ISC 3120 C - Scientific Process

Spring 2017, CRN 10140
M & W 15h30 – 17h45, Whitaker 111

This Scholarly-Enriched Course has been designed to teach specific course content, which will include the production of scholarly work that utilizes writing, critical thinking, and information literacy.

Dr. Kara Lefevre, Assistant Professor, Department of Marine and Ecological Sciences
Office: Whitaker 209, (239) 590-7159 | Hours: M/W 2–3 pm & by appointment | Email via CANVAS only please

Text: None required - *Readings will be provided via CANVAS*

Course Description:

Students are introduced to the **philosophy and methodology of the scientific practice** in this discussion-format seminar. Through self practice and collaborative review, students learn: philosophical and practical differences between experimental and historical science; ethical issues surrounding the practice of science; hypothesis generation and testing; experimental design; construction of a research proposal; composition of a scientific paper; oral presentation; and critical review of scientific literature and research proposals. Students should plan to take this course near the beginning of their junior year, prior to the development of their research or internship plans. Students are encouraged to use this course to focus their own research interests, and may use this course to develop a proposal and research plan for a subsequent investigation. In order to foster a mentoring environment and to introduce students to the variety of interests among FGCU's scientific community, all members of the science faculty and student body are encouraged to participate.

Required Teaching Material:

All required course materials are provided through CANVAS. It is your responsibility to be sure that you are receiving e-mail from your FGCU and CANVAS accounts, and that you check them regularly for details for assignments and modifications to this syllabus.

Teaching Philosophy:

Scientific Process is taught as a seminar course. Students and faculty interact through discussion and debate; creating a peer-group setting rather than the traditional atmosphere of a lecture-based classroom. This course includes content that relates to religious beliefs that is necessary for achieving our learning objectives. In addition, the course is based in the disciplines of biology, geology, and ecology, which are dependent on the concept of natural selection as the mechanism for evolution. Professional respect for conflicting viewpoints is expected. The course has three principle objectives. First, students will be introduced to the philosophies and methods of science with the ultimate goals of: preparation for conducting research, functioning as an effective professional, and understanding the role of science in society in order to become an effective citizen in a democracy. This will be accomplished through active participation in the scientific design process as both a creator and a reviewer. Second, students will engage, and learn to critically review, scientific literature. Third students will get to know the science faculty and their fellow students. This will help students to define their own research interests and to identify potential research mentors.

Library Resources:

Main page: http://library.fgcu.edu/
Tutorials & Handouts: http://library.fgcu.edu/RSD/Instruction/tutorials.htm
Research Guides: http://fgcu.libguides.com/

COURSE POLICIES

Assessment and Grading: Student grades will be based on the following: (1) preparation for participation in class through required assignments; (2) structure and content of research proposal; (3) proposal presentation; (4) participation in peer review; and (5) final examination.

30% Research proposal: 10% first submission | 20% final submission

40% Assignments, including:
quizzes on readings, assignments for development of the proposal, in-class / group assignments

10% Presentation of Research Proposal

10% Peer Review activities: peer review of proposal sections, presentation, and draft proposals

10% Final Exam (in-class)

A	93 to 100	A-	90 to 92.9	
B+	87 to 89.9	B	83 to 86.9	
B-	80 to 82.9	C+	77 to 79.9	D 60 to 69
C	70 to 76.9			F < 60

Attendance: Because participation is such an integral component of this course, attendance is required. Not being present in class reduces your learning opportunity and that **will affect your grade**. While you will be expected to do much learning on your own through reading and research, much scientific learning is due to verbal interactions with other scientists. You must learn how to ask questions, explain your ideas to colleagues, and defend a position in order to understand it. This can only occur if you attend class.

Absences and tardiness will be excused on a case-by-case basis, for legitimate issues that must be communicated as soon as possible, e.g., medical issues and death in the family, and official documentation will be required. If you know that you will have to miss a class for personal reasons (e.g., travel, religious holiday, etc.), you must notify us at the beginning of the semester. Canvas is our tool for organizing the course and essential materials will be posted there. It is your responsibility to connect with your colleagues to catch up on what took place.

Each unexcused absence may result in a reduction in your final grade (see Student Guidebook, "Authorized Absence", and "Absences Due to Other Causes"). Late assignments for unexcused absences will not be accepted.

As of Fall 2015, all faculty members are required to confirm a student's attendance for each course by the end of the first week of classes. Failure to do so will result in a delay in the disbursement of your financial aid. ***The confirmation of attendance is required for all students, not only those receiving financial aid. Details of the process for this course will be announced in class.***

Assignments: Assignment instructions will be provided on the CANVAS site. Students are expected to check the schedule in advance of all classes to ensure completion of all assignments. We are not responsible for reminding you of any assignment(s). All assignments are to be turned in to CANVAS. In some cases you must also bring a copy, or copies, of your assignment to class for peer review.

Professionalism: Your attendance grade will incorporate participation, and that includes attitude. My classroom culture is based on general kindness and respect for others, and of course on a love of learning. Please come to class prepared to engage, clear your desk of distractions (backpacks are not for sleeping), and be respectful of other people / ideas in the classroom.

Electronics: Unless instructed otherwise, all devices (cell phones, iPODS, MP3 players, etc.) should be turned off during class time. Laptops / tablets may be used for taking notes during class, and no other reason. Violations of electronics policies will result in grade devaluation at our discretion.

Plagiarism: Plagiarism in any form is not accepted. Specifically, all ideas must be credited to their original source by citation, the source of all written words must be identified by citation and the words themselves must be identified by the use of quotations or indentations and font. For examples of plagiarism see: http://www.indiana.edu/~wts/pamphlets/plagiarism.shtml

Turnitin.com has additional material on plagiarism. Required papers may be subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Terms and Conditions of Use posted on the Turnitin.com site.

UNIVERSITY POLICIES

Academic Behavior Standards and Academic Dishonesty: All students are expected to demonstrate honesty in their academic pursuits. The university policies regarding issues of honesty can be found in the FGCU Student Guidebook under the Student Code of Conduct and Policies and Procedures sections. All students are expected to study this document which outlines their responsibilities and consequences for violations of the policy. The FGCU Student Guidebook is available online at http://studentservices.fgcu.edu/judicialaffairs/new.html

Disability Accommodations Services: Florida Gulf Coast University, in accordance with the Americans with Disabilities Act and the university's guiding principles, will provide classroom and academic accommodations to students with documented disabilities. If you need to request an accommodation in this class due to a disability, or you suspect that your academic performance is affected by a disability, please see me or contact the Office of Adaptive Services. The Office of Adaptive Services is located in the Wellness Building. The phone number is 239-590-7956 or Video Phone (VP) 239-243-9453. In addition to classroom and campus accommodations, individuals with disabilities are encouraged to create their personal emergency evacuation plan and FGCU is committed to providing information on emergency notification procedures. You can find information on the emergency exits and Areas of Rescue Assistance for each building, as well as other emergency preparedness materials on the Environmental Health and Safety and University Police Department websites. If you will need assistance in the event of an emergency due to a disability, please contact Adaptive Services for available services and information.

Student Observance of Religious Holidays: All students at Florida Gulf Coast University have a right to expect that the University will reasonably accommodate their religious observances, practices, and beliefs. Students, upon prior notification to their instructors, shall be excused from class or other scheduled academic activity to observe a religious holy day of their faith. Students shall be permitted a reasonable amount of time to make up the material or activities covered in their absence. Students shall not be penalized due to absence from class or other scheduled academic activity because of religious observances. Where practicable, major examinations, major assignments, and University ceremonies will not be scheduled on a major religious holy day. A student who is to be excused from class for a religious observance is not required to provide a second party certification of the reason for the absence.

University Nondiscrimination Statement: Florida Gulf Coast University is committed to ensuring equity and fairness for all University employees, students, visitors, vendors, contractors and other third parties. As such, the University prohibits discrimination on the bases of race, color, national origin, ethnicity, religion, age, disability, sex (including sexual harassment/assault), gender identity/expression, marital status, sexual orientation, veteran status or genetic predisposition with regard to admissions, employment, programs or other activities operated by the University. This prohibition extends to enforcement of Title IX of the Education Amendments of 1972. Questions or complaints should be directed to the Office of Institutional Equity and Compliance (OIEC). The OIEC's phone number is (239)745-4366; the OIEC email address is OIEC@fgcu.edu.

COURSE OBJECTIVES

Objectives	Implementation
Introduce students to the practice of science (theoretical basis, philosophy and practical and theoretical methodology).	1. Students will read and discuss the writings (i.e., essays, opinions) of prominent philosophers and critics of science. 2. The differences among science, non-science, and pseudoscience will be defined, discussed, and illustrated with examples. 3. Different scientific practices and disciplines will be compared. 4. A model for the framing of a scientific project (scientific design) will be presented, discussed, and applied.
Develop the ability to critically evaluate science and relate evaluations to peers through the application of principles above (1).	1. Primary journal articles will be discussed and their scientific structure and validity critiqued. 2. Participants may take turns moderating the discussion of individual papers. 3. At the conclusion of each critique, participants will suggest design changes to improve the quality of the science.
Transform creative scientific questions into testable hypotheses (i.e., scientific design).	1. The development of hypotheses will be explored by analyzing the design of others in published papers. 2. Students will collaboratively work through the design of their own research project.
Develop skills associated with the presentation of scientific information (e.g., proposals, primary journal articles, poster and oral presentations).	1. Students will draft, review, and redraft their own unique research proposal and critically evaluate those of their peers. 2. Proposals will be presented, either orally or as posters, and defended by individuals late in the semester.
Make students and other faculty aware of individual faculty research interests and expertise.	1. Each science faculty member will provide a brief research presentation or prospectus available on the course website. 2. Faculty not teaching the course may visit and participate periodically. During these visits faculty will make brief presentations about their research interests.
Instill within students an understanding of the ethics of scientific practice.	1. Students will read & discuss essays addressing ethical issues in science. 2. Throughout the semester while journal articles and research projects are reviewed, ethical issues concerning scientific practice will be considered.

COURSE OBJECTIVES

Objectives	Implementation
Help students define their research discipline and identify potential research mentors.	1. Faculty participation and on-line resources developed for the course should help students learn the research interests of FGCU faculty and help define their own interests. 2. The published material reviewed during the semester will cover a diverse array of scientific topics, thereby exposing students to a wide range of research disciplines.
Students will develop a research proposal by the semester's end. The proposal will be presented and scrutinized by peers and faculty.	1. After a research question is identified by a student, he or she will work collaboratively with other students and faculty to develop a research plan which will then be transformed into a proposal. 2. Proposals and presentations will be peer reviewed.
Students will be introduced to various methodological techniques employed by researchers within the scientific disciplines represented	1. The published papers reviewed during the course will introduce participants to various methodologies and technologies, allowing the student the opportunity to begin to learn about methodologies unique to many different fields of science. 2. Throughout the semester faculty, students, or guest speakers may make presentations concerning the specialized methodologies and technologies they use in their research.
If possible, members from the scientific community outside of the university may occasionally participate in this course.	1. Course faculty periodically invite local or visiting scientists relevant to the day's discussion. 2. Reading lists may be altered to include literature relevant to visiting scientists.

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Day	Date	Class #	Topic	Assessment (non-graded)	*Assignment (graded)*
Mon	Jan 9	1	. Course introduction		***Science attitudes survey*** (VAC) due *Fri Jan 13*
Wed	Jan 11	2	. Where do good ideas come from?	- Pre-research survey	
Mon	Jan 16	-	MLK DAY holiday		
Wed	Jan 18	3	. Library research skills . Brainstorming research ideas	- Index cards	
Mon	Jan 23	4	. What is science? . Assumptions and bias		
Wed	Jan 25	5	. How to read a scientific paper? . Create groups		***Keywords*** due *Sun Jan 28*
Mon	Jan 30	6	. Structure of a research proposal		
Wed	Feb 1	7	. Scientific writing		
Mon	Feb 6	8	. What is peer review?	- **Proposal topic draft** (for in-class peer review)	
Wed	Feb 8	9	. Introduce the proposal template . Structure of the introduction		***Proposal topic*** due *Wed Feb 8*
Mon	Feb 13	10	. One-on-one meetings per student	- **Introduction outline** due (in-class peer review)	
Wed	Feb 15	11			
Mon	Feb 20	12	. Methods . Experimental design		***Introduction draft*** - **peer review** due *in class*
Wed	Feb 22	13			***Introduction*** due *Wed Feb 22*

Day	Date	Class #	Topic	Assessment (non-graded)	*Assignment (graded)*
Mon	Feb 27	14	. Communication in science	- **Methods draft** (peer review)	
Wed	Mar 1	15			**Methods and timeline** due *Wed Mar 1*
Mar 6 to 11		*Spring Break - no classes* ** 3 major Conferences @ FGCU! student Ecology & Evolution; Biodiversity; Wilson Ornithology **			
Mon	Mar 13	16	. Barriers in science . Ethics		
Wed	Mar 15	17	. Exploring "broader implications"		
Mon	Mar 20	18	. Planning for Funding Panel	- **First draft** (peer review)	
Wed	Mar 22	19			**First draft of proposal** due *Wed Mar 22*
Mon	Mar 27	20	**FUNDING PANEL**		
Wed	Mar 29	21			
Mon	Apr 3	22	.Philosophy of science		**Funding panel peer review** due *Mon Apr 3*
Wed	Apr 5	23		**Broader implications draft** (peer review)	**Broader implications** due *Sun Apr 9*
Mon	Apr 10	24	. How to present your proposal?	- **Biographical sketch** due *in class* / peer review	
Wed	Apr 12	25		- **Poster draft** (peer review)	**Poster** due *Sun Apr 16*
Mon	Apr 17	26	**POSTER PRESENTATION**		
Wed	Apr 19	27	. Science and politics	- **Final draft** (peer review)	**Final draft of proposal** due *Sun Apr 23*
Mon	Apr 24	28	. Course review		
Wed	Apr 26	29	**FINAL EXAM** (*in class*)		