Modesto Junior College

Course Outline of Record Report

11/17/2021

PHYS121 : Problem Solving and Technology for Physics 101

General Information

Faculty Author:	• Kenneth Meidl • Nomof, Thomas • Richmond, Jennifer • Chase, Daniel
Attachments:	PHYS 121 DE Addendum Spring 2021 Newest.pdf PHYS-121_FA16.pdf ASSIST Maintenance Reports.pdf ASSIST Maintenance Reports1.pdf ASSIST CAS PHYS 121.pdf ApprovalLetter_PHYS 121_CCC000572192.pdf Download
Course Code (CB01) :	PHYS121
Course Title (CB02) :	Problem Solving and Technology for Physics 101
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) :	CCC000572192
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 101 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)

Course is not a support course

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 204X

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)

UCLA (QTR)

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 1A

CSU Course Title

Physics for Scientists and Engineers

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)

No Value

CSU/UC Catalog Year

No Value

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

No Value

CSU Course Title

No Value

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

No Value

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

PHYS101 - General Physics: Mechanics (in-development)

Requisite Skills

Requisite Skills	Description
Explain introductory physics concepts, such as energy, motion, momentum, gravitation, and rotational mechanics.	• PHYS 101 - Define the translational kinematic variables (time, distance, position, average speed, instantaneous speed, average velocity, instantaneous velocity, average acceleration and instantaneous acceleration) as well as apply them in order to explain, analyze, and solve one-dimensional motion problems. • PHYS 101 - Define and apply concepts related to measurement to include units, systems of units, metric prefixes, standards, unit conversions, dimensional analysis, order of magnitude estimates and significant figures. • PHYS 101 - Derive, state, and apply the 4 kinematic equations of motion in order to solve one-dimensional motion problems, such as that of the falling body.

PHYS 101 - Analyze position-time, velocity-time and acceleration time graphs using the concepts of slope and area.
- PHYS 101 - Use the rules of vector algebra to add vectors, subtract vectors, resolve vectors into components, multiply vectors by scalars and multiply vectors by other vectors using both the scalar product and vector product operations.
- PHYS 101 - Use vectors in conjunction with kinematical concepts to describe special cases of two-dimensional motion (including projectile motion, uniform circular motion and non-uniform circular motion) and apply kinematical concepts in order to explain, analyze and solve problems concerning physical phenomena.
- PHYS 101 - State Newton's Three Laws of Motion and apply them in order to explain physical phenomena and solve quantitative problems in dynamics.
- PHYS 101 - Define and differentiate among the concepts of work and power (for both constant and variable forces); kinetic energy and potential energy; conservative and non-conservative force as well as apply these concepts in order to explain, analyze and solve problems concerning physical phenomena.
- PHYS 101 - Apply the Work-Kinetic Energy Theorem and Law of Conservation of Energy to explain physical phenomena and to extract quantitative kinematical information from mechanical systems.
- PHYS 101 - Derive the impulse-momentum theorem from Newton's 2nd Law and use it to explain, analyze and solve problems concerning physical phenomena.
- PHYS 101 - Derive the law of conservation of linear momentum from Newton's 3rd Law and use it to explain, analyze and solve problems involving collisions and other physical phenomena.
- PHYS 101 - Define and determine the center of mass for a system of particles and continuous mass distribution, and use the center of mass concept to simplify and solve motion problems.
- PHYS 101 - Define the analogous kinematical variables, kinematical equations and linear transformations for rotational motion and use them to explain, analyze and solve motion problems.
- PHYS 101 - Calculate the rotational inertia for systems of point particles and continuous mass distributions and use the Parallel Axis Theorem to aid in calculations.
- PHYS 101 - Define the concepts torque, work, kinetic energy, power and angular momentum in order to describe rotating systems.
- PHYS 101 - Apply Newton's Second Law, the conservation of energy and the conservation of angular momentum in order to explain, analyze and solve problems in rotational dynamics.
- PHYS 101 - State the equilibrium conditions for a rigid body and apply them in solving statics problems for various systems of rigid bodies.
- PHYS 101 - State Newton's Law of Universal Gravitation and apply it in order to explain, analyze and solve problems related to physical phenomena.
- PHYS 101 - State and apply Kepler's 3 laws in conjunction with of the Law of Conservation of Energy to analyze planetary and satellite motion.
- PHYS 101 - Define the concept of a gravitational field and calculate the gravitational potential energy for a system of point particles.

Specifications

Methods of Instruction

Methods of Instruction (Typical)	INSTRUCTIONAL METHODS
MOI	1. Lectures 2. Class demonstrations 3. Classroom exercises and group problem solving sessions 4. Modeling of problem-solving strategies through interactive discussion sessions

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. Given the ramp set up at the bench, make the appropriate measurements and calculations to predict how far the projectile will travel.
2. If a box is given a push on a rough floor and travels 4.2 meters before coming to rest, calculate the coefficient of sliding friction.

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
Serway	Physics for Scientists and Engineers	Cengage	2019	9781337553278

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
- ☑ No
- ☐ Unsure

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

This is the most recent edition.

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

Define the translational kinematic variables (time, distance, position, average speed, instantaneous speed, average velocity, instantaneous velocity, average acceleration and instantaneous acceleration) as well as apply them in order to explain, analyze, and solve one-dimensional motion problems.

Define and apply concepts related to measurement to include units, systems of units, metric prefixes, standards, unit conversions, dimensional analysis, order of magnitude estimates and significant figures.

Derive, state, and apply the 4 kinematic equations of motion in order to solve one-dimensional motion problems, such as that of the falling body.

Analyze position-time, velocity-time and acceleration time graphs using the concepts of slope and area.

Use the rules of vector algebra to add vectors, subtract vectors, resolve vectors into components, multiply vectors by scalars and multiply vectors by other vectors using both the scalar product and vector product operations.

Use vectors in conjunction with kinematical concepts to describe special cases of two-dimensional motion (including projectile motion, uniform circular motion and non-uniform circular motion) and apply kinematical concepts in order to explain, analyze and solve problems concerning physical phenomena.

State Newton's Three Laws of Motion and apply them in order to explain physical phenomena and solve quantitative problems in dynamics.

Define and differentiate among the concepts of work and power (for both constant and variable forces); kinetic energy and potential energy; conservative and non-conservative force as well as apply these concepts in order to explain, analyze and solve problems concerning physical phenomena.

Apply the Work-Kinetic Energy Theorem and Law of Conservation of Energy to explain physical phenomena and to extract quantitative kinematical information from mechanical systems.

Derive the impulse-momentum theorem from Newton's 2nd Law and use it to explain, analyze and solve problems concerning physical phenomena.

Define and determine the center of mass for a system of particles and continuous mass distribution, and use the center of mass concept to simplify and solve motion problems.

Define the analogous kinematical variables, kinematical equations and linear transformations for rotational motion and use them to explain, analyze and solve motion problems.

Calculate the rotational inertia for systems of point particles and continuous mass distributions and use the Parallel Axis Theorem to aid in calculations.

Apply Newton's Second Law, the conservation of energy and the conservation of angular momentum in order to explain, analyze and solve problems in rotational dynamics.

State the equilibrium conditions for a rigid body and apply them in solving statics problems for various systems of rigid bodies.

State Newton's Law of Universal Gravitation and apply it in order to explain, analyze and solve problems related to physical phenomena.

Define the concept of a gravitational field and calculate the gravitational potential energy for a system of point particles.

CSLOs

Solve problems and predict outcomes for moving objects though application of kinematics, Newton's laws of motion and conservation laws (algebraic, trigonometric and calculus-based principles will be utilized in the process). Expected SLO Performance: 0.0

Use the scientific method to collect and analyze data for moving objects. Expected SLO Performance: 0.0

Verify physical principles in classical mechanics through measurement and experimentation. Expected SLO Performance: 0.0

State and apply fundamental mechanical principles in order to explain phenomena in our everyday world (emphasis will be placed upon relevant phenomena in the field of engineering). Expected SLO Performance: 0.0

Content

Course Content

1. Physics and Measurement
    1. Dimensional Analysis
    2. Conversion of Units
    3. Significant Figures
2. Motion in One Dimension
    1. Position, Velocity, and Speed
    2. Instantaneous Velocity and Speed
    3. Acceleration
    4. Motion Diagrams
    5. One-Dimensional Motion with Constant Acceleration
    6. Kinematic Equations Derived from Calculus – General Problem-Solving Strategy
3. Vectors
    1. Coordinate Systems
    2. Vector and Scalar Quantities
    3. Vector algebra
4. Motion in Two Dimensions
    1. The Position, Velocity, and Acceleration Vectors
    2. Two-Dimensional Motion with Constant Acceleration
    3. Projectile Motion
    4. Uniform Circular Motion
5. Circular Motion and Other Applications of Newton's Laws
    1. Newton's Second Law Applied to Uniform Circular Motion
    2. Nonuniform Circular Motion
    3. Numerical Modeling in Particle Dynamics
6. The Laws of Motion
    1. The Concept of Force
    2. Newton's First Law and Inertial Frames
    3. Newton's Second Law
    4. The Gravitational Force and Weight
    5. Some Applications of Newton's Laws
7. Energy and Energy Transfer
    1. Work Done by a Constant Force
    2. The Scalar Product of Two Vectors
    3. Work Done by a Varying Force
    4. Kinetic Energy and the Work-Kinetic Energy Theorem
    5. Power
8. Potential Energy

1. Potential Energy of a System
2. The Isolated System – Conservation of Mechanical Energy
3. Conservative and Nonconservative Forces
4. Energy Diagrams and Equilibrium of a System

9. Linear Momentum and Collisions
    1. Linear Momentum and Its Conservation
    2. Impulse and Momentum
    3. Collisions in One Dimension
    4. Two-Dimensional Collisions
    5. The Center of Mass
    6. Motion of a System of Particles
10. Rotation of a Rigid Object About a Fixed Axis
    1. Angular Position, Velocity, and Acceleration
    2. Rotational Kinematics: Rotational Motion with Constant Angular Acceleration
    3. Angular and Linear Quantities
    4. Rotational Kinetic Energy
    5. Calculation of Moments of Inertia
    6. Torque
    7. Work, Power, and Energy in Rotational Motion
    8. Rolling Motion of a Rigid Object
11. Angular Momentum
    1. The Vector Product and Torque
    2. Angular Momentum of a Rotating Rigid Object
    3. Conservation of Angular Momentum
    4. Angular Momentum as a Fundamental Quantity
12. Static Equilibrium and Elasticity
    1. The Conditions for Equilibrium
    2. Examples of Rigid Objects in Static Equilibrium
    3. Elastic Properties of Solids
13. Universal Gravitation
    1. Newton's Law of Universal Gravitation
    2. Measuring the Gravitational Constant
    3. Free-Fall Acceleration and the Gravitational Force
    4. The Gravitational Field
    5. Gravitational Potential Energy
    6. Energy Considerations in Planetary and Satellite Motion

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
- Interactive Activities
- Collaborative Peer/Group Activities
- Quizzes, Exams, and Surveys
- Facilitated Discussions
- Listening to Audio Materials
- Synchronous Discussion
- 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
- Peer Review

- Q & A Discussion Boards

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
- Social Media
- Office Hours
- The Online Course Syllabus
- Video Conferencing Technology (e.g. Zoom, MS Teams, etc...)

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