

SCIN400

STUDENT WARNING: This course syllabus is from a previous semester archive and serves only as a preparatory reference. Please use this syllabus as a reference only until the professor opens the classroom and you have access to the updated course syllabus. Please do NOT purchase any books or start any work based on this syllabus; this syllabus may NOT be the one that your individual instructor uses for a course that has not yet started. If you need to verify course textbooks, please refer to the online course description through your student portal. This syllabus is proprietary material of APUS.

Course Summary

Description

Course Description: Research Methods for Natural Sciences is a course that focuses on providing the student the essential elements of scientific research and issues associated with the scientific method, experimental and non-experimental research design, and statistical data analyses. Students will familiarize with the current methodologies, tools, and instruments of modern research, such as: sampling, test design, data collection reporting, and publishing. In addition, they will be given the opportunity to conduct research on a variety of scientific topics within the field of Natural Sciences. The principles and practices covered during this course are commonly used in the academic fields of natural, physical, and social science. Do not attempt this course until you have completed all required courses in the Biology or Earth Science concentration. (Biology Concentration Prerequisite: BIOL240, BIOL241, BIOL342, EVSP416, SCIN211. Earth Science Concentration Prerequisite: ERSC204, ERSC206, ERSC305, GEOG200, SCIN138, SCIN261)

Course Scope:

This course is designed to prepare the student to conduct scientific research, including: planning, assessing, evaluating, and reporting data. As a summative assessment, the student will submit a research proposal at the end of the course, after working through the various steps of a traditional research process. S/He will select an appropriate research topic, approved by the instructor, and then will begin to acquire the basic information and tools needed to complete a research proposal. The weekly coursework is geared toward building the knowledge and skills necessary to elaborate a research proposal in a logical fashion: research problem (research questions and hypotheses), theoretical framework (importance and conceptual foundation of the research), literature review (supporting research in the field), research methodology and design (data collection). Particular consideration will also be given to data assessment and evaluation, as well as potential inferences and implications to the scientific body of knowledge, which are typical elements of the conclusive stages of a research.

Objectives

The successful student will fulfill the following objectives:

CO-1: Compare and contrast major philosophical influences in scientific research.

CO-2: Interpret and reflect on ethical principles and standards in scientific research, including the roles of the Institutional Review Board.

CO-3: Develop a research plan that includes: (a) research problem, (b) theoretical framework, (c) review of

the literature, (d) research design and methodology, and (e) analysis of results.

CO-4: Analyze primary and secondary sources of scientific information and scholarly material.

CO-5: Evaluate different sampling techniques and test construction techniques, including: (a) assessment of validity and (b) reliability factors.

CO-6: Analyze data, including: (a) descriptive statistics, (b) Z test, (c) t-test, and (d) X² Test.

CO-7: Evaluate non-experimental research designs.

CO-8: Evaluate experimental research designs.

CO-9: Evaluate scientific journals and publishing process.

CO-10: Prepare and present a proposal for a research.

Outline

Week 1: Student Introductions, Definition of Research, Ethical Issues in Research

Course Objectives

CO-1, CO-2

Required Readings

Syllabus

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#### Chapter 1

*Curiosity and Research (Marder, 2011)*

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Additional Readings

Philosophy and Science (Spirkin, 1983)

On Being a Scientist: A Guide to Responsible Conduct in Research (NRC, 2009)

Assignments

Academic Honor Pledge

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#### Week 1 Forum

*Virtual Introduction, definition of research, and research topic selection*

### Week 2: Research Process, Sources of Scientific Information

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Course Objectives

CO-3, CO-4

Required Readings

*Basic Steps in the Research Process (CRLS, 2012)*

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Howto Write a Scientific Paper (Day, 1977)

Assignments

Week 2 Forum

The importance of proper source selection in scientific research.

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### **Research Proposal Part 1:**

*Research Problem and Theoretical Framework.*

### **Week 3: Research Methods**

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Course Objectives

CO-5

Required Readings

### **Chapter 2**

*Overview of Experimental Analysis and Design (Marder, 2011)*

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Additional Readings

An overview of Quantitative and Qualitative Data Collection Methods (NSF, 2002)

Assignments

Week 3 Forum

Sampling Techniques and Qualities of a Good Scientific Test.

Week 4: Statistics

Course Objectives

CO-6

Required Readings

Chapter 3

Statistics (Marder, 2011)

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## **Additional Readings**

*Bad science: Common problems in research articles (Wolf, 2012).*

Assignments

## **Week 4 Forum**

*Howto Analyze and Evaluate Scientific Articles.*

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Research Proposal Part 2:

Literature Review.

Week 5: Scientific Research Designs: Non-experimental

Course Objectives

CO-7

Required Readings

Chapter 4

Mathematical Models (Marder, 2011)

Assignments

Week 5 Forum

Non-Experimental Research Design in Science.

Week 6: Scientific Research Designs: Experimental

Course Objectives

CO-8

Required Readings

Chapter 5

Scientific Information (Marder, 2011)

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*Research and Experimental Design (Ratti & Garton, 1994)*

Assignments

## **Week 6 Forum**

*Design an Experiment.*

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Research Proposal Part 3:

Research Methodology and Design.

Week 7: The Publishing Process

Course Objectives

CO-9

Required Readings

Basics of Research Paper Writing and Publishing (Derntl, 2003)

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*Howto Write and Publish an Academic Research Paper (Journal Prep, 2010)*

Assignments

### **Week 7 Forum**

*Journal Selection and Overview.*

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Research Proposal Part 4:

Final Proposal

Week 8: Research Proposal

Course Objectives

CO-10

Required Readings

Research Methods: The Practice of Sciece (Carpi & Egger, 2008)

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*The Principal Elements of the Nature of Science: Dispelling the Myths (McComas, 1998)*

Assignments

### **Week 8 Forum**

*Present Your Research Proposal.*

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## **Evaluation**

**Eight (8) Weekly Forum Assignments**

The student will be responsible for participating in eight Forum activities in which s/he will respond to questions posed by the instructor, will offer his/her feedback to the questions posed, and will respond to at least two classmates' posts.

### Course Project (Research Proposal)

The Course Project consists of writing a Research Proposal, and it is divided in **four** parts: (a) Research Problem and Theoretical Framework, (b) Literature Review, (c) Research Methodology and Design, (d) Presentation of the final Proposal.

Part 1: Research Problem and Theoretical Framework

Part 2: Literature Review

Part 3: Research Methodology and Design

Part 4: Presentation of Final Proposal

Please see the [Student Handbook](#) to reference the University's [grading scale](#).

### Grading:

| Name                                                     | Grade % |
|----------------------------------------------------------|---------|
| Forums                                                   | 40.00 % |
| Week 1 Forum                                             | 5.00 %  |
| Week 2 Forum                                             | 5.00 %  |
| Week 3 Forum                                             | 5.00 %  |
| Week 4 Forum                                             | 5.00 %  |
| Week 5 Forum                                             | 5.00 %  |
| Week 6 Forum                                             | 5.00 %  |
| Week 7 Forum                                             | 5.00 %  |
| Week 8 Forum                                             | 5.00 %  |
| Research Proposal                                        | 60.00 % |
| Assignment 1: Research Problem and Theoretical Framework | 15.00 % |
| Assignment 2: Literature Review                          | 15.00 % |
| Assignment 3: Research Methodology and Design            | 15.00 % |
| Assignment 4: Research Proposal                          | 15.00 % |

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## Materials

**Book Title:** Research Methods for Science - e-book available in the APUS Online Library

**Author:** Marder

**Publication Info:** Cambridge University Press

**ISBN:** 9780521145848

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**Book Title:** To find the library e-book(s) req'd for your course, please visit <http://apus.libguides.com/er.php> to locate the eReserve by course #. You must be logged in to eCampus first to access the links.

**Author:** N/A

**Publication Info:** N/A

**ISBN:** N/A

### Required Technology

- See the Technology Requirements section of the undergraduate catalog for the minimum hardware and software requirements.
- Microsoft Office 365 is available to APUS students for free. To sign up, visit <http://products.office.com/en-us/student>. If you have questions about accessing the software, please contact Classroom support at [classroomsupport@apus.edu](mailto:classroomsupport@apus.edu).

### Additional Readings

Cambridge Rindge & Latin School. (2012). *Basic steps in the research process*. Retrieved from [http://www.crlsresearchguide.org/00\\_basic\\_steps.asp](http://www.crlsresearchguide.org/00_basic_steps.asp)

Carpi, A., Egger, A. E. (2008). Research methods: The practice of science. *Visionlearning, POS-2(1)*. Retrieved from <http://www.visionlearning.com/en/library/sub/Process-of-Science/49/Research-Methods/55>

Day, R. A. (1977). How to write a scientific paper [electronic version]. *IEEE Transactions on Professional Communication, 20(1)*, 32-37. Retrieved from <http://xa.yimg.com/kq/groups/25169972/159394019/name/1.DAY,+R.+A.pdf>

Derntl, M. (2003). *Basics of research paper writing and publishing* [electronic version]. Dissertation, University of Vienna. Retrieved from <http://www.eng.mu.edu/corlissg/advice/06Materials/meth-se.pdf>

Journal Prep. (2010). *Howto write and publish an academic research paper*. Retrieved from <http://www.journalprep.com/en/101-tips.php>

McComas, W. F. (1998). *The principal elements of the nature of science: Dispelling the myths*. Adapted from the chapter in McComas W. F. (ed.) *The Nature of Science in Science Education*, 53-70. Netherlands: Kluwer Academic Publishers. Retrieved from [http://earthweb.ess.washington.edu/roe/Knowability\\_590/Week2/Myths%20of%20Science.pdf](http://earthweb.ess.washington.edu/roe/Knowability_590/Week2/Myths%20of%20Science.pdf)

National Research Council. (2009). *On being a scientist: A guide to responsible conduct in research, (3rd ed.)* [electronic version]. Washington, DC: The National Academies Press. Online version Retrieved from <http://www.nap.edu/catalog/12192/on-being-a-scientist-a-guide-to-responsible-conduct-in>

Ratti, J. T., & Garton, E. O. (1994). Research and experimental design. *Research and management techniques for wildlife and habitats. Fifth edition. The Wildlife Society, Bethesda, Maryland, USA*, 1-23. Retrieved from <http://www.esg.montana.edu/biol525/ratti.pdf>

Spirkin, A. (1983). *Philosophy and Science*. In *Dialectical Materialism*, Ch. 1 Philosophy as a World View and Methodology [electronic version]. Retrieved from <http://www.marxists.org/reference/archive/spirkin/works/dialectical-materialism/ch01-s04.html>

The National Science Foundation. (2002). *An overview of quantitative and qualitative data collection methods*. In *The 2002 user-friendly Handbook for Project Evaluation*, 43-62. Retrieved from [http://www.nsf.gov/pubs/2002/nsf02057/nsf02057\\_4.pdf](http://www.nsf.gov/pubs/2002/nsf02057/nsf02057_4.pdf)

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## Course Guidelines

## Citation and Reference Style

- Attention Please: Students will follow the APA Format as the sole citation and reference style used in written work submitted as part of coursework to the University. Assignments completed in a narrative essay or composition format must follow the citation style cited in the APA Format.

## Tutoring

- [Tutor.com](https://www.tutor.com) offers online homework help and learning resources by connecting students to certified tutors for one-on-one help. AMU and APU students are eligible for 10 free hours\* of tutoring provided by APUS. Tutors are available 24/7 unless otherwise noted. Tutor.com also has a SkillCenter Resource Library offering educational resources, worksheets, videos, websites and career help. Accessing these resources does not count against tutoring hours and is also available 24/7. Please visit the APUS Library and search for 'Tutor' to create an account.

## Late Assignments

- Students are expected to submit classroom assignments by the posted due date and to complete the course according to the published class schedule. The due date for each assignment is listed under each Assignment.
- Generally speaking, late work may result in a deduction up to 15% of the grade for each day late, not to exceed 5 days.
- As a working adult I know your time is limited and often out of your control. Faculty may be more flexible if they know ahead of time of any potential late assignments.

## Turn It In

- Faculty may require assignments be submitted to Turnitin.com. Turnitin.com will analyze a paper and report instances of potential plagiarism for the student to edit before submitting it for a grade. In some cases professors may require students to use Turnitin.com. This is automatically processed through the Assignments area of the course.

## Academic Dishonesty

- Academic Dishonesty incorporates more than plagiarism, which is using the work of others without citation. Academic dishonesty includes any use of content purchased or retrieved from web services such as CourseHero.com. Additionally, allowing your work to be placed on such web services is academic dishonesty, as it is enabling the dishonesty of others. The copy and pasting of content from any web page, without citation as a direct quote, is academic dishonesty. When in doubt, do not copy/paste, and always cite.

## Submission Guidelines

- Some assignments may have very specific requirements for formatting (such as font, margins, etc) and submission file type (such as .docx, .pdf, etc) See the assignment instructions for details. In general, standard file types such as those associated with Microsoft Office are preferred, unless otherwise specified.

## Disclaimer Statement

- Course content may vary from the outline to meet the needs of this particular group.

## Communicating on the Forum

- Forums are the heart of the interaction in this course. The more engaged and lively the exchanges, the more interesting and fun the course will be. Only substantive comments will receive credit. Although there is a final posting time after which the instructor will grade comments, it is not sufficient to wait until the last day to contribute your comments/questions on the forum. The purpose of the forums is to actively participate in an on-going discussion about the assigned content.



- “Substantive” means comments that contribute something new and hopefully important to the discussion. Thus a message that simply says “I agree” is not substantive. A substantive comment contributes a new idea or perspective, a good follow-up question to a point made, offers a response to a question, provides an example or illustration of a key point, points out an inconsistency in an argument, etc.
  - As a class, if we run into conflicting view points, we must respect each individual's own opinion. Hateful and hurtful comments towards other individuals, students, groups, peoples, and/or societies will not be tolerated.
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## University Policies

### [Student Handbook](#)

- [Drop/Withdrawal policy](#)
- [Extension Requests](#)
- [Academic Probation](#)
- [Appeals](#)
- [Disability Accommodations](#)

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