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**Bergen Community College**  
**Division of Math, Science and Technology**  
**Department of Physical Sciences**  
**Course Syllabus**  
**PHY 291 – Physics III**

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**Semester and year:**

**Course Number:**

**Meeting Times and Locations:**

**Instructor:**

**Office Location:**

**Phone:**

**Office Hours:**

**Email Address:**

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COURSE TITLE AND NUMBER: PHY-291 Physics III

PRE-REQUISITES: PHY-290 Physics II with a grade of "C" or better, and MAT-281 Calculus II with a grade of "C" or better. MAT-282 Calculus III, is recommended. (Not a pre or co-requisite).

COURSE CREDITS: 4

COURSE HOURS: 3 lecture hours; 3 laboratory hours

COURSE CLASSIFICATION: General Education Course

**COURSE DESCRIPTION:** Physics III is the continuation of PHY-290, Physics II, and is a study of waves and sound, heat and thermodynamics, geometric and physical optics, modern physics (wave nature of light, relativity, quantum theory and nuclear physics).

**REQUIRED TEXTBOOK** – (Recommended – Wiley all electronic version or OpenStax free electronic textbook. *Class instructor will provide the details of textbook option.*)

Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker, John Wiley and Sons Inc., 11<sup>th</sup> Edition (Extended) with Wiley Plus, 2018 ISBN : 978-1-119-45917-0. (3-ring binder version)

Fundamentals of Physics, Extended Edition, by David Halliday, Robert Resnick, and Jearl Walker, John Wiley and Sons Inc., 11<sup>th</sup> Edition (all electronic version with Wiley Plus), 2018 ISBN: 978-1-119-30695-5

University Physics (Volume 1, 2 and 3), by William Moebs, Samuel J. Ling, Jeff Sanny, OpenStax publication, Web version, 2021. with ExpertTA (<https://theexpertta.com/physics/>)

Free textbook:

Volume 1 - ISBN-10: 1-947172-20-4 and ISBN-13: 978-1-947172-20-3:

<https://openstax.org/details/books/university-physics-volume-1>

Volume 2 - ISBN-13: 978-1-50669-816-8 and ISBN-10: 1-947172-21-2:

<https://openstax.org/details/books/university-physics-volume-2>

Volume 3 - ISBN-13: 978-1-50669-825-0 and ISBN-10: 1-947172-22-0:

Vol-3: <https://openstax.org/details/books/university-physics-volume-3>

**LABORATORY MANUAL:** Details will be provided by the class instructor.

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**STUDENT LEARNING OBJECTIVES:**

As a result of meeting the requirements of this course, students will be able to:

1. Identify and describe in his or her own words the concepts and meaning behind the physical principles and laws encountered in the course.
2. Use correct terminology to describe physical processes and carry out problem solving.
3. Create sketches, diagrams, and graphs to describe physical processes and problem solving.
4. Apply appropriate mathematical relationships in the description of physical processes and problem solving.
5. Demonstrate proper use of laboratory instrumentation to perform measurements and data acquisition during laboratory sessions.

These objectives are intimately interwoven throughout the physics sequence and serve as a repeated reinforcement of the knowledge and skills necessary for the student to become successful in the engineering or scientific program of his or her choice. This course serves as foundations for further study in engineering, physics, astronomy, and many other areas, including chemistry, biology, environmental science, and the health professions.

**CHEATING/PLAGIARISM:**

Physics III follows a Zero Tolerance Policy towards Cheating/Plagiarism. The definition and consequences of Cheating/Plagiarism are described in the Bergen Community College Catalog under *Academic Regulations*.

**ASSESSMENT MEASURES:**

The student learning objectives will be assessed by:

1. Test scores.
2. Laboratory experiments and written laboratory reports.
3. Essay questions on laboratory reports (and possibly exams) will be used to assess the students' knowledge of physical principles and understanding of problem solving techniques.
4. Word problems on exams and laboratory reports that will require:
  - a. The construction and reading of graphs.
  - b. The use of precise sketches and diagrams, correct application of physical principles, and the correct use of computational skills.
  - c. Derivations of formulas requiring algebraic, trigonometric, and calculus-based manipulations.

**GENERAL GRADING POLICY:** The grade for the course is weighted:

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| 1. Three or more non-cumulative (modular) "hourly" exams and possibly quizzes                    | 45% |
| 2. Laboratory (performance and written reports)<br>(Attendance required in at least 70% of labs) | 25% |
| 3. Final exam (cumulative)   | 30% |

At least 70% of the experiments must be performed and handed in to pass the course no matter how high the test scores.

**INSTRUCTOR'S GRADING POLICY:**

An instructor may modify the General Grading Policy, and the instructor will provide that policy.

**CLASS ATTENDANCE/LATENESS POLICIES:**

Class Attendance is defined in the Bergen Community College Catalog under *Class Attendance*:

"All students are expected to attend punctually every scheduled meeting of each course in which they are registered. Attendance and lateness policies and sanctions are to be determined by the instructor for each section of each course. These will be established in writing on the individual course outline. Attendance will be kept by the instructor for administrative and counseling purposes."

**ABSENCE OF INSTRUCTOR:**

Instructor Absence is defined in the Bergen Community College Catalog under *Absence of Instructor* which reads, in part: "Students are expected to wait twenty minutes for a faculty member to come to class." Cancelled classes are listed on the BCC website homepage – current students/student support services/class cancellations. If students find a class cancelled which has not been listed, they should report this to the STEM Division Dean's Office.

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**SERVICES FOR STUDENTS WITH DISABILITIES**

Bergen Community College aims to create inclusive learning environments where all students have maximum opportunities for success. Any student who feels he or she may need an accommodation based on the impact of a disability should contact the Office of Specialized Services at 201-612-5269 or via email at [ossinfo@bergen.edu](mailto:ossinfo@bergen.edu) for assistance.

**ELECTRONIC DEVICES:**

The use of portable electronic devices such as cell phones, voice and/or video recorders, *is not* permitted while class (Lecture and Laboratory) is in session. Please TURN OFF these devices before entering class. Cell phone calculators are not permitted.

**MATERIALS AND SUPPLIES:**

1. Several #2 (soft) pencils and a notebook.
2. A pocket-sized scientific calculator. The functions must include direct and inverse trigonometric functions, natural logarithm, and exponents.

**COURSE CONTENTS:**

1. Waves; mechanical and sound
2. Heat and temperature
3. Thermodynamics
4. Geometrical and physical optics
5. Wave nature of light
6. Relativity (Special version)
7. Early quantum theory
8. Quantum mechanics
9. Atomic physics
10. Nuclear physics
11. Special topics (superconductivity, fusion, particle physics, cosmology)

**LABORATORY ASSIGNMENTS:**

<b>Title of the Experiment</b>	<b>Chapters from Wiley Textbook</b>	<b>Chapters from OpenStax Textbook</b>
Standing Waves in a String	16	16 (vol 1)
Air Column Resonance: The Speed of Sound in Air	17	17 (vol 1)
Boyle's Law (Supplied)	19	2 (vol 2)
The Thermal Coefficient of Linear Expansion	18	1 (vol 2)
The Specific Heats of Metals	18	1 (vol 2)
Heats of Fusion and Vaporization	18	1 (vol 2)
Reflection and Refraction	34	2 (vol 3)
Spherical Mirrors and Lenses	34	2 (vol 3)
Line Spectra and the Rydberg Constant	34, 35, 38, 39	3, 4, 6 (vol 3)
The Transmission Diffraction Grating: Measuring the Wavelengths of Light	35	3 and 4 (vol 3)
The Speed of Light	37	5 (vol 3)
Planck's Constant	38	6 (vol 3)
Detection of Nuclear Radiation: The Geiger Counter	42	10 (vol 3)
The Absorption of Nuclear Radiation	42	10 (vol 3)
Radioactive Half-Life	42	10 (vol3)

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**TEXT ASSIGNMENTS:**

Chapter	Topic	Suggested chapter questions Wiley Textbook
16	Waves I	3,5,13,15,17,19,25,26,31,35,41,43,44,45,51
17	Waves II	1,5,7,11,16,21,25,27,28,35,39,40,47,52,55,56,59,74,81
18	Heat and 1 <sup>st</sup> law of Thermo	2,3,5,8,9,10,12,15,21,23,27,28,31,32,39,42,43,45,49,52,53,57,97
19	Kinetic Theory of Gases	1,3,4,13,16,17,18,21,26,29,33,35,39,41,42,53,55,64
20	Entropy and 2 <sup>nd</sup> law of Thermo	1,3,5,6,7,11,24,27,29,33,37,38,39,54,57,66
33	EM Waves (Ch 33.7)	33,34,39,43,45,47,49,58,68,69,75,79
34	Images	2,7,39,41,43,45,47,68,88,89
35	Interference	5,6,14,16,19,20,21,29,35,37,39,42,47,55,59,65,75,79,80
36	Diffraction	3,5,7,11,13,15,21,23,24,25,28,29,31,35,43,44,45,46,47,55,56,58,63,69,74
37	Relativity	1,5,7,9,10,11,13,17,19,23,27,31,35,36,41,42,47,51,57
38	Photons and Mater Waves	3,6,11,15,16,17,18,23,27,29,31,35,47,49,51,53,61,62,64,67,74,81,88,90
39	More about Matter Waves	2,3,6,7,13,15,21,23,32,33,34,35,38,39,44,49,51,53,59
40	All about Atoms	2,5,6,7,16,19,21,25,27,28,31,33,39,43,48,50,53,55,77
41	Cond. of electricity of Solids	2,3,4,7,15,23,26,29,31,35,37,40,41,44,46
42	Nuclear Physics	2,9,11,13,25,26,27,30,31,32,34,47,49,53,55,56,57,60,61,62,65,66,70,71

Chapter	Topic	Suggested Chapter Questions from OpenStax Textbook
Vol-1, Ch-16	Mechanical Waves	42,44,46,48,51,54,61,64,70,72,75,77,88,90,95,98,104,112, 117 to 143
Vol-1, Ch-17	Sound Waves	29,33,35,53,55,64,71,83,86,92,96,100,105, 112, 118,122, 129 to 147
Vol-2, Ch-1	Temperature and Heat	44,48,49,54,56,65,68,70,73,78,83,86,89,92,97, 102 to 122
Vol-2, Ch-2	Kinetic Theory	19,21,31,34,35,40,50,55,57,60,62,64,66,75, 76 to 93
Vol-2, Ch-3	The 1 <sup>st</sup> Law of Thermodynamics	24,27,31,38,44,45,48,51,54,58,62,66,68,74,76, 79 to 98
Vol-2, Ch-4	The 2 <sup>nd</sup> Law of Thermodynamics	18,20,25,27,30,32,33,34,41,43,47,49,52,53,57,60, 67 to 87
Vol-3, Ch-1	The Nature of Light	28,34,44,52,57,60,64,67,70,76,77,78,75, 76 to 96
Vol-3, Ch-2	Geometric optics	27,35,37,40,42,46,48,51,54,57,63,64,67,68,73,75,87,97, 127 to 151
Vol-3, Ch-3	Interference	17,20,24,29,31,34,35,38,39,41,43, 53 to 88
Vol-3, Ch-4	Diffraction	18,20,24,26,30,32,34,37,45,47,52,53,56,57,72,74, 79 to 100
Vol-3, Ch-5	Relativity	25,27,33,34,39,42,47,49,52,55,57,62,63,68, 72 to 100
Vol-3, Ch-6	Photon and Matter	55,57,66,71,84,88,91,97,105,111,117,121, 127 to 163
Vol-3, Ch-7	Quantum Mechanics	30,31,33,34,37,44,45,46,48,56, 77 to 93
Vol-3, Ch-8	Atomic Structure	27,30,33,38,44,46,53,56,57,62,63, 85 to 101

**BIBLIOGRAPHY AND SUPPORTING MATERIALS:**

1. University Physics, Revised Edition, by Harris Benson, John Wiley and Sons, Inc., 1996.
2. Physics for Scientists and Engineers with Modern Physics, by Raymond A. Serway, Robert Beichner, John Jewitt, Brooks/Cole 2000, Fifth Edition, Updated Version.
3. University Physics, 10th edition, by Hugh D. Young, Addison-Wesley Pub. Co., 2000.
4. Physics for Scientists and Engineers, Extended Version 3rd, by Fishbane, Gasiorowicz, and Thornton, Prentice Hall Inc., 2005.
5. Physics, 2nd edition, by Keller, Gettys, and Skove, McGraw-Hill Inc., 1993.
6. Physics, for Scientists and Engineers, by Richard Wolfson and Jay Pasachoff, Addison-Wesley Pub. 1999.
7. Physics for Engineers and Scientists, by Lawrence S. Lerner, Jones and Bartlett Publishers, 1996.

All BCC students enrolled in credit courses are entitled to a **BCC portal account**. With BCC portal, you may register online, check your schedule, room assignments, GPA, and find out what courses you need to take. To find out more about BCC portal or to sign up online, visit <https://bergen.edu/welcome/step-1/>. While there, please make sure to update your preferred email address. It is suggested that you use your official BCC email address for official communications.

Every credit course at BCC has its **Moodle** shell and every BCC student get free access to Moodle. For details of class Moodle page, visit, <https://bergen.edu/portalhelp/access-moodle/>.