



**Supplement to the  
GRADUATE and GBS STUDENT HANDBOOK  
2017-2018**

Note: This information is supplemental to the material presented in the *Graduate Biomedical Sciences 2017-2018 Student Handbook*. Please refer the GBS Handbook for detailed information on resources, programs and policies common to all GBS Themes.

## CANCER BIOLOGY THEME

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## Important Dates August 2017 - July 2018

|                               |   |
|-------------------------------|---|
| Classes:                      | GBS 708 / August 8 - September 18<br>GBS 707 / September 19 - October 30<br>GBS 709 / October 31 - December 15  |
|                               | GBS 710 / January 8 - February 2<br>GBS 720 / February 5 - March 2<br>GBS 774 / March 5 - March 30<br>GBS 753 / April 2 - April 27  |
|                               | GBS 770 / April 30 - May 25   |
| Rotations:                    | August 14 - October 13<br>October 16 - December 15<br>January 8 - March 9<br>March 12 - May 11  |
| Holidays:<br>UAB Closed       | September 4 / Labor Day<br>November 23 and 24 / Thanksgiving Holiday<br>December 16 - January 2 / Christmas Holiday<br>January 15 / MLK Day<br>May 28 / Memorial Day<br>July 4 / Independence Day |
| Theme Seminar<br>11am-12:15pm | September 5<br>October 3<br>November 7  |
| SHEL 105                      | December 5<br>January 9<br>February 6<br>March 6<br>April 3   |

### **CANCER BIOLOGY CURRICULUM**

The Cancer Biology 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 perform three laboratory research rotations (~8 weeks each) with mentors of his/her choosing in any of the GBS themes. At the end of each rotation, the students will present their research in the form of a poster.

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 semester.

#### **First Year Student Schedule - Fall Semester**

| Subj | Crse | Title                   | Credit Hrs | Course Director                     | Days  | Time            | Dates            |
|------|------|-------------------------|------------|-------------------------------------|-------|-----------------|------------------|
| GBS  | 708  | Basic Genetics/Mole Bio | 2          | David Schneider                     | MTWRF | 08:00 - 10:00am | Aug 8 – Sept 18  |
| GBS  | 707  | Bas. Biochem/Metabolism | 2          | Scott Ballinger,<br>Shannon Bailey  | MTWRF | 08:00 - 10:00am | Sept 19 – Oct 30 |
| GBS  | 709  | Basic Bio Organization  | 2          | Elizabeth Sztul,<br>Zsuzsanna Bebok | MTWRF | 08:00 - 10:00am | Oct 31 – Dec 15  |
| GBS  | 795  | Lab Rotation 1          | 1          | David Schneider                     | MTWRF |                 | Aug 14 – Oct 13  |
| GBS  | 796  | Lab Rotation 2          | 1          | David Schneider                     | MTWRF |                 | Oct 16 – Dec 15  |

#### **First Year Student Schedule – Spring Semester**

| Subj | Crse | Title                           | Credit Hrs | Course Director                 | Days  | Time           | Dates           |
|------|------|---------------------------------|------------|---------------------------------|-------|----------------|-----------------|
| GBS  | 710  | Cell Signaling                  | 2          | Michael Miller                  | MTWRF | 8:00a - 10:00a | Jan 8 – Feb 2   |
| GBS  | 720  | Genomic Structure /<br>Function | 2          | Michael Crowley                 | MTWRF | 8:00a - 10:00a | Feb 5 – Mar 2   |
| GBS  | 769  | Carcinogenesis                  | 2          | Rajeev Samant,<br>Lalita Samant | MTWRF | 8:00a - 10:00a | Mar 5-Mar 30    |
| GBS  | 774  | Cancer Immunology               | 2-3        | Nabiha Yusuf                    | MTWRF | 8:00a - 10:00a | Apr 2 – Apr 27  |
| GBS  | 797  | Lab Rotation 3                  | 1          | David Schneider                 | MTWRF |                | Jan 8 – Mar 9   |
| GBS  | 794  | Lab Rotation 4                  | 1          | David Schneider                 | MTWRF |                | Mar 12 – May 11 |

#### **First Year Student Schedule – Summer Semester**

| Subj | Crse | Title                   | Credit Hrs | Course Director | Days | Time         | Dates           |
|------|------|-------------------------|------------|-----------------|------|--------------|-----------------|
| GBS  | 723  | Model Sys for Gen Analy | 2          | Kasturi Mitra   | MWF  | 8:00a-10:00a | Apr 30 – May 25 |
| GBSC | 722  | Intro to Biostats       | 2          | Karen Gamble    | MWF  | 8:00a-10:00a | Jun 1 – Jul 31  |

**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. At the end of the third 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 fourth rotation may be required. Detailed regulations for rotation are in the GBS handbook and appropriate forms are on the GBS web site.

**First Year Student Schedule -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 Cancer Biology 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 after class on Tuesday, August 15 and will participate in the workshop with Dr. Dan Bullard.

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 Individualized Development Plan (IDP).

### **Year 2 and beyond.**

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

**GBS 770- Pathobiology of Cancer** This required course will be offered in the summer of odd years. Students will gain an understanding of the pathology of cancer in general and an appreciation of the gross, histologic and molecular pathology of cancers of multiple organs, including the brain, lungs, breast, prostate, colon, bone, 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. Then the clinical implications (i.e., prognostication and treatment) of the classification systems will be discussed. Also, current controversies and topics of research interest may be introduced. In addition, several lectures will focus on the epidemiology of cancer and translational research in cancer, including animal models of cancer.

**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 in 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 course directors at 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. Cancer Biology offers one advanced course each semester. In addition, spring introductory 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.

**Advanced Course Offerings by Cancer Biology**

| Subj | Crse | Title                            | Credit Hrs | Course Master             | Course Offerings   |
|------|------|----------------------------------|------------|---------------------------|--------------------|
| GBS  | 775  | Cancer Treatment                 | 3          | Karina Yoon, Chris Willey | Spring, even years |
| GBS  | 778  | Cancer Metastasis                | 3          | Doug Hurst                | Spring, odd years  |
| GBS  | 779  | Translational Research in Cancer | 3          | Eddy Yang                 | Fall, odd years    |
| GBSC | 725  | Cancer & Micro Environment       | 3          | Yang Yang                 | Fall, odd years    |
| GBSC | 728  | Cancer Genomics                  | 3          | Sooryanarayana Varambally | Fall, even years   |

**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 must be completed and submitted to the Theme Administrator for review by the Cancer Biology Curriculum Committee each year.

**Qualifying Exam.** The details of the requirements for the qualifying exam 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 12 page NIH R01 grant. 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 sometime between the summer of the second year and end of the third year. Most students will take their qualifying exam in the Spring of their third 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.

**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 and Tumor Boards in Pathology. Students should discuss these opportunities with the theme directors.

**Thesis defense.** Details of the policies and forms required for the thesis defense are listed in the GBS and Graduate School Handbooks. The Graduate School requires at least two semesters between the qualifying exam and the thesis defense. In addition, the student must be registered for at least three to five credit hours in the semester of the thesis defense, depending on the need for continued health insurance. 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 (<https://www.uab.edu/graduate/>).

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. 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 Theme Administrator 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. Theme co-directors should be provided an electronic copy of the dissertation.

**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. 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. Shevde-Samant and Varambally. Policies regarding leave of absence and displaced students are detailed in the GBS Handbook.

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

- Monthly Cancer Biology Student Seminar Series – A student led seminar series will provide a forum for advanced students to present their current research progress to their peers. Two students will present in each session (15-20 min presentation, 15 min discussion). These seminars will occur on the first Wednesday of the month, at 11:00-12:15 (lunch included).
- Defense of Dissertation for Cancer Biology students (these can count towards the 12 seminar total for GBS 777 Cancer Biology Seminar class);
- Cancer Biology theme meetings
- The annual Comprehensive Cancer Center Retreat (all students, 2<sup>nd</sup> 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 24 hours 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). Those faculty members may apply to join the Cancer Biology faculty at any time.

### **First Year Course Descriptions.**

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

**GBS 710- Cell Signaling (Michael Miller)** This course covers major extracellular and intracellular signal transduction cascades that regulate animal development and physiology. Topics include the mitogen activated protein kinase cascade, transforming growth factor beta, insulin, and cytokines.

**GBS 720- Genomics (Michael Crowley)** This course covers gene mapping and linkage in humans and animal models of disease. Disease gene mapping and single gene disorders will be covered. Development and use of genomic technology including microarrays and next generation sequencing will be covered in the context of future personalized medicine applications.

**GBS 723 Model Systems for Genetic Analysis (Kasturi Mitra)** 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. The students will learn about the basic physiology and genetic manipulation tools for each organism.

**GBS 769- 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 developmental signaling in cancer.

**GBS 770- Pathobiology of Cancer (Andra Frost)**- 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. *Note: this module will be provided every odd year, and both first and second year students will be take the course in the year it is offered.*

**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.

**GBSC 731- Biostatistics (Karen Gamble)** This course is intended to provide graduate students with an introduction to biostatistics. The emphasis in this course will be upon understanding statistical concepts and applying and interpreting tests of statistical inference. Content will include but not be limited to: choosing the correct test for a given research design, data and data files, data screening, scaling, visual representations of data, descriptive statistics, correlation and simple regression, sampling distributions, and the assumptions associated with and the application of selected inferential statistical procedures (including t-tests, Chi-square, and ANOVA).

**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 and Molecular Medicine (C Falany)** This course is designed to provide an introduction to several of the basics principles and areas of Pharmacology and Toxicology. The course is primarily interactive lectures and discussion focused on introducing graduate students to several aspects pharmacology. The course is divided into sections on Pharmacokinetic/pharmacokinetic principles and Drug Metabolism, Chemotherapy, Drug Discovery and Development, Autonomic Pharmacology and Toxicology.