Pathogenic Bacteriology	3	Fall
MIC 530	Food Microbiology and Biotechnology	3	Spring
Elective Science Courses: Complete 6 units Courses not listed here may also be chosen, but require approval from the Director of Graduate Studies and the Program Chair			
BIOC 565	Proteins and Enzymes	3	Fall
BIOC 568	Nucleic Acids, Metabolism and Signaling	3	Spring
BIOS 576A	Biostatistics for Public Health	3	Fall/Spring
BIOS 576B	Biostatistics in Research	3	Spring

CBIO 515	Mechanisms of Human Disease	4	Spring
CMM 588	Principles of Cellular and Molecular Neurobiology *(Consult program office before enrolling)*	3	Fall/Spring
ENVS 525	Environmental Microbiology	3	Fall/Spring
EPID 573A	Basic Principles of Epidemiology	3	Fall/Spring
EPID 660	Infectious Disease Epidemiology	3	Spring
MCB 516A	Bioinformatics and Genome Analysis *(Requisites: Basic statistical knowledge and programming experience)*	3	Spring
MCB 573	Recombinant DNA Methods and Applications *(Requisites: Basic molecular biology and genetics knowledge)*	3	Spring
MIC 503R	Biology of Animal Parasites	3	Spring
MIC 528L	Microbial Genetics Laboratory	2	Spring
MIC 528R	Microbial Genetics	3	Spring
MIC 530L	Advanced Food Science and Microbiology Laboratory	2	Spring
PLS 539	Methods in Cell Biology and Genomics	3	Fall
Professional Preparation Module: Complete 12 units. See Table A			

6) Molecular and Cellular Biology Track (MCB)

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 from this track will be prepared for professional careers in government, academia, or 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 build foundational skills in logic, reasoning, self-expression, and communication. MCB researchers utilize model systems that allow them to query the most basic questions about nature, at the molecular level, the level of a cell or organism, or in the development of clinical applications of new human disease therapies. Faculty with specializations in MCB have diverse 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 coursework for the track, to tailor their studies to their personal preferences and career goals.

Table F. Curriculum for the MCB Track

Course	Course Name	Units	Usually In
Core Science Courses: Complete 9 units			
BIOC 565	Proteins and Enzymes	3	Fall
BIOC 568	Nucleic Acids, Metabolism and Signaling	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	4	Fall
MCB 516A	Statistical Bioinformatics and Genomic Analysis *(Requisites: Basic statistical knowledge and programming experience)*	3	Spring
MCB 546	Genetic and Molecular Networks	4	Spring
MCB 572A	Cell Systems	4	Fall
MCB 573	Recombinant DNA Methods and	4	Spring

	Applications		
MCB 580	Introduction to Systems Biology	3	Fall
NRSC 572	Neurodevelopment in Action: How the brain is Built, Ages and Responds to Disease	4	Spring
PLS 528R	Microbial Genetics	3	Spring
Elective Science Courses: Complete 6 units Courses not listed here may also be chosen but require approval from the Director of Graduate Studies and the Program Chair			
CBIO 550	Drug Disposition and Metabolism	2	Spring
BIOC 555	Methods of Physical Biochemistry	3	Every other Fall
BIOS 576A	Biostatistics in Public Health	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 *(Requisites: Consult program office before enrolling)*	4	Fall
PLS 525	Plant Products and Biotechnology	3	Spring
PLS 548A	Plant Biochemistry and Metabolic Engineering	3	Fall
PLS 580	Medicinal Plants	3	*(Last offered Fall 2016)*
PHYS 531	Molecular Biophysics	3	Fall
Professional Preparation Module: Complete 12 units. See Table A			

7) Sustainable Bioeconomy and Bioenergy Track (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 focused on selecting and improving appropriate feedstock; sustainably producing feedstock; the conversion of feedstock to biofuels, bioenergy, and value-added coproducts; and 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.

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. 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 or by taking online 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, detail their contributions to this field, and discuss future directions such research may take.

Students graduating from 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, or marketing and analysis professionals.

Table G. Curriculum for the SBB Track

Course	Course Name	Units	Usually In
Core Science Courses: Complete 9 units			
BE 523	Biosystems Analysis and Design	3	Spring
BE 582	Integrated Engineered Solutions in the	3	Fall

	Food-Water-Energy Nexus		
CHEE 581A	Engineering of Biological Processes	3	Spring
EIS 536	Agro-Ecology	3	Spring
PLS 548A	Plant Biochemistry and Metabolic Engineering	3	Fall
PLS 549A	Plant Genetics and Genomics	3	Spring
PLS 575A	Physiology of Plant Production under Controlled Environment	3	Spring
Elective Science Courses: Complete 6 units Courses not listed here may also be chosen, but require approval fromthe Director of Graduate Studies and the Program Chair.			
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
BE 558	Wastewater Treatment Operations and Reuse	3	Spring
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	Spring
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 and Salt-Affected Soils	3	Spring
MCB 516A	Statistical Bioinformatics and Genomic Analysis	3	Spring
MCB 573	Recombinant DNA Methods and Applications	4	Spring
MCB 580	Introduction to Systems Biology	3	Fall
MIC 530	Food Microbiology and Biotechnology	3	Spring
PLP 528R	Microbial Genetics	3	Spring
PLP 550	Principles of Plant Microbiology	4	Spring (odd years)
PLP 560	Advanced Plant Biology	4	Spring
PLS 525	Plant Products and Biotechnology	3	Spring
PSIO 572	Quantitative Modeling of Biological Systems	3	Fall
Professional Preparation Module: Complete 12 units. See Table A			

H. OTHER PROGRAM REQUIREMENTS

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 or may not be the DGS of the track) and at least two other members who will form their committee. Of the two other committee members, one of them must be a faculty

member at UA, and the other member can be a special member (non-faculty) who represents the company where the internship was conducted. The composition of the committee must be approved by the DGS or the program chair and must follow the Graduate College rules: https://grad.arizona.edu/degree-services/degree-requirements/masters-degrees#thesis-committee

2) Master's Plan of Study

Working with their advisor, students must start a tentative Plan of Study before they register for their first semester. The Plan of Study is a living, working document updated and fine-tuned by the student, the Primary Advisor, and the Graduate Committee throughout the program. The Plan of Study must be submitted through GradPath in the third semester, and updated later if necessary: https://grad.arizona.edu/degree-services/degree-requirements/masters-degrees#plan-of-study

3) Credit Transfers

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

- No more than 7 units may be transferred from other institutions, and these must be graduate courses at that home institution.
- No more than 12 units of UA non-degree graduate coursework are allowed.

However, as a general rule, transfer coursework may not exceed a total of 12 units from any combination of the two above categories. For full descriptions of these limitations, please refer to the following: https://grad.arizona.edu/degree-services/degree-requirements/masters-degrees#credit-requirements

4) Graduate College Paperwork

See the following URL for additional Graduate College requirements on Master's Degrees, including important information about paperwork that needs to be filed regularly. https://grad.arizona.edu/degree-services/degree-requirements/masters-degrees

GradPath (https://grad.arizona.edu/degree-services/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 the UAccess Student Center. 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, others). 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 login page. (More information on GradPath is in subsection 3 of Appendices)

5) Satisfactory Academic Progress

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

- **The student must maintain a minimum 3.0 GPA cumulatively.** If the student's GPA falls below 3.0, they will be placed on academic probation and given one (1) semester to bring their GPA to 3.0. If they fail to do so, they will be disqualified from the program. Obtaining an extension for an additional semester is possible in the most extenuating circumstances by getting approval from the Program Chair and the Graduate College.
- A student may not take more than 6 years to complete the degree.
- Students must show that they are making progress towards completing the degree in a timely manner. Students should regularly meet with their advisors to discuss their progress.
- Petitions to vary from this plan should be with reasonable justification and be submitted in writing for consideration by the Program Chair and DGS of the track.
- It is highly recommended that core courses be completed as early as possible during the program

6) Professionalism Requirements

Students are 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 (annually organized by BIO5), etc. Students are encouraged to become members and attend the regular/annual meetings of BIOSA, the Bioindustry Association of Southern Arizona. Potential employers value engaged employees, and participating in these ways demonstrates your engagement.

I. FACULTY IN ABS-GIDP

1) Executive Committee & Directors of Graduate Studies

Name	Affiliation	Email
Ravishankar, Sadhana	Chair, Applied Biosciences Professor, Animal & Comparative Biomedical Sciences	sadhravi@arizona.edu
Reidel-Kruse, Ingmar	Director of Graduate Studies, Molecular & Cellular Biology Professor, Molecular & Cellular Biology	ingmar@arizona.edu
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Kacira, Murat	Director of Graduate Studies, Controlled Environment Agriculture Interim Head, Biosystems Engineering	mkacira@arizona.edu
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Cuello, Joel	Director of Graduate Studies, Sustainable Bioeconomy & Bioenergy Professor, Biosystems Engineering	cuelloj@arizona.edu

2) Applied Biosciences Faculty

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J. APPENDICES

1) Syllabi and Important Forms

- Internship Form, Independent Study Form, and Master's Report Presentation Forms, are available via this link: https://abs.arizona.edu/current-students/forms. A copy of the Internship and Evaluation Forms can be found on page 54.

2) Policies, Procedures and Best Practice Guidelines for Internships

a) 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 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://registrar.arizona.edu/sites/default/files/internship_policies-guidelines_5-6-19.pdf
Where the two documents vary, the ABS program policies shall prevail.

b) 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:

- To help students compare their abilities and interests with the professional requirements of particular Applied Bioscience fields;
- To help students evaluate potential employers;
- To provide students with the possibility to participate in multidisciplinary research teams;
- To expose students to the business and professional environment;
- To learn various research methods and professional and business practices.

c) 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:

- 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;
- Discuss the status of the field and the underlying applied biological problems relevant to their internship work;
- Discuss the business, regulatory, customer relations, and/or educational environment relevant to their internship work;
- Apply appropriate methods to collect, analyze, interpret and critique data relevant to their internship.

d) Minimum Eligibility for Enrolling Internship

Before applying for an internship, students are required to:

- Be enrolled in the ABS-GIDP.

- 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 before enrolling in an internship.

e) Internship Policies

"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.

Internships may be paid or unpaid, regardless of credit awarded. International students should consult with the International Student Services 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.

Hours of employment: Per Arizona Board of Regents (ABOR) policy, 1 unit is equivalent to 45 hours of internship work. ABS Students are expected to complete 8 units for their Degree.

- The total number of units may be divided into work contracts (blocks) with different hosting agencies, each worth a minimum of 1 unit.
- 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.

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.

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.

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. If 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 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 documents 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.

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 their experience and training.

Internship-related work that includes research involving human subjects or involving animals must be approved by the University of Arizona Research Laboratory & Safety Services: https://research.arizona.edu/compliance-public/RLSS

f) Application Procedure

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.

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 or 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.

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 under whom the student will be enrolled, the instructor of ABS 593A must sign the bottom of the work plan.

The student will then submit the signed ABS Internship Work Plan (page 54) 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.

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 before registering.

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: https://research.arizona.edu/compliance-public/human-subjects-protection-program

g) Evaluation

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**.

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**.
- 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.

Based on 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 (Incomplete) 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 ABS 593A 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.

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.

h) Supervision

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.

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.

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) a discussion of any significant difficulties or concerns with the internship.

i) Suggestions for the Intern

- 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.
- 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.
- 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.

- 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.
- 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.
- The intern should keep daily notes to assist in the preparation of the final Internship Report.
- 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 promptly.
- 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.
- The intern should understand and follow the policies, procedures, rules, and regulations of the hosting agency.
- 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.
- The student should talk to the Internship Supervisor regarding the expected University holidays. Keep in mind that many organizations do not follow the University calendar.
- 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.

j) 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 their 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.
- 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:

- Provide relevant education/training to the intern if it extends beyond the skills they have acquired in the ABS program.
- Maintain the intern status of the student, to be distinguished from employment status.
- 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.
- The agency Internship Supervisor should inform agency personnel of the purpose, role, and expected performance of the intern.
- The intern should be organizationally placed near the agency's 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.
- 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.
- 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.
- 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.
- At the end of the internship, the hosting agency supervisor should complete and sign

the Evaluation of the Intern form and send it 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.

k) Role of the ABS-GIDP 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.

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

- Selecting students who are in good academic standing.
- Ensuring that students are NOT awarded internship credit for previous positions.
- Ensuring 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 employees of the organization.
- Informing students of the necessity of complying with pertinent program and workplace policies and procedures.
- If the student's internship involves doing research with human and animal subjects, make sure that RLSS training is provided as appropriate to the student's assignments.
- Requiring Primary Advisors to document communications with the student and with the work supervisor regarding internship activities.
- Notifying 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 their participation; this includes, but is not limited to, travel and housing arrangements.
- Notifying 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 experience.

l) Primary Advisor's Supervisory Responsibilities

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.

The Primary Advisor should ensure that the internship experience is related to the curriculum and 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.

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 email.

The Primary Advisor should require the intern to report regularly throughout the Internship. These reports should include:

- a brief comment on the allocation of the intern's time during the period,
- progress toward objectives,
- discussion of any significant difficulties or concerns with the internship.

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.

The Primary Advisor determines the unit grades (S, P, or 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.

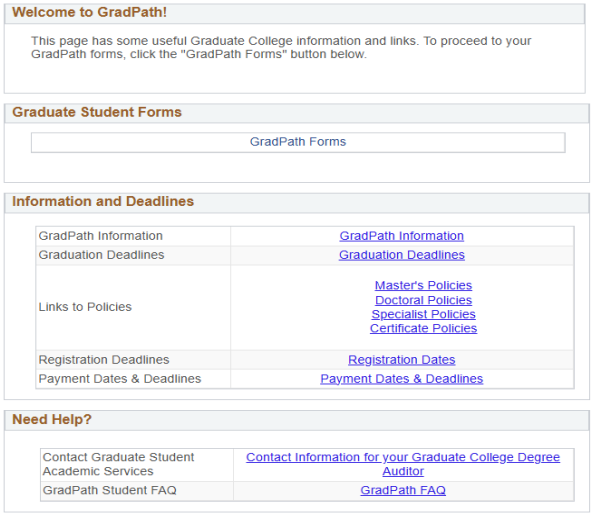
3) GradPath User's Guide

a) 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.

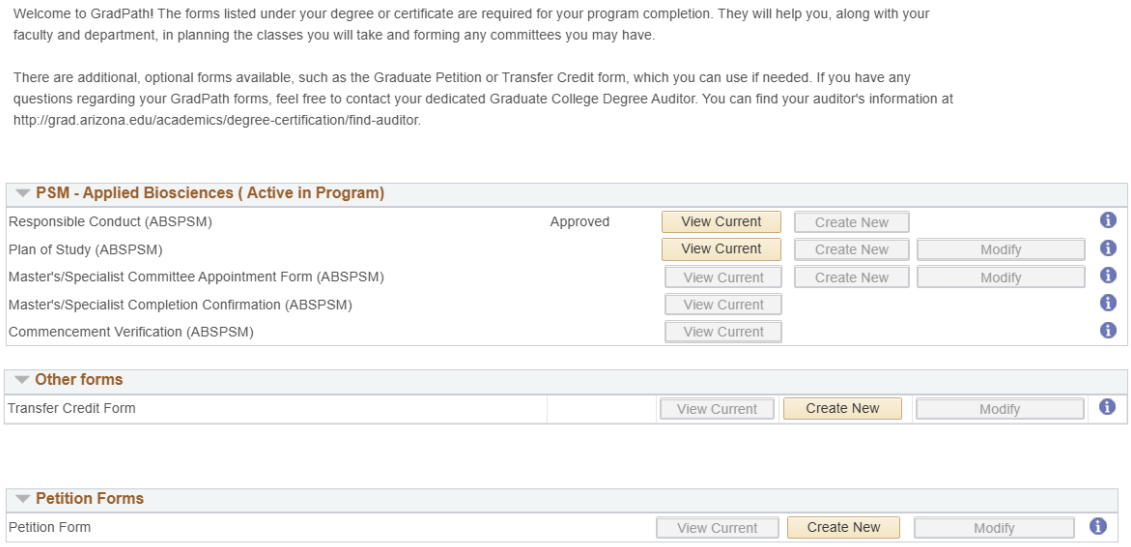
b) How to access GradPath

Students will enter GradPath using the UAccess Student Center. Once they get to the UAccess Student Center, they will need to click on the Advising tab and choose GradPath. https://studentcenter.arizona.edu/



A student entering GradPath 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. To access GradPath forms, simply click on the link under Graduate Student Forms.

When the student proceeds from the landing page into the GradPath forms, they see 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 they have 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.)

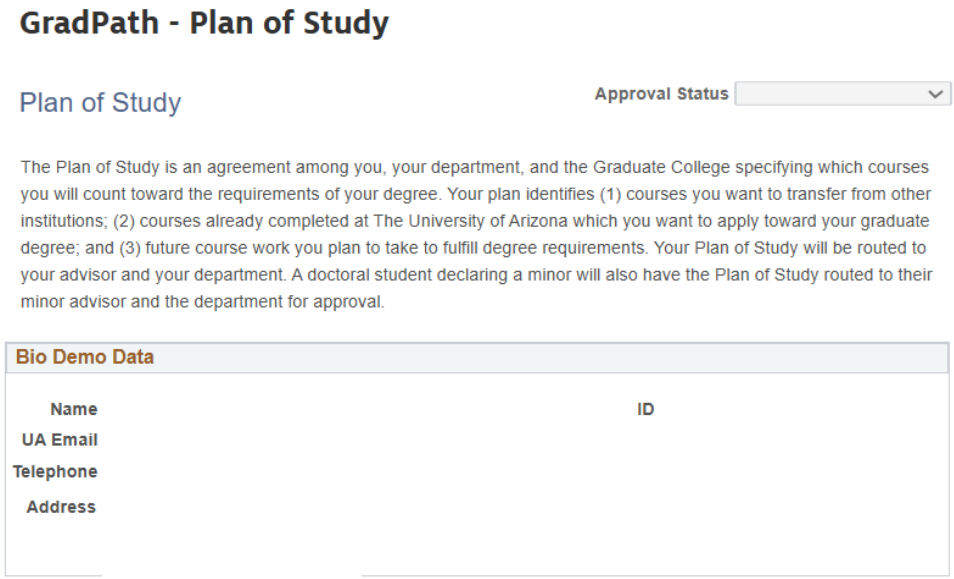


Note: A student must complete and submit the Responsible Conduct of Research

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, they can return to the navigation page to access the other forms.

c) General Features in GradPath Forms

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.



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 with the contact information for their 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.

d) Degree Certification Procedures

The committee members and the 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.

4) Copies of Internship and Evaluation Forms

On the next few pages, Internship and Evaluation Forms are attached.