

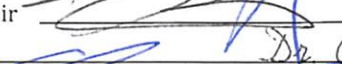

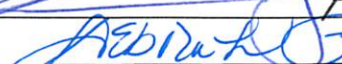
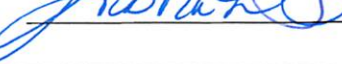


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| <br><b>FLORIDA ATLANTIC UNIVERSITY</b>   | <b>NEW COURSE PROPOSAL</b><br><b>Graduate Programs</b>   |   | UGPC Approval _____<br>UFS Approval _____<br>SCNS Submittal _____<br>Confirmed _____<br>Banner Posted _____<br>Catalog _____ |
|   | <b>Department</b> Biology<br><b>College</b> Science<br><i>(To obtain a course number, contact erudolph@fau.edu)</i>                        |   |  |
| <b>Prefix</b> BOT<br><br><b>Number</b> 5545   | <i>(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)</i><br><b>Lab Code</b>   | <b>Course Title</b><br>Advanced Plant Cell Biology  |  |
| <b>Credits</b> <i>(Review Provost Memorandum)</i><br>3  | <b>Grading</b> <i>(Select One Option)</i><br><br><b>Regular</b> <input checked="" type="radio"/><br><b>Sat/UnSat</b> <input type="radio"/> | <b>Course Description</b> <i>(Syllabus must be attached; see Guidelines)</i><br>Plant Cell Biology covers cell and molecular biology using experimental approaches and including discussion of model organisms. |  |
| <b>Effective Date</b> <i>(TERM &amp; YEAR)</i><br>Spring 2019   | <b>Prerequisites</b>   |   | <b>Corequisites</b>  |
|   |  | <b>Registration Controls</b> <i>(Major, College, Level)</i><br>Biology, College of Science, 5000  |  |
| <i>Prerequisites, Corequisites and Registration Controls are enforced for all sections of course</i>  |  |   |  |
| <b>Minimum qualifications needed to teach course:</b><br>Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.) |  | <b>List textbook information in syllabus or here</b><br>In Syllabus   |  |
| <b>Faculty Contact/Email/Phone</b><br>Dr. Zhang/xhzhang@fau.edu/7-1011  |  | <b>List/Attach comments from departments affected by new course</b><br>N/A  |  |

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|---|---|
| <b>Approved by</b><br>Department Chair <br>College Curriculum Chair <br>College Dean <br>UGPC Chair <br>Graduate College Dean <br>UFS President _____<br>Provost _____ | <b>Date</b><br>11-6-17<br>11-6-17<br>11-6-2017<br>11/7/17<br>11-21-17 |
|---|---|

Email this form and syllabus to [UGPC@fau.edu](mailto:UGPC@fau.edu) one week before the UGPC meeting.

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# ***Syllabus*** *Advanced Plant Cell Biology Spring 2019*

Plant Cell Biology - BOT 5545

2:00 - 4:50 TUESDAY

Sanson Life Sciences Bldg SC 119

**Credit hours:** 3

**Format:** In Person

On Line course: No

**Course number:** BOT 5545

**Prerequisites:** This graduate level course has been listed with no prerequisites. However preparation in plant biology, cell and molecular biology and plant physiology will best prepare you for success. If you lack adequate preparation you will need to plan extra study time to keep up with the material.

## **Instructor contact information**

Instructor: Dr. Xing-Hai Zhang

Office: SC Office Hours: Tuesday 11-2 or by appointment

Office Phone: 561 297-1011

E-mail Address: [xhzhang@fau.edu](mailto:xhzhang@fau.edu)

## **Required text**

The text is *The Molecular Life of Plants*. First edition. Jones, Ougham, Thomas and Waaland. 2013. The book may be purchased as a new or used hard copy or paperback, electronic copy or rented from the publisher, Wiley-Blackwell. ISBN 978-0-470-87012-9 (paperback). ISBN 978-0-470-87011-2 (hardback). There are used copies available on Amazon as well as new copies and links to purchase rental copies and electronic copies from the publisher and in the FAU Bookstore. It is not available in the FAU Library or through interlibrary loan. The book should be purchased before the first day of class.

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There is a companion web site [www.wiley.com/go/jones/molecularlifeofplants](http://www.wiley.com/go/jones/molecularlifeofplants) that can be accessed with power points of all figures and PDFs of tables. At the present time this can be accessed without an access code needed. There are no text or study guides on the web site.

In addition, if you have limited plant biology background you may want to purchase a copy of Raven, Biology of Plants by Evert and Eichhorn. ISBN 978-1-4292-1961-7 8th edition WH Freeman and Company. Used copies of the earlier 7<sup>th</sup> edition are available from Amazon very inexpensively and have sufficient background material.

Additional materials as needed.

## **Course description**

Advanced Plant Cell Biology covers the cell biological aspects established in plant anatomy, plant physiology, plant growth and development, plant taxonomy, plant biochemistry, and plant molecular biology. An emphasis is made on experimental approaches used to understand these processes at the molecular level. A discussion of model organisms and cell types will be included. Format will include lectures, discussions, and in-class student presentations.

This is an exciting time for plant biology!!! Plants are the basis of all life on Earth. They are components of natural ecosystems; as crops used for food, feed and materials; used as model systems to understand all eukaryotic cellular function; and also used to understand human biology and disease at a cell and molecular level. Plant cell biologists are beginning to understand the complex signals and molecular networks of plants that make them unique while sharing cellular characteristics of all eukaryotic organisms.

We will emphasize scientific communication, examination of current literature (both primary and secondary sources) and developing personal skills. Grant writing and grant awarding procedures and processes will be covered as well as scientific oral presentations.

Some course materials (syllabus, reading assignments, announcements, team projects, plants in the news articles, etc.) will be available on FAU Canvas (the new course management system for FAU). <https://canvas.fau.edu/>

## **Course objectives/student learning outcomes**

This course is designed to introduce graduate students to contemporary plant cell and molecular biology. Advances in plant cell biology are due to the intersection of plant

biochemistry, physiology, genomics, development, molecular biology and evolution research. New techniques, model organisms, international cooperation and dedicated new instrumentation have also played a major role in our understanding of plant cell biology. Students will learn the unique features of the plant cell, the plant genomes, and growth and development at a cellular level. Scientific communication at the researcher, university student and the informed citizen level will be mastered. The importance of plants as components of natural ecosystems; as crops used for food, feed and materials; and as model systems to understand all eukaryotic cellular function will be demonstrated. The complex signals and molecular networks of plants that make them unique while sharing cellular characteristics of all eukaryotic organisms will be learned.

## Canvas

Canvas is the learning management system (LMS) used at FAU for courses. Your username and password for Canvas is the same used to log into your myFAU. For this course, you can:

- View the course syllabus
- Check test dates and instructions
- View Power points of the lectures
- See supplemental help like practice quizzes and study guides posted before each quiz
- Check for announcements
- View grades

It is important to learn how to navigate Canvas for all your FAU courses. Go to <https://canvas.fau.edu/courses/6269> or link through your MyFAU page to the Canvas Student Training Course. The purpose of this course is to prepare students to use Canvas with their courses (traditional, hybrid, and online) and serve as a resource that can be referred back to after training is completed.

There are multiple ways to get support for Canvas-related issues or questions. Call the toll-free number (855) 691 7827 or call the FAU helpdesk at 561.297.3999 and choose Option 3. If you are logged into Canvas (<https://canvas.fau.edu>), click on the Help icon at the bottom left corner, under the global menu. You will be able to chat with a Canvas representative by clicking on "Chat with Canvas Support."

## Course structure

Most class meeting will be composed of (1) a lecture, (2) a quiz on the prior week's lecture and past and current reading assignments, (3) team meeting times (4) student presentations and (5) "plants in the news" presentations. An announced "mega quiz" covering multiple lectures or readings will be given. Class attendance is mandatory and there is no make up for missed quizzes or late assignments. One quiz grade will be dropped.

At the first meeting the class will form teams of undergraduates and graduate students. The team will be responsible for two class presentations on topics chosen early in the semester. The presentation must be accompanied by handouts for the class. Team members will usually share the same grade for the assignment. More instructions will be given in class.

Graduate students must write a 10-12 page critique of a current research paper in plant cell biology or a short research proposal using NSF guidelines (with the project description section limited to 8 pages). The paper or grant topic must be approved by me by February 23. In addition, there will be different and additional quiz essay questions for graduate students and an additional team presentation. The paper is due at the beginning of class on April 11. I will comment on early drafts up until April 4th.

## Course topical outline and text book reading assignment:

*This may be modified as the semester progresses. Lecture topics and associated readings subject to change; mega quiz and final exam dates firm. The out-of- classroom assignments are expected to take at least 6 hours per week of (1) textbook-assigned readings, (2) review of lecture notes and supplemental materials posted on Canvas, (3) study, (4) practice test-taking, (5) plants in the news research (6) research for and preparation of group presentations, (7) research and writing of assigned paper and (8) tutoring or additional individual help from Professor as needed.*

| <b>Week</b>     | <b>Topic</b>                               | <b>Readings</b> | <b>Quiz</b>     |
|-----------------|--|-----------------|-----------------|
| January 10      | Introduction to Plant Biology              | Chapter 1       |                 |
| January 17, 24  | Cell Architecture                          | Chapter 4       | Quiz, quiz      |
| January 31      | Genomic Organization and Expression        | Chapter 3       | Quiz            |
| February 7, 14  | Membrane transport and protein trafficking | Chapter 5       | Quiz, Quiz      |
| February 21, 28 | Cell cycle and meristems                   | Chapter 11      | Quiz, Mega quiz |

**Spring Break March 7**

|   |   |                                |
|---|---|--------------------------------|
| <b>March 14</b>   | <b>Growth and development</b>                         | <b>Chapter 12 Quiz</b>         |
| <b>March 21, 28</b>   | <b>Light perception at cell level (Grant writing)</b> | <b>Chapter 8, 9 Quiz, Quiz</b> |
| <b><i>Suggested date: March 28 for submitting paper draft</i></b> |   |                                |
| <b>April 4</b>  | <b>Intercellular Transport</b>                        | <b>Chapter 14 Quiz</b>         |
| <b><i>Last date for submitting paper drafts if requested.</i></b> |   |                                |
| <b>April 11-18</b>  | <b>Flowering and sexual reproduction</b>              | <b>Chapter 16 Quiz,</b>        |
| <b><i>Student Papers: Due at start of class April 11</i></b>      |   |                                |
| <b>Exam week: Tuesday May 2<sup>nd</sup></b>                      | <b>1:15- 3:45</b>                                     | <b>Final Exam</b>              |

### **Course evaluation method**

Up to 13 multiple choice and essay quizzes will be given each during class time including a longer cumulative quiz (Mega quiz) and a cumulative final. The lowest regular quiz score will be dropped in calculation of final grade. The mega quiz and final will count as two quiz grades and may not be dropped. Therefore no make-up quizzes will be given. Undergraduates and graduates will have different quizzes. 50% of total grade

The class team presentations will be graded on content, understanding of the subject, completeness of presentation, clarity and handouts. 30% of total grade.

The student papers will be graded on content, completeness of review, depth of critical analysis, understanding of the literature, organization and grammatical correctness. **Paper due at the start of class on April 11, 2019** 20% of total grade.

Extra credit: For each "plants in the news presentation" 1% point will be added to final grade. (Limit 5 % points).

### **Suggested Topics for Group Presentations**

Specialized plant cells: Stomata, root hairs, collenchyma, storage cells, pollen grains, sperm, xylem, phloem, endosperm, cork, wood, storage cells, sclerenchyma, trichomes, epidermal cells, fibers, rootcap, spores

Specialized plant cell features: Plasmodesmata, cell wall synthesis, apical meristems, root tip growth, lateral meristems, motile sperm, gametophyte generation (ferns, bryophytes), pollen

grains and fertilization, plant embryos and seeds, seed dispersal mechanisms, cytoplasmic streaming, chloroplasts, chloroplast genomes, plant mitosis and cytokinesis, phragmoplast and cell division, vacuole, cutin, waxes, secondary plant metabolites, phytochrome and light perception

Plant cellular genetics: Nuclear genome, chloroplast genome, chromosomes and ploidy levels. Evolutionary implications. Gene structure, expression and regulation. RNAs

Plant biotechnology: Plants that have been genetically modified. Genetic modification techniques, GMO policies. Agricultural advances vs world hunger. Salt tolerance, drought tolerance, nutritional value, increased productivity, increased shelf life, pest resistant, herbicide resistant, less fertilizer, stress resistant, heat or cold tolerant, ornamental value.

Crop plants and agriculture at the cellular level: Cellular basis for crop plant value. Protein, lipid, carbohydrate, lignin content and modifications of a particular crop plant. Unique non-food plant products (cork, oils, medicines, wood, paper, cloth).

Plant subcellular features: Plant cytoskeleton, organelles, plant cell wall, ribosomes, vacuole, plastids

Model plants and their importance to cell biology: Arabidopsis, tobacco, corn, Chlamydomonas, tomato.

Plant cell biology tools: Advances in microscopy, genetic engineering, breeding, cladistics.

Plant pathogen interactions at the cellular level: Secondary plant metabolites, plant viruses, fungal pathogens, plant defenses, genetic engineering to improve plant defenses.

## **Graduate Writing Assignment**

10-12 pages. First draft before April 4th (send electronically). Paper selection must be approved by me by February 28.

***Read and Critique a Research Study:*** The goal of this activity is to give you an opportunity to apply what you learned in this course in evaluating a research paper in the area of plant cell biology. A handout will be given covering how to critique the: Title, Authors, Abstract, Introduction, Hypothesis, Background information, Literature review, Methods, Data analysis and interpretation, Figures, Statistics, Results, Interpretation of the results, Discussion, Conclusion, Recommendations for future research, and Importance of the research to the field. Attach the research paper.

**Short NSF Proposal:** “A good proposal is always readable, well-organized, grammatically correct, and understandable. This narrative must contain specifics including details of experiments and/or applications, both to show that planning has been done and to help reviewers understand why the particular application you propose is better than other ideas. You must demonstrate in the narrative that you have a broad knowledge of current scholarship and activities in your field and how this is relevant to your project’s design. It is helpful to reviewers to see that you have devised a time frame. This will show that you have done adequate planning and are realistic about the program’s implementation. In most cases, it is well to describe your plans to continue the project beyond the funding period.”

From <https://www.nsf.gov/pubs/1998/nsf9891/nsf9891.htm#step2>.

## Course grading scale

### Cumulative Performance Grade

|             |    |
|-------------|----|
| 90% to 100% | A  |
| 86% - 89%   | A- |
| 82% - 85%   | B+ |
| 78% - 81%   | B  |
| 74% - 77%   | B- |
| 70% - 73%   | C+ |
| 66% - 69%   | C  |
| 62% - 65%   | C- |
| 58% - 61%   | D+ |
| 54% - 57%   | D  |
| 50%-53%     | D- |
| 49%---      | F  |

## Policy on makeup tests



No make-up tests will be given. If a quiz is missed for any reason, including excused absences, that quiz will be the single test score dropped in calculation of final grade. If an assignment is late, then one letter grade is deducted from assignment grade for each day late.

### **FAU Attendance Policy Statement:**

Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence. In this class, no make-up tests will be given. If a quiz is missed for any reason, including excused absences, that quiz will be the single score dropped in calculation of the final grade.

### **Classroom etiquette policy**

University policy on the use of electronic devices states: "In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular telephones and pagers, are to be disabled in class sessions." *No recording of lectures is allowed including photographs.*

### **Disability policy statement**

"In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS)—in Boca Raton, SU 133 (561-297-3880); in Davie, LA 131 (954-236-1222); or in Jupiter, SR 111F (561-799-8585)."

Students who wish to be excused from coursework, class activities or examinations must notify the instructor in advance of their intention to participate in religious observation and request an excused absence.

### **Honor Code policy statement**

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including cheating and plagiarism, is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For full details of the FAU Code of Academic Integrity, see University Regulation

4.001 [http://www.fau.edu/ctl/4.001 Code of Academic Integrity.pdf](http://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf)