



**FIUteach Research Methods  
(3 Credits)  
Fall 2018**

**BSC 3910  
CHM 3910  
ISC 3523  
PHY 3018**

<b>Meeting Time:</b>	Mondays & Wednesdays 1:00-2:50 p.m.	
<b>Location:</b>	OE 295	
<b>Instructors:</b>	Prof. Nicole Cook	Prof. Laird Kramer
<b>Office:</b>	VH 178	VH 140C
<b>Office Hours:</b>	By Appointment	By Appointment
<b>Phone:</b>	305-348-1804	305-348-6073
<b>Email:</b>	nicook at fiu.edu	Laird.Kramer at fiu.edu

**Prerequisites:** SMT 2661/2662 or SMT 2044

**Required Supplies:** Laptop and USB Flash Drive (1GB storage capacity, recommended)

**Required Texts:**

Research Methods for Science by Michael P. Marder [e-book on Canvas]

Additional materials on Canvas or emailed to you by the professor. Please be sure to have regular access to any e-mails sent to your FIU account.

**Course Description**

Research Methods is a one-semester, three-hour course that is part of the FIUteach program. The course is an introduction to scientific research, and therefore is developed around a sequence of inquiries that you will carry out in order to experience authentic research from several perspectives. The course is cross-listed in Biology Chemistry, Earth Sciences and Physics.

The goals of the course are:

- to equip FIUteach students with the research tools that are used to solve scientific problems;
- to provide students with the opportunity to use research tools in a laboratory setting;
- to develop awareness in students of how to effectively communicate science among peers through presentations and peer-reviewed scientific literature; and
- to enable students to understand how they, as scientists, develop new understanding and insights, including ideas that may eventually be taught in conventional science classes and be found in textbooks.

Students will design and carry out three independent inquiries, each of which will be written up and presented in alignment to scientific peer-review. The inquiries incorporate mathematics and the various science disciplines; thus, the team of instructors teaching this course have expertise in different disciplines and are available to supervise all students as they work on their inquiries in the lab.

The combination of Research Methods and Perspectives on Mathematics and Science provides FIUteach students with an in-depth understanding of how the scientific enterprise works.

## Course Objectives and Expectations

Course Objectives and Evidence of Student Learning and Engagement	
<i>Students will:</i>	<i>Evidence:</i>
create their own experiments to answer scientific questions.	<ul style="list-style-type: none"> <li>Multiple products from 3 separate inquiries designed by students : (1) brief home inquiry, (2) laboratory inquiry using high school equipment; and (3) extended laboratory inquiry</li> </ul>
design experiments to reduce systematic and random errors and use statistics to interpret the results.	<ul style="list-style-type: none"> <li>Products from inquiries 2 and 4</li> <li>Proposals for inquiries 2 and 4</li> </ul>
use probes and computers to gather and analyze data.	<ul style="list-style-type: none"> <li>Instructor observations during inquiry 2 or 4 or both</li> </ul>
use statistics to interpret experimental results and deal with sampling errors.	<ul style="list-style-type: none"> <li>Two homework assignments</li> <li>Class performance</li> <li>Write-ups for inquiries 2 and 4</li> </ul>
treat human subjects in an ethical fashion.	<ul style="list-style-type: none"> <li>Homework assignment</li> <li>Satisfactory completion of Learning Study Analysis and Study Pitch</li> </ul>
apply safe laboratory procedures.	<ul style="list-style-type: none"> <li>Instructor observations during inquiries 2 and 4</li> </ul>
find and read articles in the scientific literature.	<ul style="list-style-type: none"> <li>One in-class assignment and one take home assignment</li> <li>Performance assessment during study pitch</li> <li>Use of literature in Inquiry 4</li> </ul>
create mathematical models of scientific phenomena.	<ul style="list-style-type: none"> <li>Two homework assignments</li> <li>Personalized modeling assignments as part of inquiries 2 and 4</li> </ul>
apply scientific arguments in matters of social importance.	<ul style="list-style-type: none"> <li>Student presentations of Learning Study Pitches</li> </ul>
write scientific papers.	<ul style="list-style-type: none"> <li>Three written inquiries, with inquiries 2 and 4 involving at least draft reports</li> </ul>
review scientific papers and presentations.	<ul style="list-style-type: none"> <li>Student evaluations of each other, in pairs</li> </ul>
give oral presentation of scientific work.	<ul style="list-style-type: none"> <li>In-class oral reports on inquiries 2 and 4</li> </ul>

## Course Requirements and Expectations

As with any effective instruction, the course operates in a collaborative, active classroom environment. Thus you are expected to actively engage everyone in class activities and discussions so that everyone develops their understanding of scientific research. Please be aware of the following:

- You are expected to arrive on time and remain for the entire class. As many course topics and activities will occur only in class, you must be present to receive credit. We do not have a time machine and it would not be reasonable to ask everyone in the class to start over, thus there are no makeups.
- We expect you to be a conscientious student, thus full credit is assigned for on-time submissions. If you turn in assignments late without prior approval, you will not receive full credit for the assignment. Late assignments turned in up to 1 week late will be eligible to earn a maximum of 70% credit. After 1 week, you will not earn credit for the assignment.
- Write-ups of your final inquiries will be evaluated according to a rubric you will find on the course Canvas site.
- Inquiry drafts will receive feedback and be evaluated by checking whether major sections (Abstract, Introduction, Design, Analysis, Conclusions, etc) have been completed and turned in on time.
- Partner Peer Evaluation: You will be required to review and provide feedback on your peers' draft inquiry reports for inquiries II and IV using the rubrics for each inquiry. This will be completed using Turnitin. It is important to give each other thorough, constructively critical feedback in a timely manner. Thus you need to submit your drafts on time so your partner can provide that feedback. Partner peer evaluation must be completed before the the instructors will evaluate the assignment, your reviews earn credit toward your homework grade.
- Research Methods is a "substantial writing component course." Therefore, your inquiries will be evaluated both on content and the quality of written expression. There will be no formal examinations.

## Assignments and Evaluation Policy

Assignment	% of Total Grade	Criteria	Additional Notes
<b>Class and Laboratory Attendance and Participation</b>	<b>10</b>	Full credit requires arriving to each class session on time, signing in, actively participating in all class activities including submission of in-class assignments, and staying until the session ends.	In the case of an <b>excused absence</b> , the student should refer to the course absence policy. <b>NOTE: More than 3 missed classes, regardless of excused/unexcused will earn 20% maximum of the available credit.</b>
<b>Homework Assignments</b>	<b>20</b>	Homework will be graded in one of 3 ways: (1) Thoroughly grade all questions; (2) Thoroughly grade a randomly selected subset of questions, and grade the remaining questions on effort; or (3) Grade the whole assignment on effort. Homework must be turned in <b><u>on time in order to provide meaningful feedback.</u></b>	Homework submitted up to one week late will receive a maximum of 70% credit. More than one week late receives no credit.

<b>Inquiry 1</b>	<b>5</b>	Inquiry 1 will be evaluated using the Inquiry 1 rubric.	Inquiry 1 write-ups submitted on time will be eligible for full credit using the rubric. Write-ups submitted up to 1 week late will receive a maximum of 70% credit. More than 1 week late receives no credit.
<b>Inquiry 2</b>	<b>20</b>	There are multiple parts to this assignment, which will be discussed in detail when assigned along with all associated rubrics	All parts of this assignment are to be turned in on time. Otherwise the grade will be reduced per the course late assignment policy.
<b>Pitch Your Own Learning Study</b>	<b>10</b>	Learning Study Pitch will be evaluated according to the Learning Study Pitch rubric.	You must present your pitch in class on the assigned date and participate in Q&A to receive credit for this assignment.
<b>Article Analysis</b>	<b>5</b>	Article Analysis Questions will be evaluated using the Article Analysis Rubric	This assignment is to be turned in on time. Analysis submitted up to 1 week late will receive a maximum of 70% credit. More than 1 week late receives no credit.
<b>Inquiry 4</b>	<b>30</b>	There are multiple parts to this assignment, which will be discussed in detail when assigned along with all associated rubrics	All parts of this assignment are to be turned in on time. Otherwise the grade will be reduced per the course late assignment policy.

**Late Work Policy:** Some course topics and activities will occur only in class, and you must be present to receive credit (no makeups). If you turn assignments late without prior approval, you will not receive full credit for the assignment. Late assignments turned in up to 1 week late will be eligible to earn a **maximum of 70%** credit. After 1 week, you will not earn credit for the assignment.

**1. Grading: \*\* Points will be deducted for late and/or incomplete work. \*\***

**2. Grading Scale**

90	--	100	A
86	--	89	B+
80	--	85	B
76	--	79	C+
70	--	75	C
60	--	69	D
59	--	0	F

## Course expectations

**Attendance, participation, and professionalism:** Ten percent of your grade is based on attendance, active participation, and professionalism in all class sessions and lab experiences.

Class members will engage in class activities and discussions to develop understanding of the scientific enterprise. *The expectation is that students attend every class session and participate in all discussions and activities.* Credit is earned by arriving on time, signing the roster, actively participating in all discussions and activities, and remaining to the end.

**Class Absences:** If a serious illness or a personal emergency prevents you from coming to class, **you must inform us ASAP (preferably prior to class).** You will need to provide relevant documentation such as a doctor's note (or jury duty certificate, hospitalization record, etc.). As with any active learning classroom, it is not possible to make up the class without bringing together all of your classmates. *You are still responsible for knowing the content that you missed.* Any written assignments that were due on the day of your absence are still required.

**Pre-Arranged Absences:** Situations may arise during the semester in which you must miss a class for reasons beyond your control, such as participating in a varsity scholarly or athletic event, or attending an out-of-state family wedding, etc. These cases are generally known well in advance and if you give us sufficient notice, we will excuse you from class that day and arrange a make-up schedule for homework, etc, either prior to that class or upon your return. **Note: You must give 2 weeks advance notice to have your absence excused.**

**Devices (cell phones, laptops, iPads, etc.):** It is rude to text, tweet, check e-mail, do work for another class, order pizza or any of the other things that you can do on your electronic devices during our class. Put devices away before class and put them on silent mode if they make noise. It is unfair to other students to have your personal affairs interfering with their education. When there is a need for you to use your device in class, we will make time for you to do so.

## University Policies

### FIU STUDENT CODE OF STANDARDS

A University is a learning community following a tradition more than 1,000 years old. Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. As a member of this community:

- I will respect the tradition of academic inquiry, the University's rules of conduct, and its mission.
- I will respect the opinions and differences of all members of the FIU community.
- I will practice civility and demonstrate conduct that reflects the values of the institution.
- I will respect the rights and property of the University and its members.
- I will be diligent and honest in my personal and academic endeavors.

### FIU Academic Honesty Policy

In meeting one of the major objectives of higher education, which is to develop self-reliance, it is expected that students will be responsible for the completion of their own academic work. The use of literature, notes, aids, or assistance from other sources should be clearly identified with respect to all course assignments and examinations. In addition, students are expected to use all resources, including books, journals, and computers only in legal and authorized ways. They should also refrain from falsification of records, attend class as required, and participate in the educational process without disrupting the orderly processes and functions of the University.

Academic Misconduct – Academic misconduct by students includes all acts of dishonesty in any academically related matter and any knowing or intentional help or attempt to help, or conspiracy to help, another student commit an act of academic dishonesty. The Academic Misconduct Disciplinary Policy will be followed in the event of academic misconduct.

Accommodations: If you are registered with the Office of Disability Services, please make an appointment with the instructors as soon as possible to discuss any course accommodations that may be

necessary. If you have a disability but have not contacted the Office of Disability Services, please call 348-3532 or go to GC190 to register for services.

Plagiarism - Plagiarism is the act of representing words, data, works, ideas, computer program or output, or anything not generated by the student as his or her own. Plagiarism may be inadvertent or purposeful; however, plagiarism is not a question of intent. Plagiarism is considered a serious act of academic misconduct and may result in a student receiving an "F" in the course and being suspended from the University. Please note that your papers may be examined by Turnitin.com to detect possible cases of plagiarism. For more information, see <http://coeweb.fiu.edu/plagiarism/>

***Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and to honestly demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook.***

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### Tentative Course Schedule

\*\*Every attempt will be made to adhere to this schedule but, the instructors reserve the right to make changes as needed. Announcements about these changes will be made in class and posted to Canvas.\*\*

Meeting/Date	Topic(s)	Pending/Due/Notes	I	II	LSA	IV	PYS
Week 1A 8/20	<ul style="list-style-type: none"> <li>Course Orientation</li> <li>Curiosity &amp; Scientific Inquiry</li> </ul>	HW 0: Syllabus Review	✓				
Week 1B 8/22	<ul style="list-style-type: none"> <li>Scientific Methods</li> <li>Inquiry I Preparation</li> </ul>	Inquiry I Write Up HW 0: Syllabus Review	✓				
Week 2A 8/27	<ul style="list-style-type: none"> <li>Error Analysis</li> <li>Scientific Literature: Analysis</li> </ul>	Inquiry I Write Up	✓				
Week 2B 8/29	<ul style="list-style-type: none"> <li>Lab Methods</li> <li>Intro to Inquiry II</li> <li>Cartooning Your Inquiry</li> </ul>	Inquiry I Write Up HW 1: Lab Methods	✓	✓			
Week 3A 9/03	<b>Labor Day – No Class</b>			✓			
Week 3B 9/5	<ul style="list-style-type: none"> <li>Graphical Analysis/ Visualization of Data</li> <li>Inquiry 2 Proposal</li> </ul>	Inquiry II Proposal I HW 1: Lab Methods HW 2: Graphical Analysis/ Visualization of Data		✓			
Week 4A 9/10	<ul style="list-style-type: none"> <li>Statistics: Motivation &amp; Overview</li> <li>Statistics: Sampling and Averaging</li> </ul>	Inquiry II Initial Proposal Reading: Communicating Scientific Evidence		✓			
Week 4B 9/12	<ul style="list-style-type: none"> <li>Reading Discussion: Communicating Scientific Evidence</li> <li>Inquiry II: Proposal Review &amp; Revision</li> </ul>	Reading: Communicating Scientific Evidence Inquiry II Revised Proposal Inquiry II Supplies Request HW 3: Inquiry evaluation		✓			
Week 5A 9/17	<ul style="list-style-type: none"> <li>Statistics: Standard Deviation</li> <li>Statistics: Standard Error</li> </ul>	Inquiry II Revised Proposal HW 3: Inquiry evaluation		✓			
Week 5B 9/19	<ul style="list-style-type: none"> <li>Statistics: Distributions &amp; Central Limit Theorem</li> <li>Inquiry II</li> </ul>	Inquiry II Supplies Request		✓			
Week 6A 9/24	<ul style="list-style-type: none"> <li>Statistics: Z-tests &amp; t-tests</li> <li>Inquiry II</li> </ul>	HW 4: Statistics		✓			
Week 6B 9/26	<ul style="list-style-type: none"> <li>Inquiry II</li> </ul>	Inquiry II draft		✓			

Meeting/Date	Topic(s)	Pending/Due/Notes	I	II	LSA	IV	PYS
Week 7A 10/1	<ul style="list-style-type: none"> <li>Inquiry II</li> </ul>	HW 4: Statistics		✓			
Week 7B 10/3	<ul style="list-style-type: none"> <li>Inquiry II</li> </ul>	HW 5: Human Subjects					
Week 8A 10/8	<ul style="list-style-type: none"> <li>Inquiry II Peer Feedback</li> <li>Inquiry II</li> </ul>	Inquiry II draft HW 6: Inquiry II Peer Feedback		✓			
Week 8B 10/10	<ul style="list-style-type: none"> <li>Human Subjects</li> <li>Learning Study Analysis Overview</li> <li>Inquiry II</li> </ul>	HW 5: Human Subjects HW 6: Inquiry II Peer Feedback Learning Study Analysis		✓	✓		
Week 9A 10/15	<ul style="list-style-type: none"> <li>Inquiry II practice presentations</li> <li>Inquiry IV planning</li> </ul>	Inquiry IV Initial Proposal		✓	✓	✓	
Week 9B 10/17	<ul style="list-style-type: none"> <li>Learning Study Share out</li> <li>Pitch Your Own Study Overview</li> <li>Inquiry II practice presentations backup</li> </ul>	Learning Study Analysis Inquiry II presentation Inquiry II final Pitch Your Own Study		✓	✓	✓	✓
Week 10A 10/22	<ul style="list-style-type: none"> <li>Inquiry II presentations</li> </ul>	Inquiry II presentation Inquiry IV Supplies Request		✓	✓	✓	✓
Week 10B 10/24	<ul style="list-style-type: none"> <li>Pitch Your Own Learning Study</li> <li>Inquiry IV: Proposal Review&amp; Revision</li> </ul>	Pitch Your Own Learning Study Inquiry IV Revised Proposal			✓	✓	✓
Week 11A 10/29	<ul style="list-style-type: none"> <li>Modeling: Order of Magnitude</li> <li>Inquiry IV</li> </ul>	Inquiry II final Inquiry IV Supplies Request HW 6: Order of Magnitude			✓	✓	
Week 11B 10/31	<ul style="list-style-type: none"> <li>Modeling: Data Fitting</li> <li>Statistics: <math>X^2</math></li> <li>Inquiry IV</li> </ul>	Inquiry IV Revised Proposal HW 7: Modeling -Data Fitting				✓	
Week 12A 11/5	<ul style="list-style-type: none"> <li>Inquiry IV</li> </ul>	HW 6: Order of Magnitude					
Week 12B 11/7	<ul style="list-style-type: none"> <li>Inquiry IV</li> </ul>	HW 7: Modeling -Data Fitting Inquiry IV draft				✓	
Week 13A 11/12	<b>Veteran's Day – No Class</b>					✓	
Week 13B 11/14	<ul style="list-style-type: none"> <li>Inquiry IV</li> </ul>					✓	
Week 14A 11/19	<ul style="list-style-type: none"> <li>Inquiry IV Peer Feedback</li> </ul>	Inquiry IV draft HW 8: Inquiry IV Peer Feedback				✓	
Week 14B 11/21	<ul style="list-style-type: none"> <li>Inquiry IV practice presentations</li> </ul>	Inquiry IV Final				✓	



Meeting/Date	Topic(s)	Pending/Due/Notes	I	II	LSA	IV	PYS
Week 15A 11/26	• Inquiry IV presentations					✓	
Week 15B 11/28	• Inquiry IV Presentations	Inquiry IV Final				✓	
Finals Week 12/3-12/8	<b>Final Exam: Inquiry IV Presentations backup</b>						