

THE UNIVERSITY OF ARIZONA

College of Pharmacy

Graduate Programs

GRADUATE STUDENT HANDBOOK

2021-2022

**DRUG DISCOVERY AND DEVELOPMENT
(DDD)**

GRADUATE PROGRAM TRACK

**PHARMACEUTICAL SCIENCES
Ph.D. DEGREE**

This handbook outlines the philosophy and requirements of the Graduate Degrees offered in the discipline of Pharmaceutical Sciences, Drug Discovery and Development Track, at the University of Arizona. It is intended to be used as a tool to understand the requirements for obtaining a graduate degree. This handbook should be used in conjunction with the current Graduate College website. The requirements of the Graduate Program Track in Drug Discovery and Development outlined herein are under the authority of and consistent with the rules and guidelines set forth by the Graduate College of the University. Some of our curricular requirements exceed those stated in the Graduate College website. Students must meet the more stringent requirements contained in this handbook. Certain general University regulations and specific Drug Discovery and Development Track degree requirements are only outlined in this document; consult the current Graduate College website for policies and guidelines set forth by the Graduate College and Graduate Council: <https://grad.arizona.edu/new-and-current-students> or read University-wide Graduate Policies on the catalog: <https://catalog.arizona.edu/policy-audience/graduate>.

Attainment of a graduate degree in Pharmaceutical Sciences requires outstanding scholarship and demonstration of distinguished research leading to a thesis/dissertation that contributes significantly to the general body of knowledge in the discipline. The degrees are never granted solely as certification of faithful performance of a prescribed program of study. All degree requirements must be fulfilled. Therefore, the requirements for these degrees are also outlined in this Handbook.

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1.0 INTRODUCTION

The Drug Discovery and Development Track of the Graduate Program in Pharmaceutical Sciences offers well-funded research opportunities, and the strong multidisciplinary nature of the program provides students with a highly interactive approach to research and education in Drug Discovery and Development.

Master of Science (M.S.) Degree in Pharmaceutical Sciences

The Drug Discovery and Development Track of the Graduate Program in Pharmaceutical Sciences does not admit students with the expressed interest in pursuing the M.S. (non-thesis) degree. For a variety of reasons, students admitted to the Ph.D. Program may complete an M.S. degree (non-thesis option) alongside or in lieu of a Ph.D. degree. These reasons may range from unsatisfactory academic performance in the Ph.D. program to a desire to make a course correction in career path. The overall expectations for these students are similar to those for students in the Drug Discovery and Development Ph.D. program.

Doctor of Philosophy (Ph.D.) Degree in Pharmaceutical Sciences

The Drug Discovery and Development Track of the Graduate Program in Pharmaceutical Sciences offers a Ph.D. degree in pharmaceutical sciences. Students in this program must take courses in the major area as well as one of the several possible minor areas of study.

The objective of the Drug Discovery and Development Track is to impart advanced scientific knowledge in the drug discovery and design phases of pharmaceutical development, and to provide training opportunities in conducting state-of-the-art approaches in basic research in pharmaceutical sciences, and closely related sub-disciplines, in order to prepare the students for careers in independent research or related careers in academia, industry or government. The average time to graduation is approximately five academic years, and time in the Program is regulated by stipulations as determined by the Graduate College.

Drug Discovery and Development Option in Biological Chemistry Program

Students in the College of Pharmacy's Drug Discovery and Development Track have the option of participating in the Biological Chemistry Program T32 Training Grant at the University of Arizona.

Many of the most exciting research opportunities today are at the interface of biology and chemistry. The Biological Chemistry Program offers an opportunity for the interdisciplinary study of molecules in living systems that integrates the traditional disciplines of chemistry and biology.

The Biological Chemistry Program consists of faculty and students from three departments that have joined together to provide this graduate education. The cross-discipline structure allows for students to explore interests that may not be confined to one graduate program. The Program is supported by a training grant from the National Institutes of Health. Visit the Biological Chemistry Program website for information about the program's requirements, faculty, and application process (<http://www.biochem.arizona.edu/bcp/Intro.html>).

1.1 BACKGROUND

Drug Discovery and Development is an interdisciplinary program involving many aspects of chemistry and molecular biology, ultimately associated with intellectual property and clinical drug candidates. As such, Drug Discovery and Development is a critical component of the drug discovery, design, and development pathway. No longer is the medicinal chemist just the synthetic chemist who synthesizes a range of compounds in the hope that one of them will turn out to be a lead compound for development. He or she has a firm basis in chemistry that may be focused in organic synthesis, computational chemistry, or one of the allied chemistry disciplines, but also has familiarity and overlap with chemical biology, structural biology, pharmacology, pharmacokinetics, toxicology, regulatory science, and intellectual property management. At the University of

Arizona, our drug discovery and development faculty have a variety of expertise, such as synthetic medicinal chemistry, structure-based design, molecular modeling, phenotypic screening, and molecular and cellular biology. The Drug Discovery and Development Program and its students have participated in drug discovery programs leading to clinical trials of agents in a number of therapeutic areas, including cancer and cardiovascular diseases.

Research in Drug Discovery and Development operates at the interface of chemistry and biology. It requires a broad perspective in science and typically involves interactions with chemists, botanists, pharmacologists, and clinicians. Drug discovery and quality control may require further contacts with business leaders, lawyers, intellectual property rights specialists, and government and non-government officials. Thus, Drug Discovery and Development offers many challenging opportunities in both basic and applied research.

The role of Drug Discovery and Development in the health-related sciences is evidenced by the increased need for highly trained professional personnel (M.S., Ph.D. degrees). This need is reflected in the number of positions available in research/teaching/service areas of health professional schools (of human medicine, pharmacy), university undergraduate and graduate programs, pharmaceutical and chemical industries, hospitals, and state and federal government research and regulatory agencies.

The Graduate Program Track in Drug Discovery and Development at the University of Arizona is oriented toward modern areas, especially those areas dealing with the discovery and development of drugs that fulfill unmet medical needs. Current research of the participating faculty members in the Program includes investigations in the fields of cancer chemoprevention, antivirals, antibiotics, antifungals, neurodegenerative diseases, natural products chemistry, antioxidant chemistry, drug design and synthesis, structure-based drug design, and the application of NMR and mass spectrometry to biomedical problems.

2.0 THE GRADUATE PROGRAM ORGANIZATION

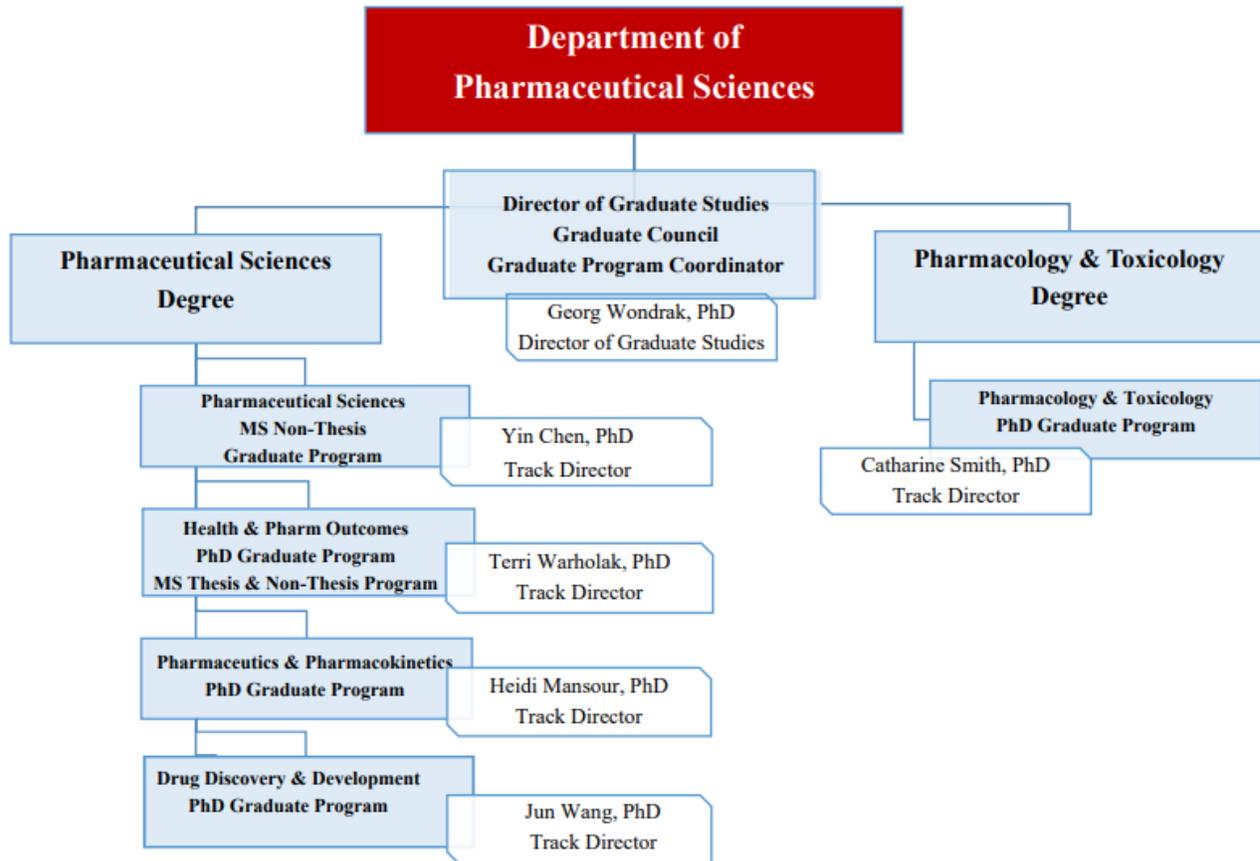
2.1 PHILOSOPHY AND GOALS

A primary mission of the Drug Discovery & Development Track within the College of Pharmacy Graduate Studies Program is to graduate outstanding scientists who will make strong contributions to the education of future pharmaceutical scientists and to the discovery and design of increasingly effective pharmaceuticals, while at the same time appreciating the other aspects of pharmaceutical development. Related to that, our mission is to contribute to the body of knowledge through scientific research.

2.2 GRADUATE COUNCIL FOR GRADUATE PROGRAMS

The Graduate Council, (Graduate Programs in the College of Pharmacy) is comprised of one voting faculty member from each of the Program associated graduate tracks, the Director of Graduate Studies, one non-voting program coordinator, and a non-voting graduate student representative from each graduate track. The Council formulates policies and coordinates activities of the graduate program for all disciplines within the College of Pharmacy, including the Drug Discovery & Development track. This council is charged with the overall evaluation of graduate student performance and also makes final decisions concerning applicants for admission to the program. The student representatives are not included in the evaluation of student performance or admitting students into the program.

The council is also charged with overseeing all curriculum matters. A chart of the organizational structure of the graduate tracks that are housed within the College of Pharmacy is shown below.



2.3 GRADUATE TRACK EXECUTIVE COMMITTEE ON DRUG DISCOVERY AND DEVELOPMENT

The Executive Committee on Drug Discovery and Development consists of voting faculty members and one non-voting program coordinator. The Council formulates policies and coordinates activities of the Drug Discovery and Development Program, evaluates and selects applicants for admission to the Program, and considers curriculum matters.

EXECUTIVE COMMITTEE MEMBERS

| Name | Phone | Email | Room |
|---|--------------|--------------------------------|------------------------|
| Program Track Director Dr. Jun Wang | 520-626-1366 | junwang@pharmacy.arizona.edu | Skaggs Bldg, Room 345D |
| Dr. Chris Hulme | 520-626-5322 | hulme@pharmacy.arizona.edu | Skaggs Bldg, Room 110 |
| Dr. Hongmin Li | 520-621-5728 | hli1@pharmacy.arizona.edu | Skaggs Blud, Rm 345C |
| Dr. Wei Wang | 520-626-1764 | wwang@pharmacy.arizona.edu | Skaggs Bldg, Rm 345B |
| Dr. Gregory Thatcher | 520-621-6624 | gthatcher@pharmacy.arizona.edu | Skaggs Bldg. Rm 345E |

2.4 PARTICIPATING FACULTY

The following is a list of full DDD Graduate Program Faculty with whom students may pursue their research. In addition, faculty associated with the Biological Chemistry Graduate Training Program (BCP) can serve as primary advisor to those DDD graduate students who are members of BCP.

2.4.1 DDD GRADUATE TRACK CORE FACULTY

Eli Chapman, PhD, Associate Professor, Drug Discovery and Development

Our lab is a chemical biology lab that is focused on a number of disease states with a primary emphasis on cellular quality control pathways, such as proteostasis and redox homeostasis. We use chemistry, biochemistry, biophysics, structural biology, and cell and molecular biology to discover and develop targeted protein modulators.

Chris Hulme, PhD, Professor, Drug Discovery and Development

Discovery and development of novel neurodegenerative therapeutics; high-throughput Medicinal Chemistry and the development of novel chemistries with iterative efficiency to expedite the drug discovery process; Microwave Assisted Organic Synthesis (MAOS) and Multicomponent reactions (MCRs).

Hongmin Li, PhD, Professor & R. Ken and Donna Coit Endowed Chair in Drug Discovery & Development

Investigating the structures, functions and mechanisms of essential macromolecules involved in various cellular actions and disease processes and developing novel biochemical and cellular assays for different drug targets. Research focusing on development of therapeutics against cancers and human pathogens such as dengue virus, Zika virus, SARS-CoV-2, Cryptococcal fungi and Mycobacterium tuberculosis.

Rick Schnellmann, PhD, Dean and Professor, Drug Discovery and Development & Howard J. Schaeffer Endowed Chair in Pharmaceutical Sciences

Identifying and developing drugs to treat acute kidney injury, diabetic kidney disease, stroke, spinal cord injury and Parkinson's disease through mitochondrial biology.

Daekyu Sun, PhD, Associate Professor, Drug Discovery and Development

Discovery and development of a new therapeutic strategy to repress the transcriptional activation of the human VEGF, HIF-1 α gene, RET, and other oncogenes with small molecules capable of binding selectively to non-canonical DNA

structures formed within the promoter region of this gene; Study of the mechanism of action of novel anticancer agents derived from natural products: Investigation of DNA-repair interference as a potential approach for cancer treatment.

Greg Thatcher, PhD, Professor & R. Ken and Donna Coit Endowed Chair in Drug Discovery and Development

Small molecule drug discovery projects have led to two cancer therapeutics having completed clinical trials in 2019, the result of applying modern techniques in medicinal chemistry, chemical and cell biology, and the use of animal models in an integrated multi-disciplinary approach. Students are expected to master at least one discipline in drug discovery and become conversant in all other aspects of the process. Current projects span Alzheimer's disease to COVID-19.

Jun Wang, PhD, Associate Professor, & Track Director for Drug Discovery and Development

The central theme of the Wang laboratory has been the identification of new drug targets and the development of novel small molecules for use as chemical probes for target validation and translational research. Research in the Wang Laboratory is mainly directed towards developing antivirals targeting drug-resistant viruses and emerging viruses, including influenza A and B viruses, enterovirus D68 (EV-D68), EV-A71, coxsackievirus, poliovirus, and the recently emerged SARS-CoV-2. We are developing inhibitors targeting multiple viral proteins and use them as chemical probes for *in vitro* and *in vivo* target validation. For influenza virus, we have developed inhibitors targeting the M2 proton channel, the viral polymerase PA-PB1 protein-protein interactions, and the hemagglutinin fusion protein. For enteroviruses, we have designed inhibitors targeting the viral capsid VP1 protein, the viral 2A protease, the viral 2C protein, and the viral polymerase. For SARS-CoV-2, we recently identified a few interesting main protease inhibitors. In addition, we are also pursuing host-targeting antivirals as a means to conquer drug resistance.

Wei Wang, PhD, Professor, Drug Discovery and Development, Director, AZ Center for Drug Discovery (ACDD)

My research aims at exploring innovative and useful chemical tools to address important and challenging biological questions in drug discovery and chemical biology. Toward this end, we take two approaches: 1) develop sustainable synthetic strategies including cascade reactions and organocatalytic and photochemical transformations to navigate new chemical space for drug discovery and 2) design functional molecular probes to understand the mechanism of action of proteins and spatiotemporally control cellular functions.

Georg Wondrak, PhD, Director of Graduate Studies, Professor, Drug Discovery and Development

My research examines the pathological role of oxidative and proteotoxic stress in solar photodamage and melanoma/nonmelanoma skin cancer aiming at the design of novel molecular strategies for chemotherapeutic and/or cytoprotective intervention.

2.4.2 DDD GRADUATE TRACK ASSOCIATE FACULTY, COP

Faculty from other COP graduate tracks (Pharmacology & Toxicology and Pharmaceutics) can serve as major advisor of DDD graduate track students after approval by the DDD Executive Committee.

2.4.3 DDD GRADUATE TRACK ASSOCIATE FACULTY, BCP

Faculty associate with the BCP Program can serve as major advisor of DDD graduate track students after approval by the DDD Executive Committee.

2.5 GRADUATE STUDENT REPRESENTATIVES

Graduate student representatives are elected by the graduate student body of the Program Track in Drug Discovery and Development for two-year terms. The representatives serve as an official liaison between the students and faculty of the Program. The representatives are responsible for organizing graduate student participation in Program endeavors, as well as serving on Program committees in an advisory capacity. Each student should seriously consider his/her choice for the graduate student representative(s) in order to maintain an effective student voice in Program issues.

3.0 PHYSICAL RESOURCES AND FACILITIES

3.1 LABORATORY SPACE

The faculty and graduate students in the Drug Discovery and Development Program occupy space in the College of Pharmacy, the University of Arizona Cancer Center UACC, and the BIO5 building. This distribution of labs in three different locations reflects the interdisciplinary nature of the program. Drug Discovery and Development's weekly seminars are held in the College of Pharmacy, and there are organized social events to bring faculty and students together periodically.

3.2 EQUIPMENT RESOURCES

Availability of modern scientific instruments is crucially important to research and graduate education programs. We are fortunate to possess ample instrumentation to conduct research at all levels of biological organization. Each investigator's laboratory is equipped with specialized instrumentation required for research in their particular field.

Drug Discovery and Development laboratories are especially well endowed with instruments necessary for modern Drug Discovery and Development, including high-field NMR, molecular graphics, mass spectrometers, and high-performance liquid chromatographs. All laboratories have access to modern computers and data processing systems.

3.3 LIBRARY RESOURCES

The University of Arizona takes pride in the outstanding quality of its libraries. UA Libraries are made up of the Main Library, Science-Engineering Library, Fine Arts Library, and Health Sciences Library and they hold extensive collections of periodicals, monographs and special collections.

The Health Sciences Library <http://ahsl.arizona.edu/> is located at the Arizona Health Sciences campus. It is the largest, most comprehensive health sciences library in Arizona. In addition to its holdings of pertinent health sciences periodicals and monographs, the library provides an excellent array of valuable services including bibliographic searches, librarian consults, and research support. The Health Sciences Library provides access to essential medical information, and specialized databases such as Embase, the world's largest database of drug information. Librarians participate as instructors in the curriculum of the health sciences colleges, and work in partnership with researchers and clinicians to advance health information literacy. The library also provides spaces for small group collaboration and quiet study.

3.4 RESEARCH COMPLIANCE TRAINING

The following research compliance programs provide training and support to help University of Arizona researchers including graduate students comply with and navigate the various federal, state, and local regulations that govern research conduct. Please consult the following page: <https://rgw.arizona.edu/research-compliance/training>

3.4.1 LABORATORY SAFETY AND ENVIRONMENTAL HEALTH

Students are required to attend courses on these topics by the end of their first semester of residence, preferably as soon after their arrival as possible. It is the responsibility of all personnel involved in scientific study to be aware of the safety precautions and the proper disposal of hazardous wastes specific to the research effort. The student has a moral obligation to not only familiarize him/herself with, but also follow, the

specifics of laboratory safety associated with his/her desired area of research. The offices of Risk Management and Radiation Control offer seminars covering such subjects as fire prevention, hazardous waste disposal, compressed gas safety, basic radiation protection, industrial hygiene, etc. Laboratory directors and technicians are the best source for day-to-day laboratory safety techniques and advice on safety seminars required for laboratory personnel.

3.4.2 UNIVERSITY ANIMAL CARE

The availability of high-quality experimental animals is of great importance to modern research in pharmacology and toxicology, Graduate Research Assistants are required to obtain UA provided training and certification if applicable to research lab and project. : <https://rgw.arizona.edu/compliance/IACUC>

3.5 POISON CONTROL CENTER

The College of Pharmacy is responsible for the operation of a State-wide Poison Control and Drug Information Center; these facilities are located in the Health Sciences Center Library. Faculty and fellows in Clinical Pharmacology provide expert advice and consultative services for these centers.

4.0 GENERAL INFORMATION

4.1 STUDENT RESPONSIBILITIES

Students are expected to fully comply with the Code of Academic Integrity as detailed by the University of Arizona Dean of Students: https://deanofstudents.arizona.edu/policies-and-codes/code-academic-integrity#student_responsibility

Students engaging in academic dishonesty diminish their education and bring discredit to the academic community. Students shall not violate the Code of Academic Integrity and shall avoid situations likely to compromise academic integrity. Students shall observe the generally applicable provisions of this Code whether or not faculty members establish special rules of academic integrity for particular classes. Students are not excused from complying with this Code because of faculty members' failure to prevent cheating.

The Graduate Program Track in Drug Discovery and Development stresses to the student the following issues of the utmost importance. First, any student who is found to be using drugs for non-experimental purposes will be expelled from the Program. Second, students are to conduct their experiments in an ethical manner; scientific fraud related to the creation of false data or the theft of others' work will not be tolerated by this Program. Students should keep their data in a format acceptable to the research advisor and be prepared to turn over their records to the Drug Discovery and Development Track Director at any time. Third, the student is expected to complete the required and elective coursework in a timely manner under the ethical constraints of the College in which the course is being offered.

Students are expected to provide departmental service as proctors facilitating execution of exams within the College of Pharmacy graduate and PharmD courses.

Students must also be aware of Graduate College requirements and general University policies and deadlines.

4.1.1 Instructional Services Assistant

Graduate students in the College of Pharmacy are required to serve as an Instructional Services Assistant as part of their professional development and growth. The College of Pharmacy is committed to supporting our students as researchers first and foremost. Instructional Services Assistants will assist Course Instructors in managing courses as needed with administrative duties (e.g. exam proctoring, office hours, grading, grade entry, and/or grade-book maintenance) rather than taking on major teaching/lecturing responsibilities. As such, students will continue to be supported as Research Assistants rather than Teaching Assistants to emphasize priority in research. Assignments in the College of Pharmacy are designed to provide students unique opportunities in professional development to gain valuable experience and communication skills that will bolster their CV and support the educational mission of the college.

Students admitted directly into the College of Pharmacy will serve as Instructional Services Assistants during their first two semesters. Since students admitted through ABBS must take two additional courses as part of the ABBS program, they will only need to serve as an Instructional Service Assistant for one semester in Year 2. Assigned classes will include those that are in the curriculum of the undergraduate (Bachelors of Science in Pharmaceutical Sciences - BSPS) and professional (PharmD) programs in the Pharmacy Practice and Science Department and the Pharmacology and Toxicology Department within the College of Pharmacy. Assignments are made

prior to the start of a semester by the Assistant Dean of Academic Affairs and Assessment (Dr. Warholak), who will match students to courses based on their schedule and interests.

Instructional Service Assistant tasks will vary depending on the course and instructor, but typically include holding office hours, grading, exam proctoring, grade entry, grade-book maintenance or other administrative duties. College of Pharmacy Professors may be open to having the Instructional Service Assistant give lectures, if the student wishes to develop and practice teaching skills; however, this is not required. Each student should work with their supervisor and/or Professor to confirm their responsibilities and ask for feedback. Again, the student's primary responsibility is their research commitment, but participation in professional development opportunities can be a very important step toward meeting career goals.

4.2 ORIENTATION

All new students who did not enter the program through the Arizona Biological and Biomedical Sciences (ABBS) program must attend an orientation session held prior to the first day of classes. The program coordinator will inform the incoming students of the time and location of this orientation in advance.

4.3 INDIVIDUAL HEALTH INSURANCE THROUGH CAMPUS HEALTH SERVICES

Students who are hired as a Graduate Assistant/Associate (GA) are eligible to receive individual health insurance through Campus Health Services. Even though the charges for health insurance show up on your student account, the university will off-set the charge.

Health insurance coverage for the fall semester begins the Monday prior to the beginning of classes, and continues until the beginning of the spring semester. Coverage for the spring semester starts at the beginning of the spring semester and continues through the summer. New students must register for health insurance when registering for courses on-line through the UA Student Link system. Continuing students who were enrolled in student health insurance in the previous semester will be automatically re-enrolled. Once you have enrolled in the plan, your coverage cannot be canceled, even if you resign or are terminated as a GA. If you resign or are terminated from your GA during the period of coverage, you will be personally responsible for the payment of the remaining coverage.

4.4 CREATING A UA NETID AND UA EMAIL ACCOUNT, AND COLLEGE OF PHARMACY EMAIL/COMPUTER ACCOUNT

All UA students are required to set up a UA email account (free to UA students), but first a UA Net ID must be established. The instructions on the UITS website (<https://netid.arizona.edu/>) will walk you through establishing your UA NetID, and then your email account. Students in the College of Pharmacy will also have a College of Pharmacy computer and email account created for them. The College of Pharmacy email will be the primary email account. Students should forward their UA email to their College of Pharmacy account so they only have to check one email account and not both.

After the UA student has created a UA Net ID, the student may access the University of Arizona UAccess Student Center System, also known as GradPath. Deadlines for the submission of paperwork pertaining to doctoral programs, as well as all forms, are available online through GradPath and can be accessed from: <https://uaccess.arizona.edu/>

4.5 FINANCIAL SUPPORT

Financial assistance in the form of graduate assistantships is available to all first-year Ph.D. students admitted into the Program through ABBS. Later support will include either traineeships or research assistantships. Students are also encouraged to apply for individual predoctoral fellowships from sources outside the University. Appointments as research assistants provide remission for tuition and health insurance. It is the responsibility of the student to pay misc. fees. Financial assistance for M.S. students is dependent on the availability of funds.

First-year directly admitted PhD students in the College of Pharmacy will be partially supported by College Instructional funds. Students will be assigned ISA duties in their first year based on course needs. The limited funds will be allocated based on the number of direct admits, and the support from the Instructional funds to a student will be evenly distributed throughout the academic year.

*Directly admitted students will join a faculty member's lab. Faculty are responsible for the remaining monthly coverage of a student's first-year funding. **Students have the option to change labs, but it is their responsibility to find that lab. Faculty are responsible for paying their share of the student's monthly coverage until a lab change is official.***

4.6 GRADUATE ASSISTANT/ASSOCIATE STIPEND LEVELS AND BENEFITS

FOR STUDENTS ON NOTICE OF APPOINTMENT:

| FISCAL | 50% FY | TUITION WAIVER FALL/SPRING | 100% FALL/SPRING REGISTRATION REMISSION | STUDENT INSURANCE FULL YEAR |
|--|------------------|--|--|-----------------------------------|
| Graduate Associates (All 1st-Year Students) Late start in August | Refer to ABBS | | | |
| COP Graduate Associates | \$27,540 | \$20,184 (Non-Arizona Domicile/Int'l only) | \$12,106 | \$2,861 |

All students must pay mandatory fees!

FY22 the fees are \$676.87 per semester (fall and spring only) and are **due the first day of class**.

Students not on Notice of Appointment: refer to the Bursar's Office tuition link that includes a breakdown of tuition by unit/per their respective admission year as well as the fees they are required to pay by the first day of classes each fall and spring semester: <https://bursar.arizona.edu/>

4.7 GRADUATE ASSISTANTSHIPS/ASSOCIATESHIPS

Please refer to the Graduate College GA Hiring Manual for complete details regarding your GA. <https://grad.arizona.edu/funding/ga>

4.8 TAX INFORMATION

Students should be aware of current tax laws, which impact salaries or stipends from graduate teaching/research assistantships, fellowships, and stipends. Contact the IRS at (800) 829-1040 and ask for the scholarship/fellowship publication or visit the IRS forms/publications website at <http://www.irs.gov>

Graduate students, who have Graduate Assistant/Associate appointments, must be enrolled 13 units each semester to comply with the College of Pharmacy enrollment requirements. ***To be exempted from FICA taxes, graduate students will need to be enrolled in at least 6 units during the fall and spring semesters, and in at least 3 units during Summer I and II.*** (information subject to change, please reference Bursar's website)

4.9 CHILD CARE SUBSIDIES AND FAMILY FRIENDLY INFORMATION

The Graduate College is dedicated to promoting and strengthening family relationships. Many resources have been designed to help graduate students balance and manage family, work, and school.

- Graduate Assistant/Associate Parental Leave at <https://grad.arizona.edu/funding/ga/benefits-appointment>
- Temporary Alternative Duty Assignments (TADA) for Teaching Assistants/Associates at <https://grad.arizona.edu/funding/ga/temporary-alternative-duty-assignments-graduate-assistantsassociates>
- Extension of Time to Degree Policy at <https://grad.arizona.edu/policies/academic-policies/extension-time-degree>
- Life & Work Connections - Child and Elder Care Resources <https://lifework.arizona.edu>

5.0 GRADUATE STATUS AND ADMISSION

5.1 REGULAR GRADUATE STATUS

Students who meet all admission requirements may be admitted to Regular Graduate Status to undertake work leading to an advanced degree.

5.2 GRADUATE NON-DEGREE STATUS

Individuals holding a bachelor's degree, or its equivalent, from a college or university which grants degrees recognized by The University of Arizona, may attend graduate-level courses without being admitted to a graduate degree program. Such students may enroll in graduate level coursework as their qualifications and performance permit. It is advisable to contact the department(s) offering courses of interests, to ensure that the courses are available to non-degree students. Up to twelve (12) units of graduate credit, earned in non-degree status and/or transferred from other institutions, may be petitioned for application toward an advanced degree once the student obtains regular admission to a degree program. International applicants requiring a student visa are not eligible for graduate non-degree admission.

5.3 CONDITIONAL ADMISSION

Although the College of Pharmacy does not generally admit students conditionally, the program's admissions faculty may recommend conditional admission on a case-by-case basis if the prospective student meets all Graduate College requirements except the minimum English proficiency requirement. For more information, visit International Conditional Admission at:

<https://grad.arizona.edu/admissions/types/international-admission-types#intl-conditional>

6.0 PH.D. PROGRAM IN DRUG DISCOVERY AND DEVELOPMENT

6.1 ADMINISTRATION

The **Drug Discovery and Development Track Director** helps the first-year student plan his/her program with an emphasis on the first year's courses. In succeeding years, the student's Major Research Advisor and Dissertation Committee tailor the coursework to fit specific needs and objectives. The faculty encourages the student to take advanced courses in organic and analytical chemistry and pharmacology and to diversify his/her program with courses in pharmacology and toxicology, pharmaceuticals, cancer biology, molecular and cellular biology, biochemistry, and related areas.

The Major Research Advisor and Dissertation Committee will help the student plan an educational program in which coursework is completed as quickly as possible. Because of individual interests or conflicts in scheduling, some formal coursework may extend into the third year of graduate study.

6.2 RESEARCH ADVISOR AND DISSERTATION COMMITTEE

Prior to the selection of a Major Research Advisor, the student must become familiar with the research interests of the faculty. Students should meet individually with the faculty whose research is of particular interest or potential interest. Additional familiarity is gained through the laboratory rotations.

After these preliminary interviews and research laboratory experiences, the student decides with whom he/she would like to do his/her dissertation research. After consultation with, and agreement of the faculty member, the student must communicate this decision to the Chairperson of the Program before the end of the Spring Semester. No firm commitments between students and faculty should be made until this date. The Major Research Advisor must be a tenure track full faculty member in the Program. ***In the event that the research project is carried out in the laboratory of an individual who is not a member of the Program faculty, a co-director from the Program Faculty must be appointed.***

At the time of Major Research Advisor selection, or shortly thereafter, a Dissertation Committee is formed. The Dissertation Committee consists of three members from the Program faculty and one or two from the minor field and is chaired by the Major Research Advisor. The Major Research Advisor discusses membership of the Dissertation Committee with the student and recommends the composition of the Dissertation Committee to the Drug Discovery and Development Track Director, who may modify Committee membership. Faculty members of the Dissertation Committee are selected on the basis of their ability to provide useful advice about the research problem, to assist in selection of appropriate coursework, and to help guide the student to successful completion of degree requirements.

The first research committee meeting should take place prior to the student taking the written portion of the comprehensive examination. After this first meeting, **the student will meet with their dissertation committee at least once a calendar year (June 1 - May 31) to review progress in coursework and research.** It is recommended that the student have brief notes from the meeting recorded on the dissertation committee meeting form.

The student will be responsible for giving a private dissertation proposal, which will consist of a private seminar to the Dissertation Committee, which will outline the background, preliminary data, and goals of the proposed dissertation topic. The Advisory Committee will be helpful in focusing the objectives of the proposed dissertation as well as limiting the scope. It is strongly recommended that the student meet with the advisory committee shortly before scheduling the final defense. You must indicate in your Annual Report the date of your annual committee meeting.

6.3 COURSES FOR DRUG DISCOVERY AND DEVELOPMENT MAJOR

A minimum of 36 units of course work in the area of the major subject including 4 seminar credits, 6 laboratory rotation units, and a minimum of 8 Research Conference (Lab meeting) credits must be completed. In addition, 9 units of course work in the minor subject, and 18 units of dissertation must be completed. Courses in the Drug Discovery and Development program are listed under two different prefixes to the course numbers: PHSC and PCOL. All research and dissertation units are registered under PHSC.

In order to qualify for Oral Comp Exam, Core coursework and Minor coursework must be completed.

REQUIRED CORE COURSES:

Year 1:

- PHSC 501: Introduction to Pharmacology, Drug Discovery & Pharmaceuticals (4 units, fall)
CHEM 550: Synthetic & Mechanistic Organic Chem (3 units, fall)
BIOC 565: Proteins and Enzymes (3 units, fall year 1; or optionally year 2)
PHSC 670: Principles in Drug Discovery, Design, and Development (4 units, spring)
MCB (PHSC) 795a ABBS Laboratory rotations (2 units per rotation; fall & spring: 6 units total)
BCP Laboratory rotations with ABBS participating faculty (together with BCP Journal Club)
PHSC 696a Seminar (1 unit per semester fall & spring semester: attendance required when enrolled; 2 units total)
PHCL 595b Science Writing, Presentation & Bioethics (spring 2 units)

Year 2:

- PCOL695a Research Conference/Lab meeting (2 unit; fall & spring; second year and beyond: 8 units total)
PHSC 696a Seminar (1 unit per semester fall & spring semester: attendance required when enrolled; 2 units total)

ELECTIVE COURSES

Need enough units from the list below to total 36 for the major. There are many elective possibilities from a variety of related graduate programs from within the College of Pharmacy (Pharmacology and Toxicology, Pharmaceutics) and outside (Chemistry/Biochemistry, and Cancer Biology).

Fall Electives:

- PHSC 505: Current Techniques in Pharm Sciences (3 units)
PHSC 530: Intro to Molecular Therapeutics and Drug Discovery (2 units)
PCOL 535: General and Systems Toxicology (3 units)
PCOL 601a: Epigenetics in Devel and Disease (2 units)
PHSC 603: Topics in Pharmaceutics (2 units)
CBIO 597a: Experimental Design (1 unit)
CBIO 552: Cancer Biology (4 units)
CHEM 584: Nuclear Magnetic Resonance Spectroscopy (3 units)
CHEM 543: Structural Organic Chemistry (3 units)

Spring Electives:

- PCOL 520a: Cellular Comm and Signal Transduction (4 units)
PCOL 550: Drug Metabolism and Disposition (2 units)
PHSC 511: Topics in Pharmaceutical Solids, Nanotechnology and Solid-State Particle Engineering Design in Drug Delivery (3 units)
BIOC 585: Biological Structure I (4 units)
BIOC 568: Nucleic Acids (4 units)
CBIO553: Advanced Topics in Cancer Biology (4 units)
CBIO 597C: Grant Writing for Graduate Student (1 unit)
CHEM 541: Mechanisms of Organic Reactions (3 units)
CHEM 548 Advanced Synthetic Chemistry (3 units)
CHEM 587: Intro to Molecular Spectroscopy (3 units)
CHEM 534A/B: Practical NMR Spectroscopy (3 units)

6.4 SEMINAR PHSC 696A, 1 CREDIT HOUR (TUESDAYS, 11:00–11:50 am)

Students are required to attend a weekly seminar, consisting primarily of scientists from other institutions, on various subjects related to Drug Discovery and Development. The students are also encouraged to invite one speaker each semester.

These seminars are presented by the students, faculty and invited speakers in the Graduate Program. Seminars are an opportunity for students to practice presentation skills and to update the faculty and students on their research progress. **Students are required to register for PHSC 696a for the fall and spring semesters for their term of full-time residence in the Program.** Grades are calculated based on presentation and attendance. First year students are not required to present a seminar, so their grade will be determined by attendance only. Ph.D., MD/Ph.D. and PharmD/Ph.D. students are required to present a seminar each academic year beginning in the second year until the final defense (final defense will be counted as a seminar presentation). Generally, senior students will present in the fall, whereas second year students will present in the spring. M.S. students are required to present 1 seminar.

PHSC 696a requires presentation of a 15-minute scientific seminar with a 5-minute question and answer session. However, students have the option of presenting a full-length seminar once during their time in the doctoral program with permission of the course coordinator. Required components of organizing and presenting seminars include:

- a. Student attendance at all of the required dates (see fall and spring schedules.)
- b. Faculty members will evaluate the seminar presentation for content and presentation skills. The student and evaluators meet immediately after the presentation for critique. The student should discuss the critique with their thesis advisor at a later time.
- c. Each student is required to document attendance at all seminars by signing the attendance sheet. One absence per semester is allowed without penalty. All absences must be requested well in advance of seminar date.

6.5 LABORATORY ROTATIONS

ABBS graduate program members: follow guidelines and procedures as applicable. Each first-year student must participate in research laboratory rotations (MCB (PHSC) 795a. The objective of the required laboratory research rotations is the introduction of the graduate student to research and familiarization with the scope and nature of the faculty's research endeavors. The research laboratory rotation constitutes a major part of the first-year graduate curriculum, and performance in the rotation will bear heavily upon overall evaluation of the student. Upon completion of each rotation, the student is evaluated by the faculty mentor using a form provided by the student (distributed through the ABBS program). This evaluation is based on the student's initial familiarity with the research, the development of library and literature skills, ability to apply the scientific method and use pharmacological and toxicological principles, development of laboratory skills, and overall attitude toward the research project. The student and faculty member may also discuss the potential for choosing the lab as a thesis lab. The student also writes a summary of their project, and the report is then forwarded to the ABBS graduate program coordinator's office where it is placed on file to become part of the student's record. The student will also present their work in a group setting (Rotation Presentation). **Please refer to ABBS Handbook and Schedule. Please refer to ABBS Handbook and Schedule. <https://abbs.arizona.edu/>**

Students directly admitted to the DDD graduate track (Track-specific Admits) will participate in three laboratory research rotations (PHSC795A) for the purposes described above for ABBS. Rotations should be done only with labs that have or are expecting funding for a student. A list of open labs will be supplied to the direct admit students. The evaluation process is also similar to that described for the ABBS graduate program except that the reports and evaluations are forwarded to the Graduate Coordinator.

Students admitted to the DDD program to work specifically with a particular faculty member (Mentor-Specific Admits) are not required to do lab rotations as they are supported financially by the faculty mentor. However, *if the faculty mentor agrees*, the student can do a research rotation in another lab. Evaluation of the student will be carried out by the faculty mentor and a committee specifically designated for the student that does not include the mentor (Early Support Team). This committee will consist of the track director or Director of Graduate Studies (DGS) and one other faculty member. The committee will formally meet with the student once per semester with the purpose of evaluating the student's progress and providing the student with an opportunity to communicate concerns. The committee will make a report summarizing the student's progress/concerns after each meeting. The committee will also receive such a report from the student's faculty mentor each semester. If problems develop, the Early Support Team will make a plan of action to resolve the problems on a case-by-case basis in consultation with the Director of Graduate Studies. The Early Support Team will be dissolved once the student formulates their thesis committee in the second semester of their second year in the program.

6.6 MINOR REQUIREMENTS

One minor is required. Students may choose from among the following approved minor list. Other options will be considered but must be approved individually by the Executive Committee and Track Director of the Program (minimum of 9 units).

6.7 SUGGESTED MINORS FOR DRUG DISCOVERY & DEVELOPMENT MAJORS

- | | |
|-----------------------------------|-------------------------|
| 1. Multidisciplinary | 6. Cancer Biology |
| 2. Chemistry/Biochemistry (BCP) | 7. Neuroscience |
| 3. Molecular and Cellular Biology | 8. Medical Pharmacology |
| 4. Pharmacology & Toxicology | 9. Physiology |
| 5. Microbiology and Immunology | |

For a multidisciplinary minor, the DDD graduate student selects graduate level courses from various programs, and the selection is to be approved by the student's PhD Advisor. For all other minors, the DDD graduate student selects graduate level courses from the respective graduate programs; this selection is to be approved by the minor advisor (to be appointed as a member of the student's graduate committee).

6.8 MINOR IN DRUG DISCOVERY & DEVELOPMENT FOR STUDENTS IN OTHER PROGRAMS

The faculty welcomes graduate students in other departments and programs of the University to minor in Drug Discovery and Development. Students are required to contact the Program Office and the Graduate Track Director before proceeding with a minor. A student may minor in Drug Discovery and Development by completing nine units of coursework listed below:

| | | |
|---|--|---------|
| PHSC 501 | Introduction to Pharmacology, Drug Discovery & Pharmaceutics | 4 units |
| PHSC 670 | Principles in Drug Discovery, Design, and Development | 4 units |
| No more than one of the following courses: | | |
| PHSC 530 | Introduction to Molecular Therapeutics and Drug Discovery | 2 units |
| PHSC 505 | Current Techniques in Pharm Sciences | 3 units |
| BIOC 565: | Proteins and Enzymes | 3 units |
| PCOL 601a: | Epigenetics in Development and Disease | 2 unit |
| PCOL550 | Drug Metabolism and Disposition | 2 units |

6.9 CREDIT REQUIREMENTS AND TRANSFER CREDIT

A minimum of 36 units of course work in the area of the major subject, 9 units in the minor subject, and 18 units of dissertation must be completed. Graduate credit earned at other approved institutions, if accepted by the major department and the Graduate College and grade was A or B, may be counted toward the

requirements of this degree, but will not be calculated in The University of Arizona G.P.A. All required units of credit must be at the 500-level or above at The University of Arizona (or, in the case of transfer units, their equivalent at other institutions). At least one half the units used on the Doctoral Plan of Study must be in courses in which regular grades (A, B, C) have been earned. A minimum of 12 units of regular grades taken at The University of Arizona are required to establish a University of Arizona G.P.A..

Students who wish to use transfer credit must first submit a request form in GradPath before the end of their first year of study. This allows the Graduate College to evaluate the transfer credit while the transcripts are still in the Graduate College, and ensures that students will know early in their studies whether or not the credits are acceptable. The Graduate College evaluation simply determines whether or not the courses are eligible for transfer; the Drug Discovery and Development Executive Committee will still decide which courses should be part of the Program of Study.

6.10 REGISTRATION

Registration is accomplished through the University of Arizona UAccess Student Center System. UAccess Student Center can be accessed from: <https://uaccess.arizona.edu/> Contact the Program office for registration of courses that are not open to web registration.

6.11 GRADUATE APPOINTMENTS MINIMUM REGISTRATION

All graduate students in the College of Pharmacy who are supported by or through the University are considered to be full-time students. All full-time students are expected to enroll for some combination of coursework, research, or independent study that results in a minimum of twelve (12) units of credit for the academic semester. Students completing their degree in an academic semester may register for less than (12) units as determined by the Major Advisor and Program Office.

6.12 MINIMUM REGISTRATION REQUIREMENTS FOR STUDENTS NOT RECEIVING FUNDING

Each student who is associated with the University in any capacity that utilizes University facilities or faculty time during any academic semester must be registered for at least three (3) units of graduate credit. Each student completing requirements for an advanced degree must be registered during the semester term during which requirements are completed, or the previous semester or term if requirements are completed during an intercession. This includes any semester during which a preliminary or final examination is scheduled.

Ph.D. students who have completed all the degree course requirements but have not completed the comprehensive examination should enroll for Research (PHSC 900). After completion of the comprehensive examination Ph.D. students should enroll for dissertation (PHSC 920).

Full-time Graduate Student Status: A student who has completed all course work, the thesis/dissertation unit requirements, has advanced to candidacy, is working on the thesis/dissertation, and is not employed as a Graduate Assistant/ Associate may apply for advanced status at: <https://arizona.app.box.com/v/grad-gsas-advancedstatus> which allows 1 unit of 900-level credit for full-time status. In all other cases, full-time status consists of a minimum enrollment in 9 units of graduate credit.

6.13 GRADES IN CORE COURSES

Students must receive a grade of B or better in all core courses. A student who receives a grade of C or less in a core course must repeat that course. A student may petition to have this repeat requirement waived; a waiver can be granted only with the written approval of the course instructor and the Drug Discovery and

Development Graduate Executive Committee. A grade of C or less in a core course constitutes grounds for dismissal from the Graduate Program.

6.14 MINIMUM ACADEMIC REQUIREMENTS

A student cannot receive a graduate degree unless he or she has achieved a grade-point average of 3.00 or higher on all course work taken for graduate credit, whether or not the courses are offered in satisfaction of the specific requirements for a specific graduate degree. A student whose cumulative GPA is below 3.0 for two consecutive semesters will be dismissed and may then reapply for non-degree status. Programs may allow students to take additional course work while in non-degree status. In order to graduate, the student may apply for readmission to the Graduate College through their graduate department. Readmission is not guaranteed.

6.15 SATISFACTORY ACADEMIC PROGRESS

In addition to maintaining a minimum 3.0 grade-point average, students are required to demonstrate satisfactory academic progress toward degree completion. The Program's policies on what constitutes satisfactory academic progress are listed below.

- Minimum Grades in a Required Course - Students must receive a grade of "B" or better in all core courses. A student who receives a grade of "C" or less in a required course must repeat that course. Students failing to obtain a "B" or higher in a required course that is repeated must petition the graduate program faculty to remain in the program. The decision to allow the student to continue in the program requires a majority approval of the program faculty, with two negative votes sufficient for termination.
- Student Evaluation – The Program Executive Committee evaluates each student on the basis of accomplishments in formal courses and performance in other areas of the Program including attendance and participation in seminars as well as performance in laboratory rotations. Satisfactory performance in courses and research are also required. Failure to meet performance criteria in any of these areas is grounds for recommendation of dismissal from the Program.
- Annual Reports - All students will submit an annual report on or before June 1. The Annual Report must be approved and signed by the graduate track director (first year students) or the Major Research Advisor (all other students) for submission to: <http://gradstudent.pharmacy.arizona.edu/>
- Sponsorship - By June 15 the Executive Committee makes a determination if each first year student should be sponsored for the following year. This determination will be assessed yearly thereafter. Poor performance in assigned duties may result in the loss of sponsorship. Sponsorship decisions after the first year are made by the student's major advisor based on satisfactory progress toward completion.
- Advancement to Candidacy – Advancement to Candidacy requires successful comprehensive examination. If performance is substandard in any portion of the examination, the Dissertation Committee may recommend 1) may recommend exam re-take within 60 days of the original exam, 2) withdrawal from program sponsorship, 3) dismissal, 4) or may recommend that the student opts to leave the DDD program with a Master's degree. If performance during comprehensive examination has been satisfactory, the student advances to candidacy.
- Dissertation/Thesis Committee Meetings - All students are required, after the formation of a dissertation/thesis committee, to have at least one committee meeting per year while in the Program (refer to committee meeting guidelines under section 6.2 Research Advisor and Dissertation Committee).
- Completion Guidelines – Students will complete the following according to the time-frame listed below.

Students can find information on the Graduate College's Summary of Grievance Types and Responsible Parties here: <https://grad.arizona.edu/policies/academic-policies/summary-grievance-types-and-responsible-parties>.

| YEAR | TIME-FRAME GUIDELINES (see Appendix A for details about forms and Links to web portals) |
|--|---|
| <p>YEAR 1 (fall/spring/summer)</p> | <p><u>Fall semester:</u></p> <ul style="list-style-type: none"> • Meet with Graduate Coordinator to go over coursework, timeline of milestones, submit transfer units. • Start Core Coursework • Start laboratory rotations (3 total); ABBS or <i>Track</i> direct admits <p><u>End of Spring semester:</u></p> <ul style="list-style-type: none"> • Selection of Mentor/Research Advisor and begin Doctoral research. • Submit Annual Report – due June 1st gradstudent.pharmacy.arizona.edu |
| <p>YEAR 2 (fall/spring/summer)</p> | <p>Continue Doctoral Research / Complete Core Coursework</p> <p><u>By beginning of Spring:</u> Meet with Grad Coordinator to finalize Doctoral Plan of Study; (submit via GradPath)</p> <p><u>Starting in Feb:</u></p> <ol style="list-style-type: none"> 1. Select Oral Comp Committee (submit via GradPath) 2. Arrange a Committee Meeting to be held by May 30th (during the meeting: 1. <i>Present coursework/thesis research overview</i> and 2. <i>Present planned Research Proposal</i> (Specific Aims Page ONLY)) <p><u>By June 1st:</u> Submit Annual Report</p> <p><u>By end of Summer:</u></p> <ol style="list-style-type: none"> 1. Compose full research proposal and receive committee feedback and “pass with approval to defend” via email) |
| <p>YEAR 3 (fall/spring/summer)</p> | <p><u>Early Fall:</u></p> <ul style="list-style-type: none"> • Schedule and Pass Written Comprehensive Examination (counts as 2nd Committee meeting) <p><u>By end of Fall semester:</u></p> <ul style="list-style-type: none"> • Oral Comprehensive Exam: (Administered by Dissertation Committee) Part 1: Orally defend research proposal Part 2: Oral Exam on general knowledge (based on Graduate Coursework) • Submit Dissertation Committee Appointment Form (via GradPath) |
| <p>YEARS 4 and 5 (fall/spring/summer)</p> | <p><u>Fall semesters:</u> 3rd and 4th Annual Committee Meeting– Discuss general progress and plan timeline toward dissertation finalization.</p> <ul style="list-style-type: none"> • Compose dissertation according to Graduate College guidelines. • Submit Announcement of Final Dissertation (via GradPath) • Meet with Graduate Coordinator 30 days prior to final defense • Pass dissertation defense & identify employment opportunities |
| <p>YEARLY</p> | <ul style="list-style-type: none"> ❖ Students must receive at least a B grade in all core courses. ❖ Attend weekly Seminar (PHSC 696a) ❖ Present at Seminar in Yrs. II and beyond ❖ Complete Annual Report (on or before June 1) ❖ Students supported by or through the University are expected to enroll for 13 units of credit each academic semester |

6.16 APPEALS PROCESS

If a student wishes to appeal any of the aforementioned requirements the appeal should be made in writing to the Director of the Program Track (Drug Discovery & Development). The appeal will be reviewed by the program faculty and may include a collective meeting with the student. A decision to accept the appeal of the program faculty will be based on a majority vote. The program faculty may place additional requirements/deadlines on the student as a prerequisite for continuing in the program.

Students may also appeal any departmental decision. Students who wish to appeal the decision of the program faculty must submit an appeal in writing to the Director of Graduate Studies in the College of Pharmacy. For additional information regarding appeals and complaints, please refer to the Graduate College webpage here: <https://grad.arizona.edu/policies/academic-policies/summary-grievance-types-and-responsible-parties>

6.17 STUDENT EVALUATION

On behalf of the Program Faculty, the dissertation committee annually evaluates each student on the basis of accomplishments in formal courses and performance in other areas of the Program including lab research as well as attendance and participation in seminars. Satisfactory performance in courses and research are required. Failure to meet performance criteria in any of these areas will result in a written warning with an opportunity to remediate. Continued failure to meet performance criteria is grounds for recommendation to the Graduate College that the student be dismissed from the Program.

After a student has formally joined a lab, It is sometimes the case that the faculty mentor wants to dismiss the student from the lab due to inadequate research performance or behavior. The mentor must document the case for doing so, including evidence that the student was clearly warned of the inadequacies, that a detailed, written remediation plan was made to allow the student to improve their performance/behavior within a certain time frame (unless it was unethical or illegal), and the student's failure to improve. A semester is the recommended time to allow for student improvement. Depending upon where the student is in their graduate studies, the case is made to the Early Support Team (Mentor-specific Admits), the DDD Executive Committee (pre-comp exam students) or the Doctoral Committee. The student may be asked to meet with these committees separate from their mentor as they consider the case. If these committees concur with the mentor, the student then meets with the track director to discuss their options which include finding another lab, taking a terminal, non-thesis masters (if they have completed their course requirements), or filing an appeal (see section "Appeals Process").

6.18 ANNUAL REPORTS

All students are required to submit an Annual Report, annually, on or before June 1. An email notice will be sent out from the Program Office containing specific instruction for submission, using the online link at: <http://gradstudent.pharmacy.arizona.edu/>

The Annual Report must be approved electronically by the DDD Graduate Program Track Director (first year students and all others) and the Major Research Advisor (2nd year students and beyond). Annual Reports documenting progress are mandatory for every year matriculating in the program.

For each first year student having completed the first year, the DDD Track faculty will make a specific recommendation regarding continuous sponsorship for the following year by June 15. For second year students, Advancement to Candidacy will be recommended at the time of successful completion of the comprehensive examination. If performance is substandard, the DDD Track faculty may recommend a

probationary period, withdraw program sponsorship, seek dismissal, or may request the student to fulfill the requirements for a Master's degree.

The Annual Report will list courses taken and grades received, committee meeting(s) held, abstracts and papers published, seminars and report presentations, honors, outside funding, and a succinct and lucid summary of research progress.

Graduate students are also required to prepare and submit a written Individual Development Plan (IDP) as part of their Annual Report. The IDP allows the graduate student to determine training goals, needs for professional development, and career objectives to be presented and discussed at the Annual Committee Meeting. The IDP is to be prepared according to AAAS guidelines and submitted online at: <http://myidp.sciencecareers.org/>

The Annual Report must be approved by the Drug Discovery and Development Track Director and signed by the Drug Discovery and Development Track Director before the year's work is considered complete. Students who do not meet this deadline will receive a one-time letter requesting the information be provided immediately or the student will be dropped from the Program for failure to meet Program degree requirements. After progression to candidacy, overall academic performance and research progress will be assessed during the Annual Dissertation Committee Meeting. **Failure to meet performance criteria in any of these areas is grounds for recommendation of dismissal from the Program.**

6.19 QUALIFYING EXAMINATION

Satisfactory completion of the first two year's work constitutes passing of the Qualifying Examination. This entails that the student attains grades of no less than a "B" in core courses and maintain a GPA of at least 3.0. Part of the evaluation includes the submission and approval of an Annual Report outlining his/her activities during that year.

6.20 PLAN OF STUDY

In conjunction with his/her major professor or advisor, each student is responsible for developing a Plan of Study during their first year in residence, to be filed online in GradPath no later than the student's third semester in residence. The Plan of Study identifies (1) courses the student intends to transfer from other institutions; (2) courses already completed at The University of Arizona which the student intends to apply toward the graduate degree; and (3) additional course work to be completed in order to fulfill degree requirements. The Plan of Study must have the approval of the student's major professor and department head (or Director of Graduate Studies) before it is submitted to the Graduate College.

6.21 COMPREHENSIVE EXAMINATION

Before advancing to formal candidacy for the Ph.D. degree, all Drug Discovery and Development graduate students must pass a comprehensive examination. General information about the comprehensive examination is provided by the Graduate College here: <https://grad.arizona.edu/gsas/degree-requirements/doctor-philosophy#comprehensive-exam>.

In order to enter comprehensive examination, the Pharmaceutical Sciences Graduate Program stipulates that the student must have passed the required core courses in the program with a grade of B (3.0) or better in each course. The comprehensive examination consists of: (1) a Written portion (research proposal) and (2) an Oral Comprehensive portion (part A: defense of the research proposal; and part B: examination on subjects of general coursework). Each student's dissertation committee serves as the comprehensive examination

committee. Regular committee meetings are chaired by the dissertation advisor; however, a DDD faculty presides the comprehensive exam related committee meetings.

Timeline:

Starting in the summer of the second year, the candidate will prepare a written portion (research proposal) that must be approved by all committee members. After passing the written portion of the comprehensive exam, a day for the oral comprehensive examination can be scheduled. On the day of the oral comprehensive examination, the student will be examined in two areas: part A (defense of research proposal) and part B (examination on subjects of general coursework). The oral comprehensive must be completed by the end of year three. This timeline can be extended ONLY under special circumstances, and an extension requires the approval of the Drug Discovery and Development Executive Committee.

1. WRITTEN EXAMINATION

Research Proposal: The candidate will prepare a NIH style research proposal (selecting a R01, R21, F31, etc. NSF format that seems to most appropriate according to the student's and Advisor's preference). Minimum requirement is a 6-page proposal plus specific aims page. By June 1st, the student will have identified a topic and submitted the title and abstract to their dissertation committee. It is recommended that students meet with their committee in spring of their third year to determine an acceptable proposal and topic. First, a specific aims page summarizing the key aspects of the proposed research has to be prepared and discussed during the meeting of the advisory committee. The candidate prepares a revised version of the specific aims page taking into consideration the feedback of the advisory committee. After this revised version of the specific Aims page has been approved by all members of the committee (via email consent), the candidate now assembles a full NIH-style grant proposal due August 1st. Two revisions will be allowed if necessary.

Research Proposal Preparation Specifics: The topic of the **research proposal** should originate from the student's own intellectual efforts without significant support from the Mentor. However, overlaps in content and aims between the student's graduate research and the proposal are acceptable. It is the student's Graduate Committee members that determine the appropriateness and originality of the chosen topic.

Portion B1: First, the topic of the research proposal is prepared by the student as a Specific Aims Page ONLY. Information on general format and content (template) of a full NIH style research proposal must be provided by the research advisor. During the 2nd Annual Committee Meeting, the topic and content of the specific Aims are discussed and approved by the dissertation committee by June 1st.

Portion B2: Based on the feedback received by the committee a full Research Proposal is composed and submitted to every committee member for electronic feedback by August 1st. Information on general format and content (template) of a full NIH style research proposal must be provided by the research advisor. After receiving feedback, the student revises the proposal accordingly and submits electronic version of the final write-up for approval by every single committee member. (Every member of the committee signs the 'COP Comprehensive Written Examination Results Form': see above).

The responsibility for the quality of the proposal, which includes originality, practicality, significance, and methodology, rests entirely with the student. The student may seek general advice from members of the dissertation committee including the Dissertation Director, but should not expect them to be active participants in the generation and completion of the proposal.

Like any other good grant proposal, quality will come from spending a lot of time thinking about the potential flaws in the proposal and then finding solutions. It is advisable to ask fellow students and colleagues to critique the document before it is distributed to the dissertation committee. The proposal should have a Title that accurately describes the major hypothesis. This should be followed by an abstract (<200 words) that concisely summarizes the problem being addressed and the proposed experimental approaches (specific aims).

The body of the proposal should include background information, enumerated specific aims, methods of approach, and an appraisal of the significance of the proposition. An excessive bibliography should be avoided; however, it needs to include all pertinent references in which the methods are described and any relevant papers that support the goals of the proposal. Use primary references where possible, avoiding excessive reliance on reviews. The total written proposal, including figures, tables, references, etc, should follow NIH guidelines. Detailed descriptions of established methods can be left to the oral defense. The submitted document should be proofed carefully for grammar and spelling. As specified above, the dissertation advisor will provide a valid template for the composition of a proposal. The format below should be taken as a suggestion with the exception of the total length of the text:

- I. Title Page
- II. Abstract
- III. Specific Aims (1 page only)
- IV. Research Plan (12 pgs RO1, 6 pgs R21, etc)
 - A. Hypothesis/Specific Aims
 - B. Background and Significance
 - C. Experimental Design
- V. References (include full article titles)
- VI. Appendix (Optional)

When the proposal has been written as well as possible, an electronic copy should then be submitted to each member of the committee by August 1st. The committee will need two weeks to critique the proposal and to give electronic feedback. The dissertation committee has the option of requesting revision of the proposal. The dissertation committee will not sign off on this part of the preliminary exam until the document is acceptable.

Outcomes Part B: After completing the written research proposal and obtaining a ‘pass’ by every committee member (by signing the *COP Comprehensive Written Examination Results Form*), the candidate has fulfilled the requirements for the Written Comprehensive Examination. The candidate now proceeds towards the Oral Comprehensive Examination which has to be passed by the end of year three.

2. ORAL EXAMINATION

The student’s Dissertation Committee is responsible for administering the oral examination. Policies and Procedures for Oral Comprehensive Examination for Doctoral Candidacy at: <https://arizona.app.box.com/grad-gsas-comporalexam> The student is responsible for scheduling the Oral examination through GradPath. No student will be allowed to officially schedule the oral exam unless the written exam has been passed, although a tentative date can be arranged at any time with the Dissertation Committee. *The student is responsible for scheduling the room for the oral exam. At the beginning of the Oral Comprehensive Exam, the student is expected to provide a brief summary of graduate coursework completed and respective grades obtained. They should also bring the Outcomes Assessment Form (Appendix I) and the Prospectus Proposal Confirmation (Appendix II, g). It is the committee chair’s duty to report the exam results through GradPath link online.*

The oral portion of the comprehensive exam generally will consist of two components: (1) a defense of an original research proposal and (2) questions concerning general knowledge within the field of Drug Discovery & Development. The defense of the research proposition will test the student’s ability to generate original ideas and to defend the adequacy of the proposal for solving the problems addressed. It is expected that the student will demonstrate a reasonable knowledge of the literature and special techniques of the field. The general questioning portion may account for up to 50% of the oral examination. The general questions will primarily be derived from both the core and elective courses that the student has taken. Additional questions pertaining to the questions from the written portion of the exam may also be asked. The oral exam must last a minimum of 2 hours, but cannot exceed 3 hours. It is common for the student to give a 5- to 10-minute overview of the research proposal followed by questions from the committee centered about a defense of the

research proposal (1 to 1.5 hours). The best way to study for the exam is (1) to know the proposal thoroughly, including all related topics, (2) to review all class notes and lecture material from all classes taken as a graduate student up to that point, especially the core course material, and (3) to be familiar with the recent literature (particularly in the fields represented by the committee members). It is important to plan your studying so that you do not get “burned out” before the exam. Know what material you want to cover and then systematically go through it. It is an excellent idea to have at least one “practice oral exam” with other graduate students and postdoctoral associates about two weeks before the scheduled exam. This can be very helpful in identifying weaknesses and will give students practice thinking on their feet.

6.22 FAILURE OF THE SECOND ATTEMPT OF THE ORAL COMPREHENSIVE EXAMINATION

Students who fail a second attempt of the oral comprehensive examination are automatically dismissed from the Ph.D. Program. It is possible, with a recommendation from the comprehensive examination committee, to offer the student a terminal M.S. (non-thesis) option.

6.23 ADVANCEMENT TO CANDIDACY

When a student has passed the oral comprehensive examination and all coursework on the Plan of Study is complete, the student will advance to doctoral candidacy. At that time, the bursar account will be billed the candidacy fees. These are one-time fees and the student will not be billed again if they change their anticipated graduation date.

After passing the Oral Comprehensive Exam, the student is required to submit the Committee Appointment Form in GradPath. The Final Oral Defense Examination cannot be scheduled until at least six months after the form is received. Deadlines for the submission of paperwork pertaining to doctoral programs, as well as all forms, are available via GradPath at the Graduate College Website: <http://grad.arizona.edu/>

6.24 FINAL EXAMINATION

Upon the completion of the dissertation, the candidate is to submit to a Final Oral Defense Examination. A student must be in good academic standing to schedule the defense. The examination focuses on the dissertation itself but can include general questioning related to the field(s) of study within the scope of the dissertation.

The exact time and place of this examination must be scheduled with the Graduate Student Academic Services (GSAS) at least 7 working days in advance. Announcement of Final Oral Examination form must be filed with GSAS. A format correct copy of the dissertation must be delivered by the candidate to each committee member at least ten (10) working days before the examination. The student should print out two (2) dissertation approval pages, and bring them to the defense. It is expedient to get all signatures at the defense.

The dissertation director presides over the examination. The examination is closed to the public, except for an initial seminar portion during which the student presents the dissertation and entertains questions. There is no minimum time limit for the Final Oral Examination, but the entire proceedings may not exceed three hours. Members of the committee must be present for the entire examination.

6.25 DISSERTATION

This begins when the student picks a laboratory and advisor. Planning the research program begins in meetings with the Major Advisor and the Dissertation Committee. The Committee reviews the goals and experimental approaches summarized by the candidate, particularly in relation to the objectives set out in the

dissertation proposal, and helps formulate and approve any changes or new plans deemed appropriate. At this time it may become necessary to increase the frequency of Dissertation Committee meetings. The candidate is expected to fulfill specific goals recommended by the Committee.

Preparation of the written dissertation follows the Graduate College rules, **Student's Manual for Theses and Dissertations** (<http://grad.arizona.edu/academics/degree-certification/diss-theses/manuals>)

When the dissertation is written, the candidate submits a copy to each member of his/her committee **ten (10) working days prior to the final examination**. The Announcement of Final Examination must be filed with the Graduate Student Academic Services (GSAS) no later than **seven (7) working days before the examination date**.

6.26 LIMITATION ON TIME SPANS

The Ph.D. degree with a major in Drug Discovery and Development usually requires approximately 4.5-5 years of education beyond the baccalaureate degree. As the success of laboratory experiments or the time required for their completion cannot be predicted accurately, more time may be required for completion of degree requirements.

Note: Graduate coursework credit, to be applicable toward a degree, must have been earned not more than five (5) years prior to the completion of the requirements for the degree. This includes graduate credit earned for a master's degree, if applicable. The Graduate Council has instructed that petitions for time-limitation waivers should only be entertained under circumstances that are judged to be extraordinary and extenuating. According to Graduate College policy, students must finish within 5 years of taking comps <https://grad.arizona.edu/gsas/degree-requirements/doctor-philosophy#time-limitation>

6.27 TIMETABLE, FORMAL DOCUMENTATION, AND DEADLINE DATES

The following forms and deadlines are required by the College of Pharmacy Graduate Programs Office and Graduate Student Academic Services. All forms can be downloaded from the Graduate College website (<http://grad.arizona.edu/>) and are submitted in GradPath through the University of Arizona UAccess Student Center System. UAccess Student Center can be accessed from: <https://uaccess.arizona.edu/>

1. Responsible Conduct of Research (1st month in residence)
2. Code of Academic Integrity (1st month in residence)
3. Doctoral Plan of Study (3rd semester in residence)
4. Oral Comprehensive Examination Committee Form (3rd semester in residence; documenting the assembly of the faculty members that will conduct the Oral Comprehensive Exam covering members from major and minor programs. The Oral Committee Chair should be a DDD faculty member). After successful completion of the Oral Comprehensive Exam, a final Dissertation Committee is assembled based with minor modifications to accommodate program membership requirements.
5. Announcement of Doctoral Comprehensive Exam (submit no later than one month prior to Oral Examination)
6. Doctoral Dissertation Committee Appointment (submit no later than 6 months prior to defending). The Program recommends submitting the Committee Appointment form immediately following completion of the Oral Comprehensive Examination.
7. Prospectus Proposal Confirmation (print from GradPath and take form to Oral Examination)
8. Announcement of Final Oral Defense (submit no later than one month prior to defense). A format correct copy of the dissertation must be given to each committee member, ten (10) working days before the examination.

6.28 SCIENTIFIC MEETINGS

As part of the educational process, students in training will be encouraged to attend national scientific meetings, as travel support permits. Priority for travel support will be given to students presenting communications at national meetings such as the American Chemical Society, American Association for Cancer Research, American Association of Pharmaceutical Scientists, Gordon and Keystone Conferences, AACR/NCI/EORTC, and related meetings. Students should discuss participation in meetings and travel support with their Research Advisors. Students may also apply for travel funds available from the Graduate Program Office. The Program Office requires a copy of any communications presented (e.g., abstracts).

APPENDIX A

It is the duty of the advisor and the student that these forms are obtained and completed by the respective deadline. Forms can be obtained from the following link: <http://gradstudent.pharmacy.arizona.edu/>

I. College of Pharmacy Graduate Programs Forms

- a. Pre-doctoral Timeline of Training (In your Welcome packet)
The Graduate Program Coordinator will meet with the graduate student to review the forms and required timelines of the program.
- b. Student Annual Committee Report
For every annual committee meeting the following form needs to be completed and signed by every committee member. Form at: <http://gradstudent.pharmacy.arizona.edu/>
- c. Annual Progress Report
For every year, an Annual Progress Report has to be completed by the student, then reviewed and signed by the advisor, followed by submission to the Track Director. Submission must occur by June 1st using the following link <http://gradstudent.pharmacy.arizona.edu/>
- d. Written Comprehensive Examination Results Form (Written Comprehensive Portion)
A student must obtain signatures from their committee once the research proposal has been approved. Form at: <http://gradstudent.pharmacy.arizona.edu/>
- e. Student Outcomes Assessment Form
Members of the Comprehensive Exam Committee will fill out this form after the Oral Comp Examination and Final Defense, and use it only as a measurement for the outcomes and not for the purpose of grading. The student will take one form for each committee member to the Exam (included in the Exam Packet from the Graduate Programs Office).