PHYS 252: NUCLEAR AND PARTICLE PHYSICS

In Workflow

1. PHYS Committee Chair (mikkel.jensen@csus.edu)
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Approval Path

1. Fri, 31 Jan 2025 19:15:26 GMT
   Mikkel Jensen (mikkel.jensen): Approved for PHYS Committee Chair
2. Fri, 31 Jan 2025 19:38:36 GMT
   William DeGraffenreid (degraff): Approved for PHYS Chair
3. Thu, 06 Feb 2025 23:02:05 GMT
   Mikkel Jensen (mikkel.jensen): Approved for NSM College Committee Chair
4. Wed, 19 Feb 2025 23:53:51 GMT
   Chris Taylor (ctaylor): Approved for NSM Dean

New Course Proposal

Date Submitted: Sat, 11 Jan 2025 01:27:22 GMT

Viewing: PHYS 252 : Nuclear and Particle Physics

Last edit: Sat, 11 Jan 2025 01:27:21 GMT

Changes proposed by: Rodolfo Barniol Duran (219696192)

Contact(s):

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Catalog Title:
Nuclear and Particle Physics

Class Schedule Title:
Nuclear & Particle Physics

Academic Group: (College)
NSM - Natural Sciences & Mathematics

Academic Organization: (Department)
Physics and Astronomy

Will this course be offered through the College of Continuing Education (CCE)?
No

Catalog Year Effective:
Fall 2026 (2026/2027 Catalog)

Subject Area: (prefix)
PHYS - Physics

Catalog Number: (course number)
252

Course ID: (For administrative use only.)
TBD

Units:
3

Is the ONLY purpose of this change to update the term typically offered or the enforcement of existing requisites at registration?
No

In what term(s) will this course typically be offered?
Spring term only - odd years

Does this course require a room for its final exam?
Yes, final exam requires a room

Does this course replace an existing experimental course?
No

This course complies with the credit hour policy:
Yes

Justification for course proposal:
Physics 252 is one of the elective courses being proposed as part of a new Master of Science in Physics. This course broadens the physics curriculum by creating an elective option to prepare students for research, internships and careers in nuclear physics, particle physics, and radiation technology. There is a nationally recognized workforce need for employees with advanced knowledge in these subjects. The course was designed with input from regional employers in this sector and by interviewing former students that have successfully completed student internships in nuclear and particle physics.

Course Description: (Not to exceed 90 words and language should conform to catalog copy.)
Foundations of subatomic physics, the classification, structure, interactions, and production of subatomic particles, symmetries and conservation laws, the Standard Model of particle physics, electroweak interactions, nucleon-nucleon interactions, nuclear models, nucleosynthesis, radioactivity, radiation hazards, accelerators, and detectors.

Are one or more field trips required with this course?
No

Fee Course?
No

Is this course designated as Service Learning?
No

Is this course designated as Curricular Community Engaged Learning?
No

Does this course require safety training?
No

Does this course require personal protective equipment (PPE)?
No

Course Note: (Note must be a single sentence; do not include field trip or fee course notations.)
1) Students can only complete for credit either PHYS 152 or PHYS 252; 2) PHYS 252 students will complete an additional research project beyond that expected of students in PHYS 152.

Does this course have prerequisites?
Yes

Prerequisite:
PHYS 106 and MATH 45, or instructor permission.

Prerequisites Enforced at Registration?
Yes

Does this course have corequisites?
No

Graded:
Letter

Approval required for enrollment?
No Approval Required

Course Component(s) and Classification(s):
Lecture

Lecture Classification
CS#02 - Lecture/Discussion (K-factor=1WTU per unit)
Lecture Units
3

Is this a paired course?
Yes

Please confirm that it complies with the Paired Courses Policy and enter the course with which it is paired:
Phys 152

Is this course crosslisted?
No

Can this course be repeated for credit?
No

Can the course be taken for credit more than once during the same term?
No

Description of the Expected Learning Outcomes and Assessment Strategies:

List the Expected Learning Outcomes and their accompanying Assessment Strategies (e.g., portfolios, examinations, performances, pre-and post-tests, conferences with students, student papers). Click the plus sign to add a new row.

	Expected Learning Outcome	Assessment Strategies
1	Specify the roles of elementary particles in nuclear and particle physics.	Homework, quizzes and exams assessing knowledge of elementary particle models.
2	Predict the advanced properties of nuclei using nuclear models.	Homework, quizzes and exams assessing knowledge of nuclear models.
3	Identify advanced symmetry principles and conservation laws in nuclear and particle physics.	Homework, quizzes and exams assessing understanding how conservation laws are a result of symmetries.
4	Demonstrate an in-depth understanding of the fundamental interactions of particles with matter.	In-class discussions, presentations, and exams assessing understanding of the detection of particles as they interact with matter.
5	Interpret the major experimental tests (for example, electroweak interactions, neutrino detection, quark-gluon production, nuclear energy levels) of the models of particle and nuclear physics.	In-class discussions, literature summary presentations, and exams assessing student's ability to interpret how experimental results are tests of particle and nuclear models.

6	Apply advanced theoretical knowledge to derive foundational relationships in subatomic physics and predict, using a quantitative model, the quantum properties of bound states of nuclei or particles.	Weekly questions that utilize student's advanced theoretical knowledge to derive fundamental subatomic expressions and a written final report describing student's application of a nuclear or particle model to predict the bound states of particles or nuclei.

Attach a list of the required/recommended course readings and activities:

PHYS 252 Nuclear and Particle Physics.docx

For whom is this course being developed?

Majors in the Dept

Is this course required in a degree program (major, minor, graduate degree, certificate?)

No

Does the proposed change or addition cause a significant increase in the use of College or University resources (lab room, computer)?

No

Will there be any departments affected by this proposed course?

No

I/we as the author(s) of this course proposal agree to provide a new or updated accessibility checklist to the Dean's office prior to the semester when this course is taught utilizing the changes proposed here.

I/we agree

University Learning Goals

Graduate (Masters) Learning Goals:

Disciplinary knowledge
Critical thinking/analysis
Information literacy

Is this course required as part of a teaching credential program, a single subject, or multiple subject waiver program (e.g., Liberal Studies, Biology) or other school personnel preparation program (e.g., School of Nursing)?

No

Is this a Graduate Writing Intensive (GWI) course?

No

Key: 14750