

A 031: UNDERGRADUATE RESEARCH EXPERIENCE

Originator

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Justification / Rationale

Replace Math 040 with Math 049

Effective Term

Fall 2023

Credit Status

Credit - Degree Applicable

Subject

A - Astronomy

Course Number

031

Full Course Title

Undergraduate Research Experience

Short Title

RESEARCH EXPERIENCE

Discipline**Disciplines List**

Astronomy

Modality

Face-to-Face

100% Online

Hybrid

Catalog Description

Under the supervision of STEM faculty, students will select a project to be completed during the semester. Topics will include information retrieval, computer skills applied to laboratory research, time management, and organizational skills, application of modern research methods, experimental design, data collection and analysis, presentation skills (written and oral), and applying for summer internship opportunities.

Schedule Description

Under the supervision of STEM faculty, students will select a research project to be completed during the semester. Advisory: ENG 061 & MATH 049

Lecture Units

1

Lecture Semester Hours

18

Lab Units

1

Lab Semester Hours

54

In-class Hours

72

Out-of-class Hours

36

Total Course Units

2

Total Semester Hours

108

Prerequisite Course(s)

Advisory: ENG 061 & MATH 049

Required Text and Other Instructional Materials**Resource Type**

Web/Other

Description

All Learning resource material will be provided.

Class Size Maximum

8

Entrance Skills

Demonstrate the ability to use research skills including library resources such as books, periodicals, electronic databases and online resources such as the internet.

Requisite Course Objectives

ENG 061-Demonstrate a basic understanding of research-based writing, including the use of library resources to identify research sources.

Entrance Skills

Recognize features of style such as purpose, audience and tone integrate these elements into academic and professional writing.

Requisite Course ObjectivesENG 061-Demonstrate, in writing, the integration of purpose, audience, and tone, to achieve particular rhetorical goals.
ENG 061-Demonstrate both literal and analytic/interpretive reading skills, and convey these skills in writing.**Entrance Skills**

Demonstrate the ability to read and respond in writing beyond the literal interpretation of the text.

Requisite Course ObjectivesENG 061-Construct and organize paragraphs in multi-paragraph essays.
ENG 061-Demonstrate both literal and analytic/interpretive reading skills, and convey these skills in writing.**Entrance Skills**

Creating equations that model real world situations given in application (word) problems.

Requisite Course Objectives

MATH 049-Find the equation of a line and apply it to solve problems with a constant rate of change.

Entrance Skills

Communicate effectively with the instructor and mathematical community using proper terminology verbally as well as proper written notation.

Requisite Course Objectives

MATH 049-Describe the definition of functions and related terminology such as domain and range. Represent and interpret single-variate functions as equations, graphs, verbal descriptions of the dependent variable in terms of the independent variable, and function notation.

Entrance Skills

Be able to recognize equation of lines, quadratic functions, selected conics and graph the corresponding solution set as well as when given the solution set formulate the Algebraic equation.

Requisite Course Objectives

MATH 049-Interpret slope as a rate of change, in preparation for generalizing the rate of change to the derivative in the Calculus course.

MATH 049-Recognize when a table, graph, or equation is quadratic.

Course Content

1. The scientific method.
2. The research process.
3. Types of Library-specific databases.
4. Online literature searches.
5. Evaluation of online articles.
6. Proper citation of information both written and online.
7. Experimental design.
8. Preparation of written, oral, and poster presentation using appropriate software.
9. Time management skills and balancing coursework with research.
10. Summer Research Internships, what are they, where are they found, and how to apply.

Lab Content

1. Laboratory safety with specific reference to working in a research lab.
2. Introduction to Laboratory software, e.g. LabView and MatLab.
3. Creating a laboratory notebook.
4. Conduct a research project.
5. Summary and analysis of project results.
6. Preparation of written, oral and poster presentations using appropriate software.

Course Objectives

	Objectives
Objective 1	Demonstrate literature searches to assess previous work by others.
Objective 2	Create proper citations for referencing the work of others.
Objective 3	Demonstrate the skills necessary to collect and analyze data, and present results.
Objective 4	Apply multiple software programs in a research environment.
Objective 5	Develop a schedule that makes it possible to complete research projects and coursework.
Objective 6	Propose a research project and present the proposal to others.
Objective 7	Evaluate proposed work by others for goals, objectives, activities, and feasibility.
Objective 8	Write a paper describing research and results with proper formatting and literature citations.
Objective 9	Prepare a poster for a presentation that describes a research project.
Objective 10	Present completed research project to a group utilizing PowerPoint or similar software.
Objective 11	Locate and apply for summer research internship opportunities at national laboratories and universities.

Student Learning Outcomes

Upon satisfactory completion of this course, students will be able to:

Outcome 1	Analyze current research published in the scientific literature.
Outcome 2	Defend ideas, scientific knowledge, and experimental outcomes through written and oral communication.

Methods of Instruction

Method	Please provide a description or examples of how each instructional method will be used in this course.
Journal	Students will keep up-to-date records in lab notebook.
Experiential	Students will complete projects.
Collaborative/Team	Students will work on projects in teams.
Lecture	Short lectures will be provided as new topics are encountered.
Laboratory	Laboratory work can be within the lab environment or outdoors.

Methods of Evaluation

Method	Please provide a description or examples of how each evaluation method will be used in this course.	Type of Assignment
Computational/problem-solving evaluations	Students are required to do homework. Questions in the homework vary between multiple choice, essay, and interactive tutorials.	Out of Class Only
Group activity participation/observation	Students will learn how to operate MRO and evaluate targets to image.	In and Out of Class
Presentations/student demonstration observations	Students are going to analyze the data, present their findings in the form of a presentation	In and Out of Class
Student participation/contribution	Students are going to work in groups where each member will have an assignment	In Class Only
Term or research papers	By the end of the semester, students are required to turn in a research paper and submit it in one of the student journals	Out of Class Only

Assignments
Other In-class Assignments

1. Note taking
2. Participation in discussion
3. Presentation of project proposal
4. Critique proposals of other students
5. Conduct project
6. Presentation of the completed project (Oral and Poster)

Other Out-of-class Assignments

1. Literature search
2. Project design
3. Complete project analysis and summarize results
4. Prepare written document

Grade Methods

Letter Grade Only

Distance Education Checklist

Include the percentage of online and on-campus instruction you anticipate.

Online %

100

Lab Courses

How will the lab component of your course be differentiated from the lecture component of the course?

The lab component will include hands-on experience where students are going to know how to operate MRO. Students will learn how to use MRO and its instruments to capture images of celestial objects for analysis.

From the COR list, what activities are specified as lab, and how will those be monitored by the instructor?

Conduct a research project.

Summary and analysis of project results.

Preparation of written, oral and poster presentations using appropriate software.

Students are going to research literature related to the topic of interest. Students will turn in a writing summary based on their findings for review by the instructor. The instructor will give comments and provide feedback and direction on the outcome product.

Students are going to use astronomical software to search for their targets, use MRO to image their targets, learn and apply techniques of image processing. All of the above-mentioned activities will be done under the supervision of the instructor.

How will you assess the online delivery of lab activities?

Students are required to turn in lab reports which are related to the performed activities.

Instructional Materials and Resources

If you use any other technologies in addition to the college LMS, what other technologies will you use and how are you ensuring student data security?

Neither LMS nor other technologies will be used other than Canvas

If used, explain how specific materials and resources outside the LMS will be used to enhance student learning.

N/A

Effective Student/Faculty Contact

Which of the following methods of regular, timely, and effective student/faculty contact will be used in this course?

Within Course Management System:

Discussion forums with substantive instructor participation

Online quizzes and examinations

Private messages

Regular virtual office hours

Timely feedback and return of student work as specified in the syllabus

Video or audio feedback

Weekly announcements

External to Course Management System:

Direct e-mail

Posted audio/video (including YouTube, 3cm mediasolutions, etc.)

Telephone contact/voicemail

For hybrid courses:

Library workshops

Orientation, study, and/or review sessions

Scheduled Face-to-Face group or individual meetings

Briefly discuss how the selected strategies above will be used to maintain Regular Effective Contact in the course.

One of my main goals is to maintain effective contact and engagement with students. I am planning to achieve this by addressing three main ways: A) Learner to Resources B) Learner to Learner C) Faculty to Learner

A) Learner to Resources: Students are required to read the chapter before taking a pre-chapter quiz. They will have access to lecture and video material to comprehend each chapter goals and outcome. When they are done with their learning resources, they will take the post-chapter quiz, do their homework, lab assignment and post their learning summary in a discussion forum.

B) Learner to Learner: At the beginning of the semester, students are going to introduce themselves and students are going to make groups based on majors or interests.

Students are going to submit their summarized learning for each chapter and view other students summary, comment on them in discussion forums.

Students are going to be interacting with each other on group project and study sessions.

C) Faculty to Learner: At the beginning of the semester, an orientation session will take place. In this session, a discussion of the syllabus will take place as well as communicating class expectations. Announcements will be used throughout the course. I am going to hold regular virtual office hours and virtual group office hours. I am going to post feedback on student and group work.

If interacting with students outside the LMS, explain how additional interactions with students outside the LMS will enhance student learning.

Some of the videos will be posted on 3cm mediasolutions. I am planning to use zoom for virtual group discussions.

Other Information

Comparable Transfer Course Information

University System

CSU

Campus

San Diego State University

Course Number

ASTR 296

Course Title

Experimental Topics

Catalog Year

2019/20

University System

UC

Campus

UC Riverside

Course Number

PHY 097

Course Title

Lower Division Research

Catalog Year

2019/20

MIS Course Data

CIP Code

40.0201 - Astronomy.

TOP Code

191100 - Astronomy

SAM Code

E - Non-Occupational

Basic Skills Status

Not Basic Skills

Prior College Level

Not applicable

Cooperative Work Experience

Not a Coop Course

Course Classification Status

Credit Course

Approved Special Class

Not special class

Noncredit Category

Not Applicable, Credit Course

Funding Agency Category

Not Applicable

Program Status

Stand-alone

Transfer Status

Transferable to CSU only

General Education Status

Y = Not applicable

Support Course Status

N = Course is not a support course

Allow Audit

No

Repeatability

No

Materials Fee

No

Additional Fees?

No

Approvals**Curriculum Committee Approval Date**

11/01/2022

Academic Senate Approval Date

11/10/2022

Board of Trustees Approval Date

12/16/2022

Chancellor's Office Approval Date

12/22/2022

Course Control Number

CCC000635122