Modesto Junior College

Course Outline of Record Report

11/17/2021

PHYS103 : General Physics: Electricity, Magnetism, & Modern Physics

General Information

Faculty Author:	• Kenneth Meidl • Nomof, Thomas • Richmond, Jennifer • Chase, Daniel
Attachments:	Physics Batch DE Spring 2021.pdf Physics Curriculum 2015-1-1.pdf CID PHYS 210.pdf PHYS-103_SU16.pdf PHYS_103_CCC000524701.pdf DE Addendum EFF 5.2.16.pdf ASSIST CAS PHYS 103.pdf Download
Course Code (CB01) :	PHYS103
Course Title (CB02) :	General Physics: Electricity, Magnetism, & Modern Physics
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) :	CCC000162354
Curriculum Committee Approval Date:	04/14/2015
Board of Trustees Approval Date:	05/13/2015
External Review Approval Date:	01/01/2015
Course Description:	Continuation of calculus-based physics: electricity, magnetism and modern physics.
Proposal Type:	Mandatory Revision Mandatory five-year review and revision.
Faculty Author:	• Nomof, Thomas • Richmond, Jennifer • Chase, Daniel

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

- A-F or P/NP

☐ 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
Chemistry for Transfer Degree (In Development)	AS-T Associate of Science for Transfer	MJC Fall 2021

Engineering (In Development)	A.S. Degree	MJC Fall 2023
Chemistry	A.S. Univ Prep - Area of Emphasis	MJC Summer 2020 to MJC Summer 2021
Chemistry for Transfer Degree	AS-T Associate of Science for Transfer	MJC Summer 2020
Computer Science for Transfer Degree	AS-T Associate of Science for Transfer	MJC Summer 2020 to MJC Fall 2021
CSU General Education Pattern	Certificate of Achievement	MJC Summer 2020 to MJC Summer 2021
General Studies: Emphasis in Natural Sciences	A.A. Degree	MJC Summer 2020
IGETC Pattern	Certificate of Achievement	MJC Summer 2020 to MJC Summer 2021
MJC-GE Pattern	MJC-GE Pattern	MJC Summer 2020 to MJC Summer 2021
Physics for Transfer Degree	AS-T Associate of Science for Transfer	MJC Summer 2020 to MJC Fall 2021

Transferability & Gen. Ed. Options

Course General Education Status (CB25)

Y

Transferability	Transferability Status
Transferable to both UC and CSU	Approved

MJC General Education (MJC-GE)	Categories	Status	Approval Date	Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable.
Area A: Natural Sciences	(MJC-GE:A)	Approved	No value	No Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable. defined.

CSU General Education Breadth Pattern (CSU-GE)	Categories	Status	Approval Date	Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable.
Area B1:Physical Sciences	(CSU-GE:B1)	Approved	No value	No Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable. defined.
Area B3: Laboratory Activity	(CSU-GE:B3)	Approved	No value	

Intersegmental General Education Transfer Curriculum (IGETC) (for CSU and UC)	Categories	Status	Approval Date	Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable.
Area 5A: Physical Sciences	(IGETC: 5A)	Approved	No value	No Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable. defined.
Area 5C: Laboratory Activity	(IGETC: 5C)	Approved	No value	

C-ID: California's Course Identification Numbering System	Categories	Status	Approval Date	Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable.
Physics (PHYS)	(PHYS)	Approved	No value	C-ID: PHYS 210 C-ID: PHYS 101 + PHYS 102 + PHYS 103=C-ID: PHYS 200S

YCCD Intra-district Equivalencies	Categories	Status	Approval Date	Rationale (include Comparable Course, C-ID Descriptor, etc. if applicable.
Columbia College Equivalent Course	(CC)	Approved	No value	CC: PHYCS 5B

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, Bakersfield (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 2220

CSU Course Title

Calculus-Based Physics II (4.00)

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

Yes

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)

UC Davis (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.

PHYSICS 009C

CSU Course Title

Classical Physics (5.00)

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

Yes

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)	4
Maximum Credit Units (CB06)	4
Total Course In-Class (Contact) Hours	108
Total Course Out-of-Class Hours	108
Total Student Learning Hours	216

Credit / Non-Credit Options

Course Credit Status (CB04)	Course Non Credit Category (CB22)	Non-Credit Characteristic

Credit - Degree Applicable

Credit Course.

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	3	6
Laboratory Hours	3	0
Activity Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	52.5
Course In-Class (Contact) Hours	
Lecture	54
Laboratory	54
Activity	0
Total	108
Course Out-of-Class Hours	
Lecture	108
Laboratory	0
Activity	0
Total	108

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

Prerequisite

PHYS101 - General Physics: Mechanics (in-development)

Prerequisite

MATH172 - Calculus: Second Course

Or qualification by the MJC placement process.

Advisory

PHYS113 - Problem Solving and Technology for Physics 103 (in-development)

Requisite Skills

Requisite Skills	Description
Identify and apply the vocabulary and basic principles of kinematics.	• 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 - 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 and solve integration problems by applying an appropriate technique.	• MATH 172 - analyze and solve integration problems by applying an appropriate technique.
State and demonstrate the ability to use the Laws of the Conservation of Energy and Linear Momentum.	• 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 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.
Model real-world situations with elementary or separable differential equations.	• MATH 172 - model real-world situations with elementary separable or linear differential equations.
Derive the standard exponential growth model.	• MATH 172 - derive the standard exponential growth model.
Use the binomial series to expand a given function as a power series.	• MATH 172 - use the binomial series to expand a given function as a power series.
Demonstrate the ability to use vector algebra.	• 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.

State and apply Coulomb's Law and the Law of Conservation of Charge in order to explain, analyze and solve problems in electrostatics.	• PHYS 113 - State and apply Coulomb's Law and the Law of Conservation of Charge in order to explain, analyze and solve problems in electrostatics.
State Gauss's Law and apply it in order to calculate the electric field of highly symmetric charge distributions and to describe properties of conductors in electrostatic equilibrium.	• PHYS 113 - State Gauss's Law and apply it in order to calculate the electric field of highly symmetric charge distributions and to describe properties of conductors in electrostatic equilibrium.

Specifications

Methods of Instruction

Methods of Instruction (Typical)	INSTRUCTIONAL METHODS
MOI	1. Lectures 2. Class demonstrations 3. Classroom exercises 4. Instructor supervised hands-on laboratory activities 5. Modeling of problem-solving strategies through interactive discussion sessions

Assignments (Typical)

Evidence of Workload for Course Units (Quantity)

1. Weekly homework assignments to include textbook reading and problem solving related to concepts discussed in lecture/textbook.
2. Weekly laboratory report.
3. Studying for weekly homework quizzes, midterms and final exam.

Evidence of Critical Thinking (Quality)

1. Example of Homework Problem: A long metallic tube of radius R has a net charge Q placed upon it. (a) Find the electric field everywhere, using the definiton of the electric field and direct integration. (b) Solve this problem using Gauss's Law, and compare and contrast the methods of solution.
2. Example of Exam Question: Use Gauss's Law to find the electric field between two parallel sheets with a charge Q place on them. (b) Find the electric field outside the plates.
3. Example of Laboratory Question: Rub the wool on a piece of pvc piping and bring the piping near the electroscope. Comment on the movement of the leaves on the scope. Then touch the back of your hand to the electroscope, remove the pvc piping and then remove your hand. What type of charge is left on the electroscope? Devise and conduct an experiment to determine the type of charge left on the electroscope.

Methods of Evaluation (Typical)	Rationale
FORMATIVE EVALUATION	1. Short quizzes 2. Mid-semester exams 3. Laboratory reports and exams 4. Homework: assigned problems
SUMMATIVE EVALUATION	1. Final exam

Equipment

No Value

Textbooks

Author	Title	Publisher	Date	ISBN
Serway, Ray & Jewett, John	Physics for Scientists and Engineers with Modern Physics (10th Ed.)	Cengage Learning	2019	9781337553278

Other Instructional Materials

No Value

Textbook Exceptions and Supplementals

Title of Other Material

Description: Physics 103 Lab Manual Author: Instructor of Record Citation: MJC Duplicating - 2022

Who prepared or published this supplemental material?

The instructor of record.

Publish date

That current semester.

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 concept of an electric field and a line of force and use Coulomb's Law to calculate electric fields for systems of point particles and continuous charge distributions.

Use kinematical concepts to describe the motion of a charged particle in a uniform electric field.

State Gauss's Law and apply it in order to calculate the electric field of highly symmetric charge distributions and to describe properties of conductors in electrostatic equilibrium.

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

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.
Define the concept of energy density and calculate the energy density of an electric field as well as the energy stored in a capacitor.
Describe properties of dielectrics and their effect upon capacitance from both a macroscopic and microscopic perspective.
Use both macroscopic and microscopic models to describe the concepts of electric 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.
Calculate the electric power generated in a circuit.
Apply reduction techniques and Kirchoff's Laws in analyzing direct current circuits.
Describe causes and properties of magnetic fields; forces and torques acting on charged particles moving in magnetic fields; and common applications of technologies exploiting such forces and torques.
Apply both the Biot-Savart Law and Ampere's Law to calculate magnetic field configurations surrounding various current distributions.
State and apply Faraday's Law of Electromagnetic Induction in order to explain common technologies and to analyze problems related to various electromagnetic phenomena.
Define and distinguish between the concepts of self-inductance and mutual inductance and calculate the energy density and energy stored in the magnetic field of an inductor.
State and apply Maxwell's equations in order to derive a model for electromagnetic waves and to explain electromagnetic phenomena.
Describe Hertz's Experiment, properties of electromagnetic waves and explain how electromagnetic waves are produced.
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 Doppler effect, relativistic velocity addition, relativistic linear momentum, relativistic energy and rest energy) in explaining phenomena and solving quantitative problems.
Describe experimental procedures and results supporting the quantum nature of radiation and matter, including Planck's Hypothesis, the Photoelectric Effect and the Compton Effect.

Explain the meaning of the wave-particle duality in nature and describe the wave properties of particles.

State the Heisenberg Uncertainty Principle and explain the role of probability in quantum mechanics.

Describe the Thomson, Rutherford, Bohr and quantum models of the atom and cite experimental evidence supporting/refuting these models where appropriate.

Describe nuclear properties and structure as well as nuclear processes.

Lab Objectives

Demonstrate the proper use of laboratory instruments in making measurements.

Record and analyze their measurements to the correct number of significant digits.

Use the scientific method in designing simple experiments to test a physical concept.

Apply the scientific method in collecting and analyzing data to form conclusions.

Use graphing techniques, statistics, and computer modeling in the analysis of data to determine the relationship between physical quantities.

CSLOs

Verify physical principles in electromagnetism and modern physics through measurement and experimentation. Expected SLO Performance: 0.0

ISLOs Core ISLOs	Students will develop skills that aid in lifelong personal growth and success in the workplace. Students will be able to: Identify and assess individual values, knowledge, skills, and abilities in order to set and achieve lifelong personal, educational, and professional goals. Practice decision-making that builds self-awareness, fosters self-reliance, and nourishes physical, mental, and social health. Apply skills of cooperation, collaboration, negotiation, and group decision-making. Exhibit quality judgment, dependability, and accountability while maintaining flexibility in an ever-changing world.
	Students will develop skills to effectively search for, critically evaluate, and utilize relevant information while demonstrating technological literacy. Students will be able to: Effectively access information and critically evaluate sources of information. Analyze, synthesize and apply information practically and ethically within personal, professional and academic contexts. Identify, utilize and evaluate the value of a variety of technologies relevant to academic and workplace settings.
Physics PHYSICS, AS-T	Use the Scientific Method to collect and analyze data in forming conclusions and to verify physical principles through measurement and experimentation.

ISLOs GELO	Demonstrate proficiency in NATURAL SCIENCE by doing the following: Explaining how the scientific method is used to solve problems and escribing how scientific discoveries and theories affect human activities

Use the scientific method to collect and analyze data for electromagnetic and modern physical systems.

Expected SLO Performance: 0.0

ISLOs Core ISLOs	Students will develop skills that aid in lifelong personal growth and success in the workplace. Students will be able to: Identify and assess individual values, knowledge, skills, and abilities in order to set and achieve lifelong personal, educational, and professional goals. Practice decision-making that builds self-awareness, fosters self-reliance, and nourishes physical, mental, and social health. Apply skills of cooperation, collaboration, negotiation, and group decision-making. Exhibit quality judgment, dependability, and accountability while maintaining flexibility in an ever-changing world.
	Students will develop skills to effectively search for, critically evaluate, and utilize relevant information while demonstrating technological literacy. Students will be able to: Effectively access information and critically evaluate sources of information. Analyze, synthesize and apply information practically and ethically within personal, professional and academic contexts. Identify, utilize and evaluate the value of a variety of technologies relevant to academic and workplace settings.
ISLOs GELO	Demonstrate proficiency in NATURAL SCIENCE by doing the following: Explaining how the scientific method is used to solve problems and escribing how scientific discoveries and theories affect human activities
Physics PHYSICS, AS-T	Use the Scientific Method to collect and analyze data in forming conclusions and to verify physical principles through measurement and experimentation.

Solve problems and predict outcomes for electromagnetic and modern physical systems though application of principles in classical electromagnetism and modern physics (algebraic, trigonometric and calculus-based principles will be utilized in the process).

Expected SLO Performance: 0.0

ISLOs GELO	Demonstrate proficiency in NATURAL SCIENCE by doing the following: Explaining how the scientific method is used to solve problems and escribing how scientific discoveries and theories affect human activities
Physics PHYSICS, AS-T	Solve problems and predict outcomes in nature using physical laws.
ISLOs Core ISLOs	Students will develop critical and analytical thinking abilities, cultivate creative faculties that lead to innovative ideas, and employ pragmatic problem-solving skills. Students will be able to: Analyze differences and make connections among intellectual ideas, academic bodies of knowledge and disciplinary fields of study. Develop and expand upon innovative ideas by analyzing current evidence and praxis, employing historical and cultural knowledge, engaging in theoretical inquiry, and utilizing methods of rational inference. Utilize the scientific method and solve problems using qualitative and quantitative data. Demonstrate the ability to make well-considered aesthetic judgments.
	Students will develop skills that aid in lifelong personal growth and success in the workplace. Students will be able to: Identify and assess individual values, knowledge, skills, and abilities in order to set and achieve lifelong personal, educational, and professional goals. Practice decision-making that builds self-awareness, fosters self-reliance, and nourishes physical, mental, and social health. Apply skills of cooperation, collaboration, negotiation, and group decision-making. Exhibit quality judgment, dependability, and accountability while maintaining flexibility in an ever-changing world.

State and apply fundamental electromagnetic and modern physical 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

ISLOs GELO	Demonstrate proficiency in NATURAL SCIENCE by doing the following: Explaining how the scientific method is used to solve problems and escribing how scientific discoveries and theories affect human activities
ISLOs Core ISLOs	Students will generate and develop capabilities for creative expression and effective communication. Students will be able to: Articulate ideas through written, spoken, and visual forms appropriately and effectively in relation to a given audience and social context. Utilize interpersonal and group communication skills, especially those that promote collaborative problem-solving, mutual understanding, and teamwork. Mindfully and respectfully listen to, engage with and formally respond to the ideas of others in meaningful ways. Plan, design, and produce creative forms of expression through music, speech, and the visual and performing arts.
	Students will develop skills that aid in lifelong personal growth and success in the workplace. Students will be able to: Identify and assess individual values, knowledge, skills, and abilities in order to set and achieve lifelong personal, educational, and professional goals. Practice decision-making that builds self-awareness, fosters self-reliance, and nourishes physical, mental, and social health. Apply skills of cooperation, collaboration, negotiation, and group decision-making. Exhibit quality judgment, dependability, and accountability while maintaining flexibility in an ever-changing world.

Physics PHYSICS, AS-T	State and apply physical concepts to explain phenomena encountered in our everyday world.

Content

Course Content

1. Electric Fields
    1. Properties of Electric Charges
    2. Charging Objects by Induction
    3. Coulomb's Law
    4. The Electric Field of a Continuous Charge Distribution
    5. Electric Field Lines
    6. Motion of Charged Particles in a Uniform Electric Field
2. Gauss's Law
    1. Electric Flux
    2. Gauss's Law
    3. Application of Gauss's Law to Various Charge Distributions
    4. Conductors in Electrostatic Equilibrium
    5. Formal Derivation of Gauss's Law
3. Electric Potential
    1. Potential Difference and Electric Potential
    2. Potential Differences in a Uniform Electric Field
    3. Electric Potential and Potential Energy Due to Point Charges
    4. Obtaining the Value of the Electric Field from the Electric Potential
    5. Electric Potential Due to Continuous Charge Distributions
    6. Electric Potential Due to a Charged Conductor
    7. The Millikan Oil-Drop Experiment
    8. Applications of Electrostatics
4. Capacitance and Dielectrics
    1. Definition of Capacitance
    2. Calculating Capacitance
    3. Combinations of Capacitors
    4. Energy Stored in a Charged Capacitor
    5. Capacitors with Dielectrics
    6. Electric Dipole in an Electric Field
    7. An Atomic Description of Dielectrics
5. Current and Resistance
    1. Electric Current
    2. Resistance
    3. A Model for Electrical Conduction
    4. Resistance and Temperature
    5. Superconductors
    6. Electrical Power
6. Direct Current Circuits
    1. Electromotive Force
    2. Resistors in Series and Parallel
    3. Kirchhoff's Rules
    4. RC Circuits
    5. Electrical Meters
    6. Household Wiring and Electrical Safety
7. Magnetic Fields
    1. Magnetic Fields and Forces
    2. Magnetic Force Acting on a Current-Carrying Conductor
    3. Torque on a Current Loop in a Uniform Magnetic Field
    4. Motion of a Charged Particle in a Uniform Magnetic Field
    5. Applications Involving Charged Particles Moving in a Magnetic Field
    6. Hall Effect

8. Sources of the Magnetic Field
    1. The Biot-Savart Law
    2. The Magnetic Force Between Two Parallel Conductors
    3. Ampere's Law
    4. The Magnetic Field of a Solenoid
    5. Magnetic Flux
    6. Gauss's Law in Magnetism
    7. Displacement Current and the General Form of Ampere's Law
    8. Magnetism in Matter
    9. The Magnetic Field of the Earth
9. Faraday's Law
    1. Faraday's Law of Induction
    2. Motional emf
    3. Lenz's Law
    4. Induced emf and Electric Fields
    5. Generators and Motors
    6. Eddy Currents
    7. Maxwell's Equations
10. Inductance
    1. Inductance
    2. RL Circuits
    3. Energy in a Magnetic Field
    4. Mutual Inductance
    5. Oscillations in an LC Circuit
    6. The RLC Circuit
11. Electromagnetic Waves
    1. Maxwell's Equations and Hertz's Discoveries
    2. Plane Electromagnetic Waves
    3. Energy Carried by Electromagnetic Waves
    4. Momentum and Radiation Pressure
    5. Production of Electromagnetic Waves by an Antenna
    6. The Spectrum of Electromagnetic Wave
12. Relativity
    1. The Principle of Gailean Relativity
    2. The Michelson-Morley Experiment
    3. Einstein's Principle of Relativity
    4. Consequences of the Special Theory of Relativity
    5. The Lorentz Transformation Equations
    6. The Lorentz Velocity Transformation Equations
    7. Relativistic Linear Momentum and the Relativistic Form of Newton's Law
    8. Mass and Energy
    9. The General Theory of Relativity
13. Introduction to Quantum Physics
    1. Blackbody Radiation and Planck's Hypothesis
    2. The Photoelectric Effect
    3. The Compton Effect
    4. Photons and Electromagnetic Waves
    5. The Wave Properties of Particles
    6. Quantum Particle
    7. The Double-Slit Experiment Revisited
    8. The Uncertainty Principle

Lab Content

1. Electricty and Electrostatics
    1. Electrostatics
    2. Charging by conduction, friction, and induction
    3. Conservation of Charge
    4. Couloumb's Law
    5. Electric Field Mapping
2. Electrical Circuits
    1. Measuring voltage and current

    2. Ohm's Law
    3. Resistors in series and parallel
    4. Capacitors
3. Motion of charged particles
    1. The cathode ray tube
    2. The charge-to-mass ratio of the electron
4. Magnetic Field
    1. Permanent magnets
    2. Electromagnets
    3. Mapping magnetic fields
    4. Electromagnetic Induction
5. Modern Physics
    1. The Photoelectric Effect
    2. Atomic Spectra
    3. Nuclear Radiation

Recommended Course Content

Recommended Course Content

1. Nuclear Physics and Radioactivity
    1. Structure and Properties of the Nucleus
    2. Binding Energy and Nuclear Forces
    3. Radioactivity
    4. Alpha, Beta and Gamma Decay
    5. Conservation of Nucleon Number
    6. Half Life and Decay Rates
    7. Decay Series
    8. Radioactive Dating
    9. Nuclear Reactions and the Transmutation of Elements
    10. Nuclear Fission
    11. Nuclear Fusion

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
- Online Activities

- Viewing and Listening to Videos
- Written Assignments
- Reading Course Materials
- Interactive Activities
- Group Meetings/Review Sessions (hybrid only)
- Synchronous Discussion
- Facilitated Discussions
- Quizzes, Exams, and Surveys
- Multimedia Presentations

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 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. Labs may take place on campus in a face-to-face setting or remotely using simulation software and/or materials that are checked out out from the laboratory technician.

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. Lab simulations will have accessibility options.

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
- Social Media
- 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

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.

Lectures will take place online. Labs may take place in either a face-to-face or online setting. Assessments may take place in either a face-to-face or online setting, but should take place in a face-to-face setting whenever possible.

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