
UAB GRADUATE SCHOOL
& GLOBAL AFFAIRS

The University of Alabama at Birmingham

C  **CANCER BIOLOGY**
Graduate Program at **UAB**

Supplement to the
GRADUATE and GBS STUDENT HANDBOOK
2024-2025

Note: This information is supplemental to the material presented in the *Office of Graduate Biomedical Sciences 2024-2025 Student Handbook*. Please refer the GBS Handbook for detailed information on resources, programs and policies common to all GBS Themes.

CANCER BIOLOGY THEME

Theme Director: Lalita Shevde-Samant, Ph.D.
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Important Dates August 2024– July 2025

Classes: GBS 707 August 27 and September 30
 GBS 708 September 26 – October 30
 GBS 709 October 31 – December 11

 GBS 770 January 6 – January 31
 GBS 769 February 3 – February 28
 GBS 753/723 March 3 – March 28
 GBS 774 March 31 – April 25

Rotations: August 12 – October 11
 October 14 – December 13
 January 2 –February 28
 March 3 – May 2 (if needed)

CANCER BIOLOGY (CANB) CURRICULUM

The Cancer Biology (**CANB**) Theme curriculum is designed to give students a broad understanding of the diverse research areas that comprise cancer research. Advanced classes and other opportunities are geared towards the student's specific cancer-related interests.

Year 1

First year students will follow a structured schedule designed to provide a broad base of knowledge for advanced studies. Concurrent with the first year of course work, each student will have the opportunity to undertake four laboratory research rotations (~8 weeks each) with mentors of their choosing in any of the GBS themes (see next page for details on rotation). At the end of each rotation, students will receive a grade for this rotation.

First year students will also attend the Cancer Biology Journal Club on Fridays at 2PM, but will not be required to register or present. Starting in the second year, students will be required to register for a journal club each fall and spring semester.

First Year Student Schedule - Fall Semester

Subj	Crse	Title	Credit Hrs	Course Director	Days	Time	Dates
GBS	707	Bas. Biochem/Metabolism	2	Mythreye Karthikeyan, Shannon Bailey	MTWRF	08:00 - 10:00am	Aug 27- Sept 30
GBS	708	Basic Genetics/Mole Bio	2	David Schneider, Rui Zhao	MTWRF	08:00 - 10:00am	Sept. 26- Oct 30
GBS	709	Basic Bio Organization	2	Sasanka Ramanadham, Alecia K Gross	MTWRF	08:00 - 10:00am	Oct 31 - Dec 11
GBS	701	Core Concepts in Research	1	Jianhua Zhang, Tanecia Mitchell	M and F		Aug 12 and Oct 18
GBS	795	Lab Rotation 1	1	David Schneider	MTWRF		Aug 12 - Oct 11
GBS	796	Lab Rotation 2	1	David Schneider	MTWRF		Oct 14- Dec 13

First Year Student Schedule - Spring Semester (subject to change)

Subj	Crse	Title	Credit Hrs	Course Director	Days	Time	Dates
GBS	770	Pathobiology of Cancer	2	Frida Rosenblum	MTWRF	8:00a - 10:00a	Jan 6 - Jan 31
GBS	769	Carcinogenesis	2	Rajeev Samant, Lalita Samant	MTWRF	8:00a - 10:00a	Feb3 - Feb 28
GBS	752	Intro to Pathobiology	2	Eason Hildreth, OR	MTWRF	8:00a - 10:00a	Mar 3- Mar 28
GBS	723	Model Systems for Genetic Analysis	2	John Hartman, John Parant	MTWRF	8:00a - 10:00a	Mar 31 - April 25
GBS	774	Cancer Immunology	2	Nabiha Yusuf	MTWRF	8:00a - 10:00a	Mar 31- Apr 25
GBS	797	Lab Rotation 3	1	David Schneider	MTWRF		Jan2 - Feb 28

First Year Student Schedule - Summer Semester

Subj	Crse	Title	Credit Hrs	Course Director	Days	Time	Dates
GBS	794/ 798	Lab Rotation 4 (if needed)/ Non-dissertation Research	6	David Schneider	MTWRF		Mar 3 - May 2
GRD	717	Principles of Sci Integrity	3	Lisa Curtis	Online + 8 hr wkshp		May 5 - Aug 8

Discussion Group Meetings. There will be 3 discussion group meetings held on Fridays during fall semester. The groups are, Cell Biology (Dr. Eason Hildreth), Biochemistry (Dr. Will Placzek) and Cancer Genetics (Drs. Darshan Chandrashekar and Soory Varambally). The dates for each of these groups, the time of the group meeting, and the venue will be e-mailed to you by the Group Leader and/or the GBS Office.

Rotations and choosing a thesis mentor. Laboratory rotations are meant to help students become acquainted with the laboratory and the mentor and gain practical experience in a variety of the techniques and types of scientific questions being addressed within different laboratories. We anticipate that at the end of the fourth rotation, the student will identify a thesis mentor. In choosing laboratories for rotations, that students should inquire directly about the funding status of the laboratory and whether the faculty member will be accepting students permanently. When a student and mentor come to a mutually agreeable decision about joining the laboratory, the Chairman of the mentor's primary department must sign an agreement to support the student in the event the mentor is not able. In special circumstances, a fifth rotation may be required. Detailed regulations for rotation are in the GBS handbook and appropriate forms are on the GBS web site.

Note: In the event that the student is able to identify a mentor's laboratory after two rotations and that there is mutual agreement between the student and the potential mentor, the student will need to appeal to the Associate Director of the GBS to waive the third and fourth rotation. This appeal should include a short description on why the student feels so strongly about joining the lab and how prior research experience informed this decision.

Summer Semester – Students will continue with Non-dissertation research in the summer after their first year.

Transfers to Cancer Biology Theme. If a student would like to transfer into the CANB Theme after the first year, courses taken in other themes will count toward meeting the course requirements for Cancer Biology. Specific advanced courses may be required. These additional courses will be determined on a case-by-case basis in consultation with the mentor, theme director, and thesis committee.

Individualized Development Plan (IDP) – The IDP will be initiated during the student's first year and should be updated and modified as the student progresses through graduate school. Students will have an information session following the GBS core classes within the first few weeks of the term.

Beginning with their first committee meeting, students should present a slide or handout of 2-4 goals from their IDP at their committee meeting. This should include the students plan to meet, progress, and possible changes to the goals to be reviewed briefly at subsequent committee meetings. Please see the GBS Handbook for general information about the IDP.

Year 2 and beyond.

GRD 717- Principles of Scientific Integrity (Bioethics) Bioethics is required and should be taken in the summer of the student's first year. The class must be completed before taking the Qualifying Exam.

GBS 777- Seminar. Beginning in the second year, students will take the Cancer Biology Seminar course each Fall and Spring semester until graduation. Because the cancer related seminars are offered through a variety of departments and centers, GBS 777 will allow students to attend cancer-related seminars of their choosing at UAB or associated institutions (SRI, HudsonAlpha).

Each student will keep an **electronic** seminar journal that includes each seminar date, title and a **brief** synopsis of the seminar. The journal will be emailed to the theme directors before the end of the semester. Anyone turning in a journal after the deadline will receive NP for the course. At least 12 cancer-related seminars must be attended and documented in the Journal each semester for GBS 777.

Seminar guidelines: Seminars should be cancer relevant, but do not need to specifically address cancer. Acceptable seminars include regular departmental seminars, Cancer Center seminars, and special seminars/multi-speaker symposium/retreats (but not more than 2 journal entries per event). Seminars given by graduate students or postdoctoral fellows do not count towards the 12 seminar total, except for

final Defense of Dissertation seminars. Students attending tumor board presentations may include up to 4 such sessions in their 12 seminar total.

Suggested format for Seminar entries:

File Name: Standard file name format- Seminar Journal_Semester (Spring or Fall) Year_ LastNm, First Title:

Name and Affiliation of speaker:

Date / Time / Venue of talk:

Hypothesis/objective:

Data/approach:

Summary of findings/take home message

Note: descriptions should be concise; bullet points are acceptable

Journal Club. Cancer Biology students must participate in a cancer-relevant journal club related to the student’s research interests during the Fall and Spring semesters. Journal club provides students with valuable experience in critical assessment of the scientific literature, enhances presentation skills and keeps students up-to-date on emerging cancer research. Most Cancer Biology students will take the Cancer Biology Journal Club (GBS 776); however, other journal clubs may be included upon approval of the mentor and Cancer Biology theme director. Students are required to present at least once a year in the journal club but are encouraged to present more often if possible. Alternative journal clubs relevant to the Cancer Biology theme include but are not limited to: Pharmacology Journal Club (PHR 790), Journal Club in Structural Biology (GBS 786) and more.

Advanced Courses. Students must successfully complete at least three advanced courses (700 level; graded classes only) with a grade of B or better prior to graduation. Advanced courses are chosen after consultation with the mentor and, if applicable, the student’s thesis committee. Advanced courses offered by any theme or department will count toward this requirement.

In addition, spring introductory courses from other themes can be completed for advanced credit. In most cases, additional assignments will be required to bring the course up to an advanced level. An advanced course credit form must be submitted through the GBS office for this.

Advanced Course Offerings by Cancer Biology (subject to change)

Subj	Course	Title	Credit Hrs	Course Master	Course Offerings
GBS	775	Cancer Treatment	3	Karina Yoon, Chris Willey	Spring, even years
GBSC	725	Cancer & Micro Environment	3	Andrea Comba	Fall, even years
GBSC	721	Brain Tumor Biology	3	Anita Hjelmeland	Fall, odd years
GBS	743	Quantitative Approaches in Basic, Translational, and Clinical Oncology Research- Shared Resources	3	Anna Sorace, Jim Mobley	Spring, every year
GBS	787	Hallmarks of Cancer	3	Romi Gupta	Fall, every year

Non-dissertation Research. Cancer Biology students generally take a total of 9 credits per Fall and Spring semesters and 9 hours in the summer. Non-dissertation research is laboratory research performed prior to admission to candidacy (before the qualifying exam). Non-dissertation research credits are graded on a Passed/ Not Passed scale. After enrolling for Advanced Classes, Journal Club and Seminar, students will register for non-dissertation research up to the required number of credit hours each semester.

Assembling a thesis committee. At the beginning of their second year and before the qualifying exam, students must assemble a thesis committee. Instructions and requirements for the thesis committee are detailed in the GBS handbook. In general, the committee consists of 5 faculty, each of whom contributes some expertise to guide the

student's project. The committee must be approved by the Graduate School. It is required that the thesis committee meet at least one time prior to the qualifying exam. After the qualifying exam and during years 2-4, the student should meet with the committee at least once a year. After year 4, the student must meet with the committee every 6 months. After each committee meeting, a written progress report evaluation must be completed and submitted to the GBS Office.

Qualifying Exam. The details of the requirements for the qualifying exam and associated timelines are discussed in the GBS handbook. Briefly, the exam will include a written research proposal as well as an oral defense of this proposal. The proposal will be written on the topic of the student's thesis research and will be formatted like a 6 page NIH F31 Pre-doctoral Fellowship grant application. During the oral phase of the exam, the student will be required to defend the proposal as well as address general scientific questions to gauge the students general knowledge, comprehension, and critical thinking skills. The qualifying exam should be completed by the end of the second year. Students are required to include the Theme Directors in scheduling the Qualifying Exam to ensure that one of the Cancer Biology theme directors is in attendance at their qualifying exam.

Dissertation Research. Students will register for dissertation research after the successful completion of the qualifying exam and admission to candidacy approval.

Clinical Opportunities for Advanced Cancer Biology Students After successful completion of the qualifying exam, candidates will also have the opportunity to advance their understanding of clinical issues in cancer prevention, diagnosis and therapy through involvement in clinical forums and interaction with cancer clinicians including Grand Rounds with the Division of Hematology/Oncology, Pathology Grand Rounds, and Tumor Boards in Pathology. Or Precision Medicine. Students should discuss these opportunities with the Mentor and theme directors.

Thesis defense. Details of the policies and forms required for the thesis defense are listed in the GBS and Graduate School Handbooks. In general, Cancer Biology students should have at least two first author publications related to their thesis work. Exceptions can be approved by the thesis committee. Deadlines and rules for the final preparation of your dissertation and graduation requirements are available from the Graduate School and may be obtained from the Graduate School website (<http://www.uab.edu/gbs/home/student-resources/handbook-library>).

On average, students should plan for 1-2 months to devote to writing their dissertation. Students should schedule a private defense with their committee prior to the public defense, with the public defense scheduled 10-14 days after the private defense. The written thesis is a summary of the student's research and scholarship over several years. Each committee member is expected to read the thesis prior to oral defense of the dissertation, thus the student must deliver the written thesis to each committee member at least 14 days prior to the oral defense. Failure to meet with deadline may result in rescheduling the oral defense. Theme co-directors should be provided an electronic copy of the dissertation.

Students passing the private defense will go on to give their Public Defense of Dissertation.

When students are ready to schedule their final (public) defense, they should confer with the GBS Administration and schedule the defense at a time that does not conflict with other student defense presentations and allows attendance of at least one of the CANB Co-Directors at the public defense. Include the Theme Directors in scheduling the public defense.

Cancer Biology Thesis Format. In addition to the prescribed Thesis format, UAB Graduate School's "UAB Format Manual for Theses and Dissertations" allows for preprints (submitted or in preparation) to be included.

The Preprint/Reprint Option

The preprint/reprint option (i.e., journal articles that appear as chapters) is for students who have written closely related articles which have already been published (reprint) and accepted for publication, under review for publication, or being prepared for publication (preprint). Students considering this option **must first obtain the**

approval of their graduate committee. Doctoral students are typically expected to be first author on a minimum of two articles. Master's level students are typically expected to be first author on one or two articles; however, final requirements are at the discretion of the department and/or the graduate committee and are not dictated by the Graduate School.

If the graduate committee approves the submission of the Thesis in the Preprint/reprint style, the following mandates must be followed:

1. The dissertation must include an expanded Introduction section. This can be formatted so as to introduce each of the manuscripts or a single Introduction section for the Thesis.
2. There must be an expanded section on Materials and methods. This is essential because very often, manuscripts have an abbreviated version to comply with the word requirements of journals.
3. There needs to be an expanded Discussion section that can be formatted to summarize the findings of each manuscript or the entire body of the research.
4. Copying exact wording and using that in the expanded Introduction and Discussion section is not permitted. The students are expected to write these sections in a manner that is comprehensive and non-overlapping with the manuscript(s).
5. Include a section on Future Directions that puts into perspective the findings from your research in the context of the literature and the research field. This is meant to showcase your ability to integrate your findings and propose future directions that the work could take.
6. Given that manuscripts often have co-authors who have contributed to the research, such data should be clearly indicated in the Thesis with due credit given to the co-author (i.e. data courtesy of Dr. John Smith).

Special requirements for students after their fifth year. Once a student enters into a laboratory (after completing the core curriculum) he or she will receive up to 5 years of support by the mentor. The stipend is not an entitlement and will be evaluated on a yearly basis for research progress and thesis committee evaluation. After 5 years, the student will have to petition their Graduate committee for an extension of the graduate stipend. Both the Graduate committee and Drs. Shevde-Samant and Varambally will have to approve this extension. The extension will be for 1 year and must be re-approved each subsequent year. Obviously, this does not insure that the student will complete his/her thesis during this timeframe, but may mean that the student will have to complete the thesis work without benefit of a stipend. Exceptions to this rule include maternity leave or an extended illness. Those students that transfer to another laboratory during their thesis work would be evaluated based on the recommendations of their new thesis committee and with the approval of Drs. Varambally and Shevde-Samant. Policies regarding leave of absence and displaced students are detailed in the GBS Handbook.

Participation in Cancer Biology events. Students are required to attend Cancer Biology events, including:

- Monthly Cancer Biology Student Theme Meeting (Young Investigator Seminars) – A student led seminar series will provide a forum for advanced students to present their current research progress to their peers. One CANB student will present in each session (20 min presentation, 10 min discussion). These seminars will occur once a month in collaboration with the O'Neal Comprehensive Cancer Center.
- We also will try and schedule 'fun' Theme and Team-building lunches once every semester ☺
No registration is needed for first year students. Second year and beyond-registration is required.
- Defense of Dissertation for Cancer Biology students (these can count towards the 12 seminar total for GBS 777 Cancer Biology Seminar class).
- The annual O'Neal Comprehensive Cancer Center Retreat (all students, 2nd year and beyond, should present their research in the poster session).

In addition, we ask that students plan to participate in recruitment activities for Cancer Biology GBS applicants.

Students should check emails regularly for announcements from the GBS Program Managers and Co-Directors. Individuals are expected to respond within one working day of a request for information.

Certificate Programs. The GBS offers certificate programs with specialized instruction for specific career paths. Students can enroll in these programs with the permission of their mentor and committee members. More information can be found at: <http://www.uab.edu/gbs/home/themes/certificates>

Cancer Biology Faculty

You may find the faculty designated as Cancer Biology faculty at:

<http://apps.medicine.uab.edu/facultydirectory/FacultyListingType.asp?FacultyTypeID=CB>

*There are additional faculty doing cancer related research at UAB and associated institutions (SRI, HudsonAlpha).

First Year Course Descriptions.

Core curriculum GBS 707, 708, 709- Overview of basic biochemistry, genetics, and cell biology.

GBS 770- Pathobiology of Cancer (Frida Rosenblum) In this course, students will gain an understanding of the pathology and epidemiology of cancer in general and an appreciation of the gross, histologic and molecular pathology of cancers of multiple organs, including the brain, lungs, skin, breast, prostate, colon, bone marrow and lymph nodes. The students will learn the basis of the pathologic classification of cancers of particular organs, including the gross, microscopic and molecular features that aid in classification. The clinical implications (i.e., prognostication and treatment) of the classification systems will be discussed.

GBS 747- Carcinogenesis (Lalita Samant and Rajeev Samant) This course is intended to introduce the concepts in carcinogenesis, followed by understanding the etiology, molecular events and signaling pathways involved. Topics include oncogenes and tumor suppressor genes, cancer stem cells, DNA damage and repair, cell cycle, apoptosis and cell death, and immunologic and metabolic alterations, and signaling in cancer.

GBS 723- Model Systems for Genetic Analysis (John Hartman and John Parant) This course is designed to introduce various genetic model systems to students. The model organisms discussed in this course include bacteria, yeast, plants, worm, fly, killifish, zebrafish, chick, frog and mouse. Students will learn about the basic physiology and genetic manipulation tools for each organism. There will be one lecture highlighting the strength of each model organism. The students will also learn how to use induced pluripotent stem (iPS) cells in disease models.

GBS 752- Intro to Pathobiology (Eason Hildreth) This 4-week course consists of a series of lectures and case discussions designed to help students explore the fundamental mechanisms and pathologic basis of disease. It is designed to be an introduction to pathobiology with an emphasis on using clinic examples and experimental studies of disease processes to help anchor the main points. The instructors present general pathology and pathogenic principles in a way that is easy to understand and remember. The material presented will give students the background knowledge to tackle any complex disease process from a solid scientific foundation.

GBS 774- Cancer Immunology (Nabiha Yusef) This course will review basic concepts in immunology, including the innate and adaptive immune response and immunological methods. The lectures will then examine topics in tumor immunology including the interaction of the immune system and tumors, and cancer immunotherapy.

GRD 717- Bioethics (Lisa Curtis) This course surveys ethical issues and principles in the practice of science. Among the topics discussed are the nature, extent, and causes of fraud in the sciences; UAB policies on fraud; ideals of good science; the responsibilities of authorship and peer review; potential problems raised by the commercialization of research; scientists as public policy advisors; and ethical issues involved in animal experimentation and in clinical trials.

The following first year course may be taken as an advanced course, with the permission of the instructor and appropriate modification to the requirements.

GBS 753- Pharmacology & Toxicology and Molecular Medicine (Robert van Waardenburg and Karina Yoon)

This course is designed to provide an introduction to the basic principles of Pharmacology and Toxicology. The course covers pharmacokinetic (PK)/pharmacodynamic (PD) principles, drug metabolism and drug-drug interactions, drug discovery and development, structure-based drug design, drug transporters, pharmacogenomics, principles of toxicology, environmental and clinical toxicology.