

# FOS6226C ADVANCED FOOD MICROBIOLOGY SYLLABUS

Spring 2022

## SCHEDULE AND CLASS LOCATION/FORMAT

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### Lectures

M	3 Period 9:35 am – 10:25 am	Bldg. MAEB 234 (or Labs)
W	3 Period 9:35 am – 10:25 am	Bldg. MAEB 234 (or Labs)
F	3 Period 9:35 am – 10:25 am	Bldg. MAEB 234

### Labs

F	6-8 Periods 12:50 pm – 3:50 pm	Bldg. FSN 310 or AFPL 208 <b><u>(Check 'Critical Dates' for lab locations)</u></b>
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## INSTRUCTOR

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**Dr. Boce Zhang**

Office: AFPL 216

Email: boce.zhang@ufl.edu

Office Hours: Monday/Wednesday 12 – 1 pm, or by appointment

## CREDITS & COURSE DESCRIPTION

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4 Credits.

Selection of laboratory methods, characterization of food-borne pathogens and spoilage organisms.

## WHAT TO EXPECT IN ADVANCED FOOD MICROBIOLOGY

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Advanced Food Microbiology is intended to provide an advanced understanding of contemporary and emerging issues in controlling pathogenic microorganisms from farm to fork. Focus is placed on linking pathogens with relevant reservoirs and understanding basic mechanisms used by microorganisms to survive mitigation strategies in the production, distribution, and consumption of food. This course integrates lectures and microbiology labs. Students will be assessed by midterm and final exams, lecture and lab sections, guest lecture participation, and seminar presentation.

## COURSE OBJECTIVES

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1. Develop an advanced understanding of microbiological issues in the food system.
2. Comprehend the physiological mechanisms of pathogen survival against food processing interventions.
3. Practice traditional and advanced microbiology lab techniques.
4. Characterize the etiological agents of foodborne diseases, including, for each, clinical presentations, epidemiology, points of entry into the food supply chain, and preventive control.
5. Summarize and present peer-reviewed articles for contemporary and emerging food safety challenges.

## COURSE PREREQUISITES

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FOS 4222/4222L, MCB 4303/4303L and BCH 6415, or permission of instructor.

## RELEVANT COURSES

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FOS4202/5205 Food Safety and Sanitation  
FOS4222/4222L/5225C Food Microbiology  
FOS4223/6224 Food and Environmental Virology  
FOS6936 Topics in Food Science: Food Toxicology  
BSC4434C Introduction to Bioinformatics

## TEXTBOOK AND COURSE MATERIALS (REQUIRED)

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### 1) Textbook

Doyle, Michael. Buchanan, Robert (2012). Food Microbiology - Fundamentals and Frontiers (4th Edition). American Society for Microbiology:

[https://app.knovel.com/web/toc.v/cid:kpFMFFE001/viewerType:toc//root\\_slug:food-microbiology-fundamentals](https://app.knovel.com/web/toc.v/cid:kpFMFFE001/viewerType:toc//root_slug:food-microbiology-fundamentals)

Full text is available free of charge to the UF students through Knovel.com (use your UF email address to sign up).

### 2) Lab materials

a) Lab manual (required):

Title: Advanced Food Microbiology Lab Manual

Instructor(s): IFAS FSHN

Publisher: McGraw-Hill

Available at the bookstore: <https://www.bkstr.com/floridastore/home>

b) Bioinformatic resource center (required):

Access to Pathosystems Resource Integration Center (PATRIC) is free of charge on:  
<https://www.patricbrc.org/>

### 3) Other materials

*Optional Reading:*

- Optional Textbook: Food Safety Theory and Practice Author: Paul L. Knechtges
- Optional Textbook: National Environmental Health Association - Professional Food Manager Training Guide (3rd Edition)
- Risk Mitigation Programs in Food Systems  
<https://www.fsis.usda.gov/wps/portal/fsis/topics/regulatory-compliance/haccp>  
<https://www.fda.gov/Food/GuidanceRegulation/HACCP/>  
<https://www.ams.usda.gov/services/auditing/gap-ghp>  
<http://www.fao.org/prods/gap/>  
<https://www.fda.gov/food/guidanceregulation/cgmp/>
- Food Safety Modernization Act (FSMA)  
<https://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm253380.htm>
- Food and Drug Administration FDA Federal Food Code 1999  
<http://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/ucm2018345.htm>

*Optional Software:*

- USDA Pathogen Modeling Program (PMP): <https://pmp.errc.ars.usda.gov/default.aspx>
- <http://ars.usda.gov/Services/docs.htm?docid=11550>
- <http://www.ifr.ac.uk/MicroFit/>
- <http://www.combase.cc/>
- [http://www.icmsf.iit.edu/main/software\\_downloads.html](http://www.icmsf.iit.edu/main/software_downloads.html)

## **COURSE ANNOUNCEMENTS**

All lecture slides will be posted on Canvas prior to the class. All announcements will be made through Canvas (make sure to turn on the notifications in Canvas, available under your profile). It is the student's responsibility to check the announcement. Students can reach out to the instructor and TAs via email.

## **COURSE EVALUATIONS**

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

## **TESTS AND GRADING**

- **Exams:** There will be two mid-term exams and one final.
- **Labs:** There are 7 labs (5 lab reports).
- **Discussion/journal club:** Each student is required to lead 1 journal club discussion (see instructions below).
- **Presentation:** Each student will summarize and present peer-reviewed articles for a contemporary or emerging food safety topic.

**FOS6226C Final grade** (see below) You cannot drop a test.

<b>Activities</b>	<b>Grade percentage</b>
Lab reports	30% (5% each of the 6 labs)
Presentation	10%
Participation (discussion)	10%
Mid-term exams	30% (15% each)
Final Exam (cumulative)	20%

Grading Scale: A (93 to 100), A- (90 to <93), B+ (87 to <90), B (83 to <87), B- (80 to <83), C+ (77 to <80), C (73 to <77), C- (70 to <73), D+ (67 to <70), D (63 to <67), D- (60 to <63), E (0 to <60).

## **COURSE POLICIES**

- Attendance is required. Please refrain from checking or sending e-mails, texts, etc during class or lab sessions. Students are expected to participate in class discussions. Makeup exams will only be given with the permission of the instructor if adequate notice and

documentation (such as doctor's note) is provided in advance. A 10% pt penalty per day will be assigned for late assignments or reports turned in within two days after the due date. No submission will be accepted after two days past the due date.

- There are no make-up labs available. Missing one lab session will result in a 50% pt penalty from the lab report grade of the lab missed, unless due to excuses compliant with university policies.
- Requirements for make-up exams, assignments, and other work in this course are consistent with university policies that can be found at <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

### **LAB SAFETY GUIDELINES**

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All students are required to read the Lab Safety Guidelines in this syllabus. You are required to watch an instructional video highlighting the importance of biosafety and be familiar with the University's Exposure Control policy, Chemical Hygiene Manual, and Accident Report Manual. In addition, you will need to complete a Blood borne Pathogen consent form and the microscope agreement form.

1. Students must follow Standard Microbiological Practices and Universal Precautions. Detailed instructions of these laboratory safety rules and procedures shall be provided to the student by the instructor.
2. Lab Cleaning and Sanitation. Surfaces must be cleaned after each lab session. Students will use the 10% bleach for bench surfaces and supply drawer handles (at their benches)-this should be done before the lab begins and when it finishes. Also clean your writing utensils before leaving the lab.
3. The laboratory dress policy is strict and required for personal safety. Proper dress is required and includes long pants covering legs and ankles, tops covering chest and torso, socks and shoes covering feet and toes. Students will not be permitted to participate in lab if they wear the following: shorts, skirts, capris, slippers, sandals, slip-ons, and any open-toed footwear.
4. Personal protective equipment (PPE) consists of a lab coat, mask, and disposable gloves. Students must wear PPE at all times while in the lab. Do NOT share your PPE with others.
5. If the fire alarm sounds or an order is issued for emergency evacuation students shall follow the emergency exit plan and directions outlined by the instructor.
6. Failure to comply with these Lab Safety Guidelines shall result in immediate dismissal from the lab classroom and a zero grade.

## **DISCUSSION/JOURNAL CLUB GUIDELINES**

Each student will be required to select ONE high-quality & high-impact publication to give a brief 15-minute overview, followed by critiques, questions, or discussions. This is a practice for critical thinking and scientific philosophy & methodology.

- 1) The paper should be relevant to food microbiology or microbiology (in general). In addition, the paper needs to include at least one of the following areas: DNA/RNA biology, bioinformatics, artificial intelligence, or astromicrobiology.
- 2) The publication must be peer-reviewed article within the past 5 years. It is highly recommended to select from top-tier journal that are high-quality and high-impact.
- 3) The article MUST be an original research article. Review articles are NOT allowed.
- 4) The selected article must be shared with the whole class at least ONE week before the discussion date.
- 5) The lead will give a 15-minute overview of the paper, include:
  - a. High-level overview of the research question that this paper is trying to address
  - b. Background, Introduction, Rationale/Objectives, Methods, Results, Conclusions.  
(Tips are available on Canvas)
- 6) All students are required to read the selected article before the discussion. Be prepared with questions.

## **PRESENTATION GUIDELINES**

Each student will be required to select one of the topics below to conduct a literature review, using the state-of-the-art literature. Only use peer reviewed journal articles that were published within the past 5 years.

### **Topics include:**

- 1) Antimicrobial resistance in food system – epidemiology and mitigation strategies
- 2) Microbiology opportunities and challenges in space food programs
- 3) Microbiome and food safety
- 4) Omics and emerging food microbiology platforms
- 5) Artificial intelligence in microbiology (including food microbiology, but can expand the discussions to general microbiology)

### **Framework of the presentation should include, but not limited to:**

- 1) Problems and challenges facing our society
- 2) What solutions have been explored
- 3) Summary of latest scientific evidence
- 4) Critical assessment of the literatures – identify drawbacks & propose next steps

Presentation will be assessed by the instructor, TA(s), and peer students. Check “Grading Rubrics for Presentation” on how presentations are assessed.

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### **Grading Rubrics for Presentation**

Name: \_\_\_\_\_

Topic: \_\_\_\_\_

Categories	3 pts. (A level)	2 pts. (B level)	1-0 pt. (C-D level)
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<b>Identifies and summarizes problem at issue</b>	Identifies not only the basics of the issue, but recognizes nuances of the issue	Identifies the main problem and subsidiary, embedded, or implicit aspect of the problem	Does not identify and summarize the problem, is confused or identifies a different or in appropriate problem
<b>Personal perspective and position</b>	Draws support from experience and information not available from assigned sources	Identifies, appropriately, one's own position on the issue	Addresses a signal source or view of the argument and fails to clarify presented position relative to the one's own
<b>Quality of evidence</b>	Observes cause and effect and addresses existing or potential consequences. Clearly distinguishes between fact, opinion, and acknowledges value judgments	Examines the evidence and source of the evidence, questions its accuracy, precision, evidence, and completeness	Merely repeat information provided, taking it as truth or denies evidence without adequate justification
<b>Completeness</b>	A background of the topic and target audience is very clearly outlined and organized.	A background of the topic and target audience is somewhat outlined.	No, or minimal attempt made
<b>Critical thinking &amp; creativity</b>	Identifies and questions the validity of the key assumptions and addresses the fundamental dimensions that underlie the issue	Identifies some of the key assumptions and issues	Does not surface the assumptions and fundamental questions that underlie the issue

Grade: \_\_\_\_ / 15

### **COVID-RELATED PRACTICES**

- In-person attendance requires COVID "clearance" status. Any violation will result in dismissal from the class and report to the Dean.
- No student will be allowed in the classroom unless they are signed up for the in-person section and have been cleared for attendance.'

In response to COVID-19, the following policies and requirements are in place to maintain your learning environment and to enhance the safety of our in-classroom interactions.

- You are expected to wear approved face coverings at all times during class and within buildings. Following and enforcing these policies and requirements are all of our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution.
- This course has been assigned a physical classroom with enough capacity to maintain physical distancing (6 feet between individuals) requirements. Please utilize designated seats and maintain appropriate spacing between students. Please do not move desks or stations.
- Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.

- Follow your instructor’s guidance on how to enter and exit the classroom. Practice physical distancing to the extent possible when entering and exiting the classroom.
- If you are experiencing COVID-19 symptoms (guidance from the CDC on symptoms of coronavirus.), please use the UF Health screening system and follow the instructions on whether you are able to attend class. Find more information in the UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms.
- Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. Find more information in the university attendance policies.

### **MINIMUM TECHNICAL SKILLS/REQUIREMENTS**

To complete your tasks in this course, you will need a basic understanding of how to operate a computer, how to use Zoom, how to use iClicker, and how to use word processing software. The University of Florida expects students entering an online program to acquire computer hardware and software appropriate to his or her degree program. Most computers are capable of meeting the following general requirements. A student’s computer configuration should include:

- Webcam; Microphone; Speakers or headphones; Broadband connection to the Internet and related equipment (Cable/DSL modem).
- Your instructor might request that you obtain the iClicker Cloud (free for students) to respond to polls and in-class quizzes.
- Microsoft Office Suite installed (provided by the university).

Individual colleges may have additional requirements or recommendations, which students should review prior to the start of their program.

### **ACADEMIC HONESTY**

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: *“We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.”* You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment."*

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

### **NETIQUETTE AND COMMUNICATION COURTESY**

All members of the class are expected to follow rules of common courtesy during, before, and after class, in all email messages, threaded discussions, and chats.

## **SOFTWARE USE**

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All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

## **SERVICES FOR STUDENTS WITH DISABILITIES**

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The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation

0001 Reid Hall, 352-392-8565, <https://disability.ufl.edu/>

## **GETTING HELP**

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### ***Technical Difficulties:***

For issues with technical difficulties for Canvas, please contact the UF Help Desk at:

- <http://helpdesk.ufl.edu>
- (352) 392-HELP (4357)
- Walk-in: HUB 132

Any requests for make-ups due to technical issues should be accompanied by the ticket number received from the Help Desk when the problem was reported to them. The ticket number will document the time and date of the problem. You should e-mail your instructor within 24 hours of the technical difficulty if you wish to request a make-up.

## **CAMPUS HELPING RESOURCES**

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Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, [www.counseling.ufl.edu/cwc/](http://www.counseling.ufl.edu/cwc/)
- Counseling Services, Groups and Workshops, Outreach and Consultation, Self-Help Library, Wellness Coaching
- U Matter We Care, [www.umatter.ufl.edu/](http://www.umatter.ufl.edu/)
- Career Resource Center, First Floor JWRU, 352-392-1601, <https://career.ufl.edu/>
- Student Success Initiative, <http://studentsuccess.ufl.edu>
- Complaints: [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf) & <https://sccr.dso.ufl.edu/policies/student-honor-code-studentconduct-code/>
- Online Course: <http://www.distance.ufl.edu/student-complaint-process>

- Library Support: Various ways to receive assistance with respect to using the libraries or finding resources. [cms.uflib.ufl.edu/ask](https://cms.uflib.ufl.edu/ask)
- Teaching Center: 352-392-2010 General study skills and tutoring: [teachingcenter.ufl.edu/](https://teachingcenter.ufl.edu/)
- Writing Studio: 352-846-1138. Help brainstorming, formatting, and writing papers: [writing.ufl.edu/writing-studio/](https://writing.ufl.edu/writing-studio/)

## SCHEDULE (SUBJECT TO CHANGE)

Week/Day	Topics	Notes
Jan 3	W Syllabus & Introduction Microbiology overview - characteristics of bacterial growth	
	F Lab intro: General information and safety guidelines Aseptic technique and microbiology lab overview	
Jan 10	M Microbial growth: temperature and pH	
	W Microbial growth: water activity, oxygen/redox potential, catabolite repression, antimicrobials, biological structures, hurdle concepts	
	F Topic discussion/Journal club	Dr. Zhang lead
Jan 17	M	
	W Detecting and Enumerating Bacteria	
	F <b>Lab 1: MPN &amp; plate count</b> - prelab & inoculation	MPN/Plate count
Jan 24	M <b>Lab 1:</b> Interpretation & lab report	MPN/Plate count
	W Impact of injury & viable but nonculturable (VBNC)	
	F <b>Lab 2: VBNC lab</b> – thermal/acid-induced injury	BHI/MacConkey
Jan 31	M <b>Lab 2:</b> Interpretation & lab report	BHI/MacConkey
	W Pathogen persistence – biofilm & sporulation	
	F <b>Lab 3: Biofilm lab</b> – pre-lab, CV, & quantification	Biofilm/CV/Plate count
Feb 7	M <b>Lab 3:</b> Interpretation & lab report	Biofilm/CV/Plate count
	W <b>Review – Midterm 1</b>	
	F <b>Midterm 1</b>	
Feb 14	M Microbial genetics & molecular technique	
	W <b>Lab 4: PCR lab</b> – DNA extraction	
	F <b>Lab 4:</b> PCR and qPCR	PCR & qPCR
Feb 21	M <b>Lab 4:</b> Gel electrophoresis, interpretation & lab report	Gel electrophoresis
	W Microbial control & antimicrobial resistance	
	F <b>Lab 5: AMR lab</b> – prelab, MIC, & Kirby-Bauer inoculation	MIC/Kirby-Bauer
Feb 28	M <b>Lab 5:</b> Interpretation & lab report	MIC/Kirby-Bauer
	W Gram positive pathogens	
	F Gram positive – spore-forming pathogens	
Mar 7	<b>Spring Break</b>	
Mar 14	M Gram negative pathogens	
	W <b>Review – Midterm 2</b>	
	F <b>Midterm 2</b>	
Mar 21	M Topic discussion/Journal club	Slot 1
	W Introduction of NGS and 3 <sup>rd</sup> Gen. Sequencing	
	F Topic discussion/Journal club <b>Lab 6: NGS Lab</b> – Core facility (no lab report due)	Slot 2 TBD
Mar 28	M Genomics, transcriptomics, & meta-omics	
	W Guest lecture – ‘In Vitro Immunodetection of Fish Allergens’	Dr. Rao from FSU
	F Machine learning & its food safety applications	
Apr 4	M Topic discussion/Journal club	Slot 3
	W Introduction of Bioinformatic analysis	
	F <b>Lab 7: Bioinformatics lab</b> – PATRIC	PATRIC practice
Apr 11	M <b>Lab 7:</b> Interpretation & lab report	
	W Student seminar	GatorEval
	F Student seminar	GatorEval
Apr 18	M <b>Review – Final exam</b>	GatorEval
	W <b>Final exam</b> (cumulative)	GatorEval

## CRITICAL DATES

Week		M (3 Period)	W (3 Period)	F (3 Period)	F (6-8 Periods)
01	01/03		Syllabus Micro overview	Lab intro Aseptic technique	
02	01/10	Microbial growth	Microbial growth (continued)	Topic discussion /Journal club	
03	01/17		Bacteria enumeration	TBD: Guest lecture	Lab 1 (FSN 310)
04	01/24	Lab 1 (results) (FSN 310)	Injury & VBNC	TBD: Guest lecture	Lab 2 (FSN 310)
05	01/31	Lab 2 (results) (FSN 310)	Pathogen persistence	TBD: Guest lecture	Lab 3 (FSN 310)
06	02/07	Lab 3 (results) (FSN 310)	Review Midterm 1	<b>Midterm 1</b>	
07	02/14	Genetics	Lab 4 Extraction (AFPL 208)	TBD: Guest lecture	Lab 4 PCR (AFPL 208)
08	02/21	Lab 4 Electrophoresis (AFPL 208)	AMR	TBD: Guest lecture	Lab 5 (FSN 310)
09	02/28	Lab 5 (results) (FSN 310)	Gram positive pathogens	Gram positive spore-former	
10	03/07				
11	03/14	Gram negative pathogens	Review Midterm 2	<b>Midterm 2</b>	
12	03/21	Topic discussion /Journal club	NGS & Nanopore	Topic discussion /Journal club	Lab 6 (Core Facility)
13	03/28	Omics	Guest lecture Dr. Qinchun Rao (FSU) “In Vitro Immunodetection of Fish Allergens”	Machine learning & AI	
14	04/04	Topic discussion /Journal club	Bioinformatics		Lab 7 (Zoom)
15	04/11	Lab 7 (Zoom)	Student seminar	Student seminar	Student seminar
16	04/18	Review Final	<b>Final Exam</b> (cumulative)	TBD: Guest lecture/Topic discussion	
<b>Color codes</b>					
Lectures	Guest Lectures	Labs	Discussion	Exams	GatorEval