# *Introductory Physics*

Yearlong 2021-2022

## Eligible Students:

**9-10th graders (11th grade welcome)** who are either taking Algebra I concurrently or have already taken Algebra I. Students must be able to read the text, take notes, memorize vocabulary and express themselves through essay questions and written laboratory reports. They must have the maturity to study regularly and keep pace with the course.

**Please note:**
Students enrolled in this course will complete five quantitative laboratory experiments and written reports that adhere to a specific rubric for scientific writing. A parent is expected to be present during the formal experiments to assure safety and adherence to the protocols. The laboratory supplies need to be collected prior to class and the students must be ready to conduct the experiments during organized class time. It is also very important that students have a tablet so that they may actively participate in the class. The student completing this course earns one high school course credit.

**Class Dates:** Begin Wednesday, September 8, 2021; running through Friday, May 27, 2022.
**Class Times:** Monday, Wednesdays, and Fridays: 11:00 a.m. — 12:15 p.m. (EST)
**Instructor:** Dr. Chris Clancy
**E-mail:** clancy_schole@comcast.net

## *Introductory Physics* Schedule

### Class Sessions Dates:

Classes will take place on Mondays, Wednesdays, and Fridays: 11:00 a.m. — 12:15 p.m. (EST) for 32 weeks and 95 classes on the following dates[1*]

**September** (10): 8, 10 | 13, 15, 17 | 20, 22, 24 | 27, 29
**October** (13): 1 | 4, 6, 8 | 11, 13, 15 | 18, 20, 22 | 25, 27, 29

[1*] *Please note the above dates and times are the anticipated class sessions for this course. However, all dates are subject to change as the instructor's circumstances might dictate (e.g. illness, family emergency). Any classes canceled by the instructor will be made up at an alternate time designated by the instructor.*

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| **November** (10): | 1, 3, 5 \| 8, 10, 12 \| 15, 17, 19 \| [**Thanksgiving Break**] \| 29 |
| **December** (8): | 1, 3 \| 6, 8, 10 \| 13, 15, 17 \| [**Christmas Break**] |
| **January** (10): | [**Christmas Break**] \| 10, 12, 14 \| 17, 19, 21 \| [**End 1st Semester**] 24, 26, 28 \| 31 |
| **February** (9): | 2, 4 \| 7, 9, 11 \| [**Winter Break**] \| 21, 23, 25 \| 28 |
| **March** (13): | 2, 4 \| 7, 9, 11 \| 14, 16, 18 \| 21, 23, 25 \| 28, 30 |
| **April** (10): | 1 \| 4, 6, 8 \| [**Holy Week**] \| 18, 20, 22 \| 25, 27, 29 |
| **May** (12): | 2, 4, 6 \| 9, 11, 13 \| 16, 18, 20 \| 23, 25, 27 \| [**End 2nd Semester**] |

**OFFICE HOURS: By appointment**. I will be available to students by appointment. Depending on need and interest, I will establish a regular weekly office hour if it will best serve the students.

## *INTRODUCTORY PHYSICS* COURSE MAP

### QUARTER 1

1. Chapter 1: The Nature of Scientific Knowledge
2. Experiment 1
3. Chapter 2: Motion
4. Chapter 3: Newton's Laws of Motion
5. Experiment 2

### QUARTER 2

1. Chapter 4: Energy
2. Experiment 3
3. Chapter 5: Momentum
4. Chapter 6: Atoms, Matter, and Substances
5. Experiment 4

### QUARTER 3

1. Chapter 7: Heat and Temperature
2. Chapter 8: Pressure and Buoyancy
3. Chapter 9: Waves, Sound, and Light
4. Chapter 10: Introduction to Electricity

### QUARTER 4

1. Chapter 11: DC Circuits
2. Experiment 5
3. Chapter 12: Fields and Magnetism
4. Chapter 13: Geometric Optics

## *Introductory Physics* Course Description

*Introductory Physics* is for freshmen and sophomores who have taken, or are concurrently taking, Algebra I. The course utilizes mathematical skills such as algebraic manipulations of equations, unit conversions and significant figures. Students are also expected to read the text, take notes, and write in full sentences.

The course text, *Introductory Physics* (3rd ed.) by John D. Mays, contains thirteen modules covering topics in scientific knowledge, motion, Newton's laws of motion, energy, momentum, atoms, matter, and substances, heat and temperature, pressure and buoyancy, waves, sound, and light, introductory electricity, DC circuits, fields and magnetism, and geometric optics. This course also emphasizes the history of physics and physicists and the epistemology of science.

In order to prepare students for upper-level high school science courses, this course uses a mastery approach. This is achieved by covering fewer concepts at a deeper level. Our goal is to have a solid, working comprehension of these concepts and to apply the mathematical calculations accompanying them. Mastering these concepts now will create a tremendous foundation upon which higher level concepts can build in biology, chemistry and advanced physics. Regular review of important "standard problems" throughout the year will keep concepts relevant and fresh. Students will be expected to keep up with the daily workload of reading the text, taking notes, attending class, completing the practice problems and reviewing old material. This will get easier as good skills and habits are developed.

**Laboratory**: A good scientist must understand how to design and conduct experiments, interpret results, and clearly and precisely communicate his findings. Five experiments will be conducted during the course: The Pendulum Experiment, The Soul of Motion Experiment, The Hot Wheels Experiment, Density, and DC Circuits. Guidelines for lab report writing will follow *The Student Lab Report Handbook* by John D. Mays. Supplies can be found at Home Science Tools under the name "Lab Kit for use with Novare Introductory Physics". It is important that supplies for the experiments are acquired in a timely fashion.

**NOTE:** Parents will be expected to be present during laboratory exercises to ensure the safety of their student and the following of proper procedure. Students and parents should pre-read the exercise and set up supplies prior to class time when experiments are conducted during class time.

**Grading**: Students' grades will be based on frequent cumulative quizzes, semester exams, class participation, homework completion, and written laboratory reports. Completion of homework, self-checking, and regular review of past material using the Weekly Review Guide will help to ensure success on quizzes and a course grade of *cum laude* or *magna cum laude*.

## *Introductory Physics* Course Texts

### Required Course Texts:

1) *Introductory Physics* (3rd ed.) by John D. Mays, Novare Science and Math. 2019.
https://classicalacademicpress.com/products/introductory-physics-3rd-edition

2) *The Student Lab Report Handbook: A Guide to Content, Style, and Formatting for Effective Science Lab Reports* (2nd ed.) by John D. Mays. Novare Science and Math. 2014.
https://classicalacademicpress.com/products/the-student-lab-report-handbook-2nd-edi-tion?_pos=1&_sid=1f2cb4224&_ss=r

3) *Solutions Manual to Accompany Introductory Physics.* By Rebekah L. Mays and John D. Mays. *This is a companion answer key to the problems in the text allowing students to check their work.* Do **not** purchase the *complete* solutions manual (teacher only).
https://classicalacademicpress.com/products/solutions-manual-for-introductory-physics-2e?_pos=1&_sid=1f41e405a&_ss=r

*4) Lab Kit for Use with Novare Introductory Physics,* Home Science Tools (**NV-KITPHYS**). Please note that it may be worthwhile to determine whether the student already has access to the items in this kit. There is an option to buy the items individually rather than buying the whole kit.
https://www.homesciencetools.com/product/lab-kit-for-use-with-novare-introductory-physics/

5) Wacom Intuos tablet (see technical requirements) or other equipment to allow the student to share writing done by the student with a stylus, not a mouse. Please note that class participation is a very effective way for students to learn and master the material. It will also determine 15% of students' grades.

6) Scientific calculator. The students should *not* use calculators on their computer during class, as using a mouse to operate a desktop calculator is cumbersome and slow.

7) Spiral notebook or loose-leaf notebook paper.

8) 3-ring binder.

9) Index cards and storage box.

### Optional Course Texts:

1) *Experiments for Introductory Physics and Accelerated Studies in Physics and Chemistry*
https://classicalacademicpress.com/products/experiments-for-introductory-physics-and-aspc?_pos=2&_sid=f690f5a5c&_ss=r

OR
*Favorite Experiments in Physics and Physical Science*
https://classicalacademicpress.com/products/favorite-experiments-in-physics-and-physical-science?_pos=1&_sid=f690f5a5c&_ss=r

These two books have both the teacher and student information for all five experiments. The second text is more expensive because it contains extra information about demonstrations in addition to the experiments. Because parents are expected to help with the experiments, you may find it helpful to purchase one of these books. If so, you may wish to keep the teacher information sections for yourself as they do step through the process of teaching about the experiment, and it may be more fruitful if the student has no preconceived ideas before we discuss the experiments in class. However, if a student should choose not to buy either text, Dr. Clancy will of course provide the student pages.

2) Papers and essays will be submitted using basic MLA formatting guides. The *MLA Handbook for Writers of Research Papers* — 7th Edition may be a helpful resource.

## Student Evaluation: Grading Criteria

Dr. Clancy will communicate with students regarding assignment feedback and grading through the free online grading system, Schoology. The teacher will provide students with more detailed information via the *Introductory Physics* course page.

Grades will be comprised of:

1. Assessments (quizzes and semester exams): 65%
2. Class Participation: 15%
3. Homework Completion: 10%
4. Lab Reports: 10%

## Student Evaluation: Grading

While studying *Introductory Physics* through Scholé Academy will be "restful", we also recognize the need to provide grades for students who will be using this course as part of their prepared college transcript. It is a delicate balance to achieve both restful learning and excellent academic performance, but earning a specific grade should not overshadow achievement goals for mastery of this discipline. The expectations of the course are clearly laid out for each student via objectives for each chapter and a standard problems list for the entire course. Our goal is to master these topics while utilizing the techniques of classical learning and deep contemplation, rather than cramming information to pass a test just to move on to the next topic. Physics is one discipline of science, and mastery of *Introductory Physics* will prepare students for other scientific and mathematical pursuits. I will assign the following Scholé grades according to the student's level of achievement: *magna cum*

*laude* (with great praise); *cum laude* (with praise); *satis* (sufficient, satisfactory), and *non satis* (not sufficient).

Parents of students receiving satis and non-satis grades during the year should meet with Dr. Clancy for advice on how to help their student by developing better study habits and use resources to help him succeed in the class.

I will provide quarterly reports of progress and a transcript of the Scholé grade (and traditional grade for transcript purposes) at the end of the year. Ideally, an average student working diligently should do praiseworthy work (*cum laude*). One who excels beyond this expectation would be a *magna cum laude* student. Students who do adequate but not praiseworthy work be will receive a *satis* designation. *Non satis* means lacking sufficiency or adequacy.

Inasmuch as you might be fully on board with this grading method in theory, there will undoubtedly be the need to complete a high school transcript with either a numeric or traditional letter grade. Traditional percentage grades will be provided and readily accessible on the *Introductory Physics* Schoology page. Additionally, Dr. Clancy will provide a transcript of that grade to the requesting parent at the end of the year.

## Student Evaluation: Mastery Portrait

**Mastery portrait**: Students who are prepared to take this class are typically early to mid-teens, adolescents approaching young adulthood. This developmental stage is an interesting one, brimming with lots of new characteristics. It is imperative, then, that this course not only provide the academic components necessary to achieve mastery of the content of the class (knowledge) and skills associated with analytical thought; but also help engage the student in development of their moral virtues. These three aspects of the course would comprise the "learning target".

At the completion of this course *cum laude* students will be able to do the following:

- Use the metric system, unit conversions, scientific notion, and significant figures fluently.
- Demonstrate a solid understanding both verbally and computationally of the Standard Problems List based on the topics covered in the text.
- Understand the principles of Classical Physics and their historical development, and deepen their appreciation and understanding of the nature of God's creation.
- Students will also be guided in development of the virtues and encouraged to fight against vices.

## Student Expectations: Executive Function Skills

Students enrolling in *Introductory Physics* will be expected to show development of Executive Function Skills throughout the year. Executive Function Skills speaks to a set of qualities and skill sets students can develop and hone to better approach the courses, lectures, readings, and teachers they will face in their future academic coursework.

Each teacher will invariably have his own set of requirements and skills he requires students to bring to their studies. *Generally* speaking, Scholé Academy believes there are five such qualities that are necessary for students in various subjects:

**1. Engagement:** A student should be willing to step into the arena of class discussion, ask questions, supply answers, generate the internal dialogue necessary to determine if what's being discussed is important and necessary to himself.

**2. Note Taking:** A student should be able to note important and relevant content in an organized fashion during and after being engaged with the class (Cornell Notes may be a great option). Furthermore, the student should consult his notes for application in assignments and assessments.

**3. Attention to Detail/Preparedness:** A student should consistently adhere to deadlines, submission requirements, confirm technology is working prior to the start of class, determine how to proceed after an absence, be responsible for consulting his course syllabus and adjusting as the class proceeds, etc.

**4. Employ Critiques:** A student should be able to receive feedback about his work or performance and then apply that feedback to future assignments rather than repeating mistakes. He should also learn how to apply the in-class critiques of fellow students to his own studies.

**5. Initiative/Maturity:** A student should be able to keep up with the workload for the class, make use of resources made available as needed, and contact the teacher for help if necessary.

## Student Expectations In Action

In this class, students will be expected to listen attentively and participate actively in class discussions and practices. Students are expected to arrive to class on time and with all assigned material completed. The instructor will facilitate learning for the student, but the responsibility for staying up to date with classwork and assignments ultimately falls to the student.

All assignments should be submitted to the appropriate Schoology Assignment folder prior to the start of class each day. Students turning in late work will earn a 10% penalty for each

day the assignment is late. Students will submit their work by scanning their homework pages and uploading it into the Schoology assignment window or by uploading a PDF or Word document. Photographs of completed assignments will not be accepted as they can incredibly difficult to read.

Students and their parents should read John D. Mays's outline on his method of study for mastery learning in the *Preface for Students* on pp. xvi-xix of *Introductory Physics.* More resources can also be found at the Novare site https://novarescienceandmath.com, including "A Letter from Teachers to Parents" https://novarescienceandmath.com/a-letter-from-teachers-to-parents/.

## Student Evaluation: Academic Dishonesty

Students will often take assessment tests and/or quizzes privately at home. Students are on their honor to abide by Scholé Academy's Learning Philosophy which assumes the personal cultivation of Student-Virtues described in the Student-Parent Handbook.

Additionally, plagiarism is a serious and punishable offense. Proper citation of all sources is essential to the academic endeavor. Remember to cite any source if the information is not common knowledge or is an opinion obtained through any source. A plagiarized assignment will result in a failing grade. Students should consult their chosen style manual (see Student Expectations above) for specific direction on obtaining, quoting, and paraphrasing sources.

## The Virtual Classroom

We will be using the free online "virtual classroom" software provided on Zoom. The virtual classroom will provide students with interactive audio, text chat and an interactive whiteboard in which texts, diagrams, video and other media can be displayed and analyzed. We will provide students with a link (via email) that will enable students to join the virtual classroom.

Specific information regarding the technology used by Scholé Academy (including required technology) can be found by visiting the Technology in the Classroom section of the Student Parent Handbook.

Students will submit assignments by uploading them as PDFs or Word files the *Introductory* Physics Schoology assignment page (access granted after enrollment is secured). Parents will receive individual parent access codes for their student's Schoology page.

## About the Instructor

**Chris Clancy** earned her PhD in Chemistry from the University of North Carolina at Chapel Hill. After working as a postdoctoral researcher at Duke University and the University of Chicago, she decided to leave academia and stay home with her first born son. She and her husband homeschool their four children. After reading Dorothy Sayers' "The Lost Tools of Learning", she was inspired to teach her children in the classical style of learning.

Chris has taught high school Biology, Chemistry, and Physics to both her own children and other homeschoolers at a Catholic homeschool coop which she and her husband helped found. She is equally enthusiastic about history and literature, and is always willing to play a board game, cribbage, or backgammon.