Modesto Junior College

Course Outline of Record Report

11/17/2021

PHYS153 : Problem Solving and Technology for Physics 143

General Information

Faculty Author:	• Kenneth Meidl • Nomof, Thomas • Chase, Daniel • Richmond, Jennifer
Attachments:	PHYS 153 DE Addendum Spring 2021 Newest.pdf PHYS-153_FA16.pdf ApprovalLetter_PHYS 153_CCC000572197.pdf ASSIST CAS PHYS 153.pdf ASSIST Maintenance Reports.pdf ASSIST Maintenance Reports1.pdf Download
Course Code (CB01) :	PHYS153
Course Title (CB02) :	Problem Solving and Technology for Physics 143
Department:	Physics
Proposal Start Date:	MJC Fall 2023
TOP Code (CB03) :	(1902.00) Physics, General
CIP Code:	(40.0801) Physics, General
SAM Code (CB09) :	Non-Occupational
Distance Education Approved:	No
Course Control Number (CB00) :	CCC000572197
Curriculum Committee Approval Date:	03/22/2016
Board of Trustees Approval Date:	04/13/2016
External Review Approval Date:	01/01/2015
Course Description:	Designed to supplement Physics 143 in developing problem-solving skills, measuring and instrumentation techniques and applications of physical concepts and laws in a small group environment.
Proposal Type:	Mandatory Revision Mandatory five-year review and revision.
Faculty Author:	No value

Discipline(s)

Master Discipline Preferred:
- Physics/Astronomy

Bachelors or Associates Discipline Preferred: No value

Course Coding

Basic Skill Status (CB08)

Course is not a basic skills course.

Course Special Class Status (CB13)

Course is not a special class.

Grading

- P/NP Only

☐ Allow Students to Gain Credit by Exam/Challenge

Repeatability

0

Course Prior To College Level (CB21)

Not applicable.

Rationale For Credit By Exam/Challenge

No value

Type of Repeat

No value

☐ Allow Students To Audit Course

Course Support Course Status (CB26)

No value

Associated Programs

☐ Course is part of a program (CB24)

Associated Program	Award Type	Active
No value	No value	

Transferability & Gen. Ed. Options

Course General Education Status (CB25)

Y

Transferability

Transferable to both UC and CSU

Transferability Status

Approved

Field Trips

Field trips are required.

- (●) Yes
- ( ) No
- ( ) Maybe

Comparable Lower-Division Courses at UC/CSU v2

Courses numbered 100-299 require identification two comparable lower-division courses from CSU or UC from the current institutional catalog (not schedule). At least one course from CSU, and if requesting/maintaining UC general elective transfer, one course from UC. Please identify the CSU campus offering this course. (Term type is indicated in parentheses)

CSU, Chico (SEM)

CSU Catalog Year

2020-2021

Provide the CSU course code (e.g., ENGL 1A) from the most current official Catalog (not schedule). Curriculum changes each year.

PHYS 202Y

CSU Course Title

Physics Problem Session

Does course-to-course or lower-division, "major prep" articulation with this course exist for this academic year?

Unsure

Select the institution that offers the second comparable course from CSU or UC. If seeking or maintaining UC transferability, you must supply a UC campus. (Term type is indicated in parentheses)

CSU, Stanislaus (SEM)

CSU/UC Catalog Year

2020-2021

Provide the CSU course code (e.g., ENGL 1A) from the most current official Catalog (not schedule). Curriculum changes each year.

PHYS 2111

CSU Course Title

Problem Solving for topics in Physics 2110

Does course-to-course or lower-division, "major prep" articulation with this course exist for this academic year?

Unsure

Select the institution that offers the third comparable course from CSU or UC. If seeking or maintaining UC transferability, you must supply a UC campus if not already provided above. (Term type is indicated in parentheses)

UCLA (QTR)

CSU/UC Catalog Year

2020-2021

Provide the CSU/UC course code (e.g., ENGL 1A) from the current official Catalog (not schedule). Curriculum changes each year.

PHYS 5B and 5C

CSU Course Title

Physics for Life Science Majors

Does course-to-course or lower-division, "major prep" articulation with this course exist for this academic year?

Unsure

Units and Hours

Summary

Minimum Credit Units (CB07)	1
Maximum Credit Units (CB06)	1
Total Course In-Class (Contact) Hours	18
Total Course Out-of-Class Hours	36
Total Student Learning Hours	54

Credit / Non-Credit Options

Course Credit Status (CB04)

Credit - Degree Applicable

Course Non Credit Category (CB22)

Credit Course.

Non-Credit Characteristic

No Value

Course Classification Code (CB11)

Credit Course.

Funding Agency Category (CB23)

Not Applicable.

☐ Cooperative Work Experience Education Status (CB10)

☐ Variable Credit Course

Weekly Student Hours

	In Class	Out of Classs
Lecture Hours	1	2
Laboratory Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	52.5
Course In-Class (Contact) Hours	

Activity Hours	0	0

Lecture	18
Laboratory	0
Activity	0
Total	18

Course Out-of-Class Hours

Lecture	36
Laboratory	0
Activity	0
Total	36

Time Commitment Notes for Students

No value

Units and Hours - Weekly Specialty Hours

Activity Name	Type	In Class	Out of Class
No Value	No Value	No Value	No Value

Prerequisites, Corequisites, and Advisories

Co-Requisite

PHYS143 - Electricity, Magnetism, Optics, Atomic and Nuclear Structure (in-development)

Requisite Skills

Requisite Skills	Description
Describe properties of electric charges and methods of charging objects.	• PHYS 143 - Describe properties of electric charges and methods of charging objects. • PHYS 143 - State and apply Coulomb's Law and the Law of Conservation of Charge in order to explain, analyze and solve problems in electrostatics. • PHYS 143 - Define the concept of an electric field and a line of force and sketch field lines for simple charge distributions. • PHYS 143 - Define the concepts of electric potential, electric potential difference and electric potential energy and calculate these quantities for collections of point charges. • PHYS 143 - Define the concept of an equipotential surface, explain its relationship to electric field lines, and calculate the value of the electric field given the electric potential

of a charge distribution.
- PHYS 143 - Define capacitance, calculate the capacitance of various types of capacitors, and calculate the effective capacitance for arrangements of capacitors in series and parallel.
- PHYS 143 - Define the concept of energy density and calculate the energy density of an electric field as well as the energy stored in a capacitor.
- PHYS 143 - Describe properties of dielectrics and their effect upon capacitance from both a macroscopic and microscopic perspective.
- PHYS 143 - Describe the concepts of electric DC and AC current, resistance and resistivity; describe their relationship to voltage via Ohm's Law; and apply these concepts in order to explain, analyze and solve problems in electrodynamics.
- PHYS 143 - Describe simple sources of electric power and calculate the electric power generated in a circuit.
- PHYS 143 - Apply reduction techniques and Kirchoff's Laws in analyzing DC circuits.
- PHYS 143 - Describe causes and properties of magnetic fields in current-carrying wires and permanent magnets.
- PHYS 143 - Describe forces and torques acting on charged particles moving in magnetic fields as well as common applications of technologies exploiting such forces.
- PHYS 143 - Describe magnetic field configurations surrounding various current distributions.
- PHYS 143 - State and apply Faraday's Law of Electromagnetic Induction in order to explain common technologies and to analyze problems related to various electromagnetic phenomena.
- PHYS 143 - Describe Hertz's Experiment, properties of electromagnetic waves and explain how electromagnetic waves are produced.
- PHYS 143 - Describe the nature of light using both wave and particle models and describe experiments to determine the speed of light.
- PHYS 143 - Using the ray model for light, state and apply the Law of Rectilinear Reflection and Snell's Law of Refraction in explaining and analyzing optical phenomena, such as dispersion and total internal reflection.
- PHYS 143 - Use analytical techniques as well as ray diagrams to describe images formed by reflecting and refracting surfaces.
- PHYS 143 - Using the wave model for light, describe and apply interference conditions to analyze, explain and solve problems involving double slit interference, thin films, single slit diffraction and diffraction gratings.
- PHYS 143 - Describe four processes of polarizing light (selective absorption, reflection, scattering and double refraction) and apply Brewster's Law and the Law of Malus in order to solve problems involving light polarization.
- PHYS 143 - State the postulates of special relativity and explain and apply the consequences of these postulates (including relative simultaneity, time dilation, length contraction, twin paradox, relativistic velocity addition, relativistic linear momentum, relativistic energy and rest energy) in explaining phenomena and solving quantitative problems.
- PHYS 143 - Describe experimental procedures and results supporting the quantum nature of radiation and matter, including Planck's Hypothesis, the Photoelectric Effect and the Compton Effect.
- PHYS 143 - Explain the meaning of the wave-particle duality in nature and describe the wave properties of particles.
- PHYS 143 - State the Heisenberg Uncertainty Principle and explain the role of probability in quantum mechanics.
- PHYS 143 - Describe the Thomson, Rutherford, Bohr and quantum models of the atom and cite experimental evidence supporting/refuting these models where appropriate.
- PHYS 143 - Describe nuclear properties and structure as well as nuclear processes.

Specifications

Methods of Instruction

Methods of Instruction (Typical)	INSTRUCTIONAL METHODS

MOI

1. Lectures
2. Class demonstrations
3. Classroom exercises
4. Modeling of problem-solving strategies through interactive discussion sections

Assignments (Typical)

Evidence of Workload for Course Units (Quantity)

1. Weekly problem solving homework assignments
2. Daily reading of text
3. Preparation for weekly quizzes and mid-term exams

Evidence of Critical Thinking (Quality)

1. Using the digital multimeter, the low voltage supply, and electrical leads, construct and calculate the electric field 2.0-cm from the positive electrode in an electrical dipole.
2. Use Snell's law to calculate the index of refraction knowing that the incident angle is 42 degrees and the transmitted angle is 31 degrees.

Methods of Evaluation (Typical)	Rationale
FORMATIVE EVALUATION	1. Participation and completion of in-class assignments covering course curriculum
SUMMATIVE EVALUATION	1. Workbook of all in-class exercises attempted and completed

Equipment

No Value

Textbooks

Author	Title	Publisher	Date	ISBN
Giancoli, Douglas	Physics (7th Ed.)	Pearson	2019	0-321-6259

Other Instructional Materials

No Value

Textbook Exceptions and Supplementals

Title of Other Material

No Value

Who prepared or published this supplemental material?

No Value

Publish date

No Value

Are any of the textbook editions cited on this proposal considered "Classics" (typically with a publish date more than 5 years old)?

- [ ] Yes
- [x] No
- [ ] Unsure

If yes, explain why this older text is used in the course. Reasons should focus on content only.

No Value

Materials Fees v2

Is there a materials fee for this course?

No

Provide a cost breakdown for all items provided for a materials fee. Each item must become "tangible personal property" of student upon payment of the fee and completion of the course.

No Value

Explain how these materials are related to the Student Learning Objectives for the course.

No Value

Explain how the materials have continuing value outside the classroom.

No Value

Is the amount of the material the student receives commensurate with the fee paid AND with the amount of material necessary to achieve the Student Learning Objectives for the course AND provided as the district's actual cost?

No Value

If no is checked, explain why.

No Value

If the district is NOT the only source of these materials, explain why the students have to pay a fee to the district rather than supply the materials themselves. (Cost savings? Health/Safety? Consistency/Uniformity?)

No Value

Learning Outcomes and Objectives

Course Objectives

Describe properties of electric charges and methods of charging objects.

State and apply Coulomb's Law and the Law of Conservation of Charge in order to explain, analyze and solve problems in electrostatics.

Define the concepts of electric potential, electric potential difference and electric potential energy and calculate these quantities for collections of point charges.

Define the concept of an equipotential surface, explain its relationship to electric field lines, and calculate the value of the electric field given the electric potential of a charge distribution.

Define capacitance, calculate the capacitance of various types of capacitors, and calculate the effective capacitance for arrangements of capacitors in series and parallel.

Describe the concepts of electric DC and AC current, resistance and resistivity; describe their relationship to voltage via Ohm's Law; and apply these concepts in order to explain, analyze and solve problems in electrodynamics.

Describe simple sources of electric power and calculate the electric power generated in a circuit.

Describe forces and torques acting on charged particles moving in magnetic fields as well as common applications of technologies exploiting such forces.

Using the ray model for light, state and apply the Law of Rectilinear Reflection and Snell's Law of Refraction in explaining and analyzing optical phenomena, such as dispersion and total internal reflection.

Use analytical techniques as well as ray diagrams to describe images formed by reflecting and refracting surfaces.

Using the wave model for light, describe and apply interference conditions to analyze, explain and solve problems involving double slit interference, thin films, single slit diffraction and diffraction gratings.

Describe experimental procedures and results supporting the quantum nature of radiation and matter, including Planck's Hypothesis, the Photoelectric Effect and the Compton Effect.

State the postulates of special relativity and explain and apply the consequences of these postulates (including relative simultaneity, time dilation, length contraction, twin paradox, relativistic velocity addition, relativistic linear momentum, relativistic energy and rest energy) in explaining phenomena and solving quantitative problems.

CSLOs

Solve problems and predict outcomes for electromagnetic, optical and modern physical systems through application of principles in classical electromagnetism, classical wave theory and modern physics (algebraic and trigonometric principles will be utilized in the process).

Expected SLO Performance: 0.0

Use the scientific method to collect and analyze data for electromagnetic, optical and modern physical systems. Expected SLO Performance: 0.0

Verify physical principles involving classical electromagnetism, classical wave theory and modern physics through measurement and experimentation. Expected SLO Performance: 0.0

State and apply fundamental electromagnetic, optical and modern physical principles in order to explain phenomena in our everyday world (emphasis will be placed upon relevant phenomena in the fields of the life sciences). Expected SLO Performance: 0.0

Content

Course Content

1. Electric Charge and The Electric Field
    1. Conservation of charge
    2. Coulomb's Law
    3. Electric field lines
2. The Electric Potential and Capacitance
    1. Equipotentials
    2. Capacitance and Dielectrics
3. Electric Currents
    1. Ohm's Law
    2. Electric power
    3. DC Circuits
4. Magnetism
    1. Magnetic fields
    2. Sources of magnetic fields and Ampere's Law
    3. Forces on charged particles
5. Electromagnetic Induction
    1. Induced EMF
    2. Faraday's Law
    3. Lenz's Law
    4. Generators and transformers
6. Geometric Optics
    1. The law of reflection
    2. Index of refraction
    3. Thin lenses and mirrors
    4. Snell's Law
7. Wave Nature of Light
    1. Interference of light
    2. Dispersion
    3. Diffraction
    4. Polarization
8. Special Theory of Relativity
    1. Galilean relativity
    2. Einstein's postulates of special relativity
    3. Time Dilation
    4. Length Contraction
    5. Energy and mass relationship
9. Early Quantum Theory
    1. The properties of the electron
    2. The photoelectric effect
    3. Photon interactions
    4. The Bohr model of hydrogen
    5. The Heisenberg uncertainty principle
    6. The periodic table of elements
10. Nuclear Physics
    1. Structure of the nucleus
    2. Fundamental forces

3. Binding Energy
4. Fission
5. Fusion
6. Radioactive Half-life
7. Nuclear radiation
8. Radioactive Dating and transmutations

Recommended Course Content

Recommended Course Content

No Value

Recommended Lab Content

No Value

Distance Education (DE) Addendum

Is this course being proposed for Distance Education? If so, select Yes below from the list in the dropdown and complete the questions. If no, select No and skip all questions.

- Yes

Modality Type:

- Hybrid
- Online (ECO)

Methods of Instruction:

- Asynchronous Discussion
- Viewing and Listening to Videos
- Online Activities
- Written Assignments
- Reading Course Materials
- Collaborative Peer/Group Activities
- Interactive Activities
- Synchronous Discussion
- Listening to Audio Materials
- Facilitated Discussions
- Quizzes, Exams, and Surveys
- Multimedia Presentations
- On-campus Orientation Sessions (hybrid only)

If Other is selected for Methods of Instruction, please describe:

No Value

Describe how the methods of instruction selected above will allow students to meet the course's learning outcomes:

The course information can be covered asynchronously through recorded videos with closed captioning or through synchronous lectures and discussions using video conference technology. The instructor will use the school's learning management system to administer written assignments, reading materials, discussions, class activities, and quizzes/exams for formative and summative assessment. Discussions may be used in the hybrid modality to provide non-traditional assignments that promote equity for students.

Describe how the methods selected will be presented in an accessible way (Title 5 §55206). For information about accessibility standards in online classes, see the OEI Rubric, Section D (Copy this link and paste in a separate browser to visit OEI Rubric: https://onlinenetworkofeducators.org/course-design-academy/online-course-rubric/)

Instructor created curriculum in the form of written assignments and evaluations will follow OEI guidelines for heading styles, lists, links and images. The campus learning management system accessibility checker tool will be used when creating online content for students. Heading styles will be used to make navigation of material easy for students and accessible for screen readers. Lists will use the bullet tool instead of being developed manually, images will have robust captions, tables will be formatted according to accessibility, and hyperlinks will be defined properly. All videos will have closed captions that are high quality, consistent, and meet the needs of deaf and hard of hearing audiences.

Regular and Effective Contact (REC) Methods and Examples: Select the methods below that ensure regular effective contact (REC) will take place among students and among students and faculty (Title 5 §55204) by being initiated by the instructor, regular and frequent, and meaningful or of an academic nature. Select the methods of REC that may be used:

No Value

REC Among students: How will students interact with each other in the course? What methods will be used? Check all that apply.

- Discussion Boards
- Group Projects
- Social Media
- Q & A Discussion Boards
- Peer Review

REC Among students and faculty: How will faculty interact with students in the course? What methods will be used? Check all that apply

- Announcements
- Assignment Feedback
- Discussion Boards
- Email
- Video Conferencing Technology (e.g. Zoom, MS Teams, etc...)
- Office Hours
- The Online Course Syllabus
- Social Media

Other Methods of REC among students and among students and faculty. Please describe and provide example(s).

No Value

In hybrid or teleclass courses, describe what parts of the course are done face-to-face and what parts are done online.

The hybrid learning modality will involve a face-to-face orientation session at the beginning of the semester. Weekly discussions following the orientation will occur remotely.

Checkoff List

Does this proposal meet the five development criteria as stated in the CCCCO Program and Course Approval Handbook (PCAH)?

Yes

Are library resources needed for this course?

No library resources are needed for this course.

Do you have any special concerns/needs or comments? If yes, describe.

No Value

Have you included documentation, if necessary, by uploading file(s) in the Cover Info tab? For example, advisory committee meeting minutes, C-ID descriptor, etc.)

No documentation is necessary

If this is a new course, have you attached the completed class capacity form, with required approvals, and uploaded the file in the Cover Info tab?

No, this is not a new course

If you are requesting Distance Education, did you complete the DE addendum tab?

Yes

If requesting transferability, have you completed the comparable courses field?

Yes

Add any additional comments you want reviewers to read.

No Value