

**INTD 531 — Cell Biology (Fall 2022)**

**Credit:** 4 units

**Course Sessions:** Tuesdays and Thursdays

**Time:** 9:00 a.m. – 10:50 a.m.

**Location of Lectures:** MCH 156 (in person)

→ a few sessions will be online-only

**First Day of Class:** August 23, 2022

**Course Director:** Axel H. Schönthal, PhD ([schontha@usc.edu](mailto:schontha@usc.edu))

**Teaching Assistant:** Daniel Jake (“DJ”) Fernandez ([djfernan@usc.edu](mailto:djfernan@usc.edu))

**Syllabus Version:** 1.1 (current as of August 17, 2022)

### Course Description

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INTD 531 is a graduate-level course in cell biology that revolves around the concept that the cell is the fundamental unit of life. The cell represents the basic structural, functional, and biological unit of all known organisms. This course will focus on eukaryotic cells of animals, and will present, explore and discuss important aspects of their structure and function, both as individual units and within the context of an organism. Selected from many cell-based diseases, the course will illustrate certain pathological changes of cells within the background of cancer and metastasis as representative disease examples.

Three major areas of cell biology and related biomedical research will be emphasized:

- Module I: Cellular Growth Control and Regulation, with Relation to Cancer Biology
- Module II: The Dynamic Architecture and Composition of Cells
- Module III: Cells In Their Social Context, with Relation to Cancer Metastasis

Each of these areas is covered in a separate module of the course. The course will use the material in the recommended textbook as a starting point, and original recent work and advances in the individual areas (published and unpublished primary research) will be added, along with considerations of experimental procedures and techniques that are being applied to advance these research areas.

### Course Goals

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Students who successfully complete this course will acquire in-depth understanding and advanced knowledge of a range of general and specialized areas in cell biology. They will develop insight into the complexities of cell structure and function, the molecular controls that govern the cells’ dynamic properties, and cellular interactions with the organism as a whole. They will also appreciate how some cellular functions can change to create a tumor cell phenotype.

A further goal of this course is to educate and train the students in skills required for the assembly of a fellowship or grant application. Therefore, an important component of this course will be homework assignments consisting of developing research proposals based on selected course topics. These

assignments will receive feedback from faculty who will comment on strengths and weaknesses of each student's proposal.

## Learning Objectives

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Upon completion of this course, the students should be able to:

- Describe regulation and function of key cellular processes, such as cell division, autophagy, senescence, apoptosis, endo- and exocytosis, migration, as well as cellular communication and interactions with the microenvironment.
- Explain how certain cellular processes function differently in stem cells or cancer cells.
- Design experimental approaches to investigate the above cellular processes.
- Write a structured research proposal to propose an investigational approach to study a novel aspect of cell biology.

## Pre-Requisites, Co-Requisites, Concurrent Enrollment, Recommended Preparation

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There are no pre- or co-requisites, and no concurrent enrollment is required. While there is no specific recommended preparation, students should already be familiar with reading the scientific literature in the biomedical sciences and should have some basic knowledge of hands-on lab research and experimental design, all of which will make it easier for students to succeed in this course. As well, students should anticipate to allocate significant effort to several (graded) homework assignments outside of the regularly scheduled course meeting times, and should expect to spend 30-60 minutes in advance of each lecture to review required pre-lecture materials.

## Course Correspondence and Communication

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Much of the correspondence regarding this course will be distributed via email to each student. It is expected that students regularly (i.e., daily) check their USC email account.

Communications between instructors and students can be made using email, unless otherwise arranged. Students should expect to receive a response to an email inquiry within 48 hours, and are encouraged to re-send their email if a response was not received during this time frame. Email contacts for all lecturers are listed further below. The email address for the course TA is shown on p.1.

All information regarding lectures, reading assignments, and homework will be posted on the Blackboard web site. The Blackboard web site may be entered at <https://blackboard.usc.edu/webapps/login/> Only students who are registered for the course will have access to the Blackboard web site. If you cannot access the web site, inform the course TA.

## Course Textbook

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The recommended textbook is the Seventh Edition (2022) of *MOLECULAR BIOLOGY OF THE CELL*, by Alberts et al. (W. W. Norton & Company publisher). Second-best is the Sixth Edition (2015) of this text, which was published by Garland Science (note that the publisher has changed; but the format of the text has remained the same). The Course Director has requested that the Norris Medical Library

(NML) on the Health Sciences Campus (HSC) places this textbook on hold during the semester, so that students can loan the book for 3 hours at a time. But it is not currently known whether NML already has purchased the new (7<sup>th</sup>) Edition, or whether only the older version (6<sup>th</sup> Edition) is available.

For students interested in purchasing their own copy of this textbook (1552 pages), please note that different formats of this text are available (with different pricing). For example, the publisher (Norton) offers a Loose Leaf version with Ebook + Smartwork + Videos/Animations (\$174) in addition to a conventional Hardcover version (\$217.50 at Norton, \$200 on Amazon). Amazon also offers a 5091-page Kindle version (\$140) and a rental version for \$163. (Students are not required to acquire the textbook.)

### **Technological Proficiency and Hardware/Software Requirements**

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This course requires familiarity with use of the Zoom video-conferencing platform. Several discussion sessions will be held online-only via Zoom, without concurrent meeting in the lecture hall. It requires that enrolled students have secured individual access to the course on Blackboard and know how to navigate this educational technology. Regular, in-person sessions that take place in the lecture hall will not be streamed online; for these in-person sessions, students need to be present in the lecture hall.

### **Attendance, Participation, and Expectations on Student Engagement**

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Students are expected to attend all class sessions, on time, for the entire course of the class. They are expected to come prepared (i.e., have reviewed and understood the pre-class assignments) and actively participate in each and every class.

Students are expected to act in a professional manner, meeting deadlines, solving problems, responding to questions from instructors voluntarily or when called upon, cooperating with classmates, and generally contributing in a positive way to the class. Working in the real world often means searching for solutions in a group context. Teamwork, listening, empathy, enthusiasm, emotional maturity, and consideration of other people's concerns are all essential to success. Please bring these qualities and values with you to class. It is as important to 'practice' these interpersonal skills as it is to learn new intellectual content.

### **Class Format**

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The course will consist of two 2-hour class sessions per week. The lecture schedule and assigned lecturers are listed in the "Course Schedule" (see below). Lecture dates may vary with advance notice. Pre-class review of introductory materials will be required for most classes and will be posted on Blackboard. It is advisable that students login to the course on Blackboard and check for updates regularly.

Most class meetings will consist of no more than one hour of lecturing by the instructor. Some instructors may post introductory reading assignment on Blackboard, which students need to review in order to be sufficiently prepared for that class.

About half of the lecture time will be used for interactive exercises that will emphasize data analysis, experimental design, research proposal preparation, or discussion of primary research reports and relevant research methods.

## Zoom Etiquette

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The course will consist of two 2-hour class sessions per week, and some of these sessions will be delivered via Zoom, i.e., entirely online, without physical presence in the lecture hall. This will allow the use of breakout rooms and facilitate small-group discussions. Students will find it more engaging if everyone is using “video on”, so that students and instructors can see each other. This is particularly true during small-group work in Zoom breakout rooms. It is therefore recommended that you prepare your environment in a manner so you feel comfortable showing yourself. But, while “video on” is strongly encouraged, it is not mandatory. If you are uncomfortable watching yourself on the screen, it is acceptable to keep your video off.

## Exams

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There will be a total of five (5) exams in three different formats. The different formats present challenges that require the application of different cognitive styles and abilities, and therefore aim to support success by all students, irrespective of their highly variable individual learning styles.

- Two (2) exams will consist of multiple-choice questions, based on topics presented during the course section immediately preceding the exam. (*Didactic strategy: emphasizing fact learning and rote memorization.*)
- Two (2) exams will consist of writing and evaluating a research proposal. (*Didactic strategy: focus on critical thinking and creative application of the learned material.*)
- One (1) exam will consist of student presentations. (*Didactic strategy: independent collection, appraisal, consolidation, and communication of course-related topics.*)

## Grading

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The final grade for each student will be assigned based on the student’s performance on all five exams. Points will be given as follows. Distribution of obtainable points:

Max. Points	Exam Part	Exam Content
5	Exam 1, Part 1	Written 1-page Research Proposal
5	Exam 1, Part 2	Peer Critique of 1-page Research Proposal
5	Exam 1, Part 3	Review & Discussion
15	Exam 2	Multiple-Choice Test
20	Exam 3, Part 1	Written 2-page Research Proposal
5	Exam 3, Part 2	Peer Critique of 2-page Research Proposal
5	Exam 3, Part 3	Review & Discussion
20	Exam 4	Student Presentations
20	Exam 5	Multiple-Choice Test
100	Total	Maximum Points Possible

Conversion of points to grades:	≥95 points: A (USC has no A+)
	≥90 to <95: A–
	≥85 to <90: B+
	≥80 to <85: B
	≥75 to <80: B–
	≥70 to <75: C+
	≥65 to <70: C
	≥60 to <65: C–
	≥50 to <60: D
	>50: F

Please note: Any grade below C (i.e., C–, D, F) will be considered “fail” by the Graduate School, meaning that the student will not receive credit for this course, even though the grade still counts toward the GPA. A grade of C is considered “pass” by the Graduate School, meaning that the student receives full credit (4 units in this case).

### **Exam Dates and Deadlines for Upload of Homework Assignments to Blackboard**

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See section: Schedule of Assignments and Exams (below).

### **Late Policy**

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Some of the pre-class work and homework assignments require that students work in groups, and in-course discussion will be based on submitted responses. Therefore, late work will not be accepted.

If you miss an upload deadline because of an unavoidable, documented, and serious reason, discuss the situation with the course director via email to discuss alternatives.

### **Course Recordings**

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As per USC policies, recordings of lecture material by students requires the express permission of the instructor and announcement to the entire class, and can only be used for individual or group study.

### **Special Needs**

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Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to the Course Director as early in the semester as possible. DSP is located in GFS-120 (University Park Campus) and is open 8:30 a.m. – 4:30 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776. Their website is <http://dsp.usc.edu>.

### **Stress Management**

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Students are under a lot of pressure. If you start to feel overwhelmed, it is important that you reach out for help. A good place to start is the Eric Cohen Student Health Center on this campus (the Health

Sciences Campus, HSC). The phone number is (323) 442-5631 and the website is <http://ecohenshc.usc.edu>. The service is confidential, and there is no charge.

### **Student Counseling Services**

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Tel: (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

<https://engemannshc.usc.edu/counseling/>

### **National Suicide Prevention Lifeline**

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Tel: 1-800-273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. <http://www.suicidepreventionlifeline.org/>

### **Beyond Academic Challenges**

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Balancing course work, midterms, finals, and laboratory research presents a challenge and at times can feel overwhelming. On top of that, many students are far away from home and family, perhaps even their country and their native language, which can feel quite depressing. Sometimes, relationship problems come up and make life miserable. But no matter the problem, USC offers resources to help students deal with depression, anxiety, and other types of distress. USC's services are not only geared toward helping students with academic challenges, but also with personal problems. Students in need should not hesitate to take advantage of the services that are listed above (and on the next page); there is no need to feel embarrassed or ashamed. USC is offering these services and resources so that students are in the best position to meet their academic and personal goals.

### **Content of the Following Pages**

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- **Statements on Academic Conduct etc.**
- **Schedule for Lectures and Assignments**
- **Email Contacts of Lecturers**
- **Details on Homework Assignment (incl. Example of Research Proposal)**

## ACADEMIC CONDUCT

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Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in Section 11 of the *SCampus* publication (online at: <https://policy.usc.edu/student/scampus>).

Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct/>.

## ACADEMIC INTEGRITY STANDARDS

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The University prides itself in maintaining high academic integrity standards. The entire academic community benefits from the adherence to such standards. An academic integrity overview, including descriptions of dishonest acts and consequences for students found responsible, is available online at: <https://sjacs.usc.edu/students/academic-integrity/>.

Further information, including a number of tutorials for students, can be found online at: <https://libraries.usc.edu/research/reference-tutorials>. This website has tutorials such as: how to avoid plagiarism, how to prevent academic dishonesty, how to manage your research, and other useful how-to tools and tutorials.

## DISCRIMINATION, HARASSMENT, ASSAULT

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Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu> or to the *Department of Public Safety* <http://dps.usc.edu/>. This is important for the safety of the whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. The Relationship and Sexual Violence Prevention (RSVP) Services at <https://engemannshc.usc.edu/rsvp/> provide 24/7 confidential support, and the Sexual Assault Resource Center webpage <https://sarc.usc.edu/> describes reporting options and other resources.

## OTHER SUPPORT SYSTEMS

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A number of USC schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* [http://sait.usc.edu/academicssupport/centerprograms/dsp/home\\_index.html](http://sait.usc.edu/academicssupport/centerprograms/dsp/home_index.html) provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu/> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.

## INTD-531 SCHEDULE OF LECTURES AND EXAMS — Fall Semester 2022

Lecture dates are Tuesdays and Thursdays 9:00 a.m. — 10:50 a.m.

Location: MCH 156 (Health Sciences Campus)

Schedule Version: 2 (08/10/2022)

### Module I: Mechanisms of Cell Growth Control, Proliferation, Survival, and Death

<i>Date</i>	<i>Topic</i>	<i>Lecturer</i>
Aug. 23	Introduction — Review of Course Format — Assignments — Exams	Dr. A. Schönthal
Aug. 25	Cellular Growth Control and Cell Cycle	Dr. A. Schönthal
Aug. 30	Applied Methods: Autophagy – Senescence – Cell Death	Dr. A. Schönthal
Sept. 1	Principles of Intracellular Signaling	Dr. E. Zandi
Sept. 6	Introduction to Cancer Cell Biology	Dr. A. Schönthal
Sept. 8	Applied Principles of Intracellular Signaling	Dr. E. Zandi
Sept. 13	Regulation of Stem Cell Self-Renewal and Growth	Dr. Q. Ying
Sept. 15	Systems Biology Approaches	Dr. N. Graham
Sept. 20	Circulating Tumor Cells	Dr. A. Goldkorn
Sept. 22	Applied Systems Biology Approaches	Dr. N. Graham
Sept. 27	Discussion of students' research proposals #1 + critiques #1	Dr. A. Schönthal

### Module II: The Dynamic Architecture and Composition of Cells

<i>Date</i>	<i>Topic</i>	<i>Lecturer</i>
Sept. 29	Mitochondrial Function in Health and Liver Disease	Dr. S. Win
Oct. 4	Endoplasmic Reticulum Function and GRP78	Dr. R. Hill
Oct. 6	Manipulating Endoplasmic Reticulum Stress and GRP78	Dr. R. Hill
Oct. 11	Membranes and Organelles	Dr. C. Okamoto
Oct. 13	Fall Recess	
Oct. 18	Endocytosis and Exocytosis	Dr. C. Okamoto
Oct. 20	Cytoskeleton, Motors and Transport	Dr. R. Lansford
Oct. 25	Cell Motility and the Cytoskeleton	Dr. R. Lansford
Oct. 27	Discussion of students' research proposals #2 + critiques #2	Dr. A. Schönthal



### Module III: Cells In Their Social Context

<b>Date</b>	<b>Topic</b>	<b>Lecturer</b>
Nov. 1	Overview of the Microenvironment of the Cell	Dr. Y. DeClerck
Nov. 3	Cell-Matrix Interactions: Integrins and Other ECM Adhesion Molecules	Dr. S. Swenson
Nov. 8	The Extracellular Matrix: Structure, Function, and Applications in Tissue Engineering	Dr. M. McCain
Nov. 10	From Hands-on Bench Work to Commercialization	Dr. S. Swenson
Nov. 15	The Tumor Microenvironment: Social Environment of the Cancer Cell	Dr. Y. DeClerck
Nov. 17	Extracellular Vesicles as Communicators between Cells	Dr. L. Sarte
Nov. 22	Inflammation: A Disease of the Social Environment	Dr. Y. DeClerck
Nov. 24	Thanksgiving Holiday	
Nov. 29	Extracellular Vesicles: Diagnostic and Therapeutic Potential	Dr. L. Sarte
Dec. 1	Student Presentations & Discussion	Dr. Y. DeClerck
Dec. 3-6	Study Days	

Dec. 15: Start of Winter Recess

## E-MAIL CONTACTS FOR LECTURERS

### Module I: Mechanisms of Cell Growth Control, Proliferation, Survival, and Death

<b>Lecturer</b>	<b>Email Address</b>
Dr. Axel Schönthal	<a href="mailto:schontha@usc.edu">schontha@usc.edu</a>
Dr. Amir Goldkorn	<a href="mailto:agoldkor@usc.edu">agoldkor@usc.edu</a>
Dr. Qilong Ying	<a href="mailto:qying@usc.edu">qying@usc.edu</a>
Dr. Nicholas Graham	<a href="mailto:nagraham@usc.edu">nagraham@usc.edu</a>
Dr. Ebrahim Zandi	<a href="mailto:zandi@usc.edu">zandi@usc.edu</a>

### Module II: The Dynamic Architecture and Composition of Cells

<b>Lecturer</b>	<b>Email Address</b>
Dr. Sanda Win	<a href="mailto:swin@usc.edu">swin@usc.edu</a>
Dr. Reginald Hill	<a href="mailto:rhill@eitm.org">rhill@eitm.org</a>
Dr. Rusty Lansford	<a href="mailto:lansford@usc.edu">lansford@usc.edu</a>
Dr. Curtis Okamoto	<a href="mailto:cokamoto@usc.edu">cokamoto@usc.edu</a>

### Module III: Cells In Their Social Context

<b>Lecturer</b>	<b>Email Address</b>
Dr. Yves DeClerck	<a href="mailto:ydeclerck@chla.usc.edu">ydeclerck@chla.usc.edu</a>
Dr. Megan McCain	<a href="mailto:mlmccain@usc.edu">mlmccain@usc.edu</a>
Dr. Steve Swenson	<a href="mailto:sswenson@usc.edu">sswenson@usc.edu</a>
Dr. Randall WidELITZ	<a href="mailto:widelitz@usc.edu">widelitz@usc.edu</a>
Dr. Laurence Sarte	<a href="mailto:LSarte@chla.usc.edu">LSarte@chla.usc.edu</a>