Introductory Physics

Yearlong Course

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Students of Introductory Physics

9-11th Graders will develop and solidify their understanding **Introductory Physics**. "Students should be enrolled or concurrent in **Algebra I** to use this book, which is standard track mathematics for 9th grade. We make our exercises challenging, requiring students to utilize multiple concepts and skills to arrive at an answer, but nothing higher than basic algebra is required for this text" (J.D. Mays, 2014). Students must be able to read the text, take notes, memorize vocabulary (using flash cards), and express themselves through essay questions and written laboratory reports. They must have the maturity to study regularly and keep pace with the course.

Students enrolled in this course will complete **Quantitative Laboratory Experiments** and written reports that adhere to a specific rubric for scientific writing. A parent is expected to be present during the experiments to assure safety and adherence to the laboratory protocols. The laboratory supplies and equipment need to be collected prior to conducting the experiments at home. The student completing this course earns one high school course credit.

Schedule for Introductory Physics

Course starts **Tuesday, September 6, 2022,** and will end **Thursday, May 25, 2023**.

Section	Introductory Physics Sessions	Eastern Standard Time
2	Mondays, Tuesdays, Thursdays	2:00 p.m. to 3:15 p.m.
3	Mondays, Tuesdays, Thursdays	3:30 p.m. to 4:45 p.m.
4	Mondays, Tuesdays, Thursdays	5:00 p.m. to 6:15 p.m.

95 sessions (in 32 Weeks) on the following dates.*

Month	#	Session Dates
September	**11**	6, 8, 12, 13, 15, 19, 20, 22, 26, 27, 29
October	**13**	3, 4, 6, 10, 11, 13, 17, 18, 20, 24, 25, 27, **31 [QII Starts]**
November	**10**	1, 3, 7, 8, 10, 14, 15, 17, **[Thanksgiving Break],** 28, 29
December	**7**	1, 5, 6, 8, 12, 13, 15, **[Christmas Break]**
January	**11**	9, 10, 12, 16, 17, 19, **[End 1st Semester],** 23, 24, 26, 30, 31
February	**9**	2, 6, 7, 9, 13, 14, 16, **[Winter Break],** 27, 28
March	**13**	2, 6, 7, 9, 13, 14, 16, 20, 21, 23, **27 [QIV Starts],** 28, 30
April	**9**	**[Holy Week]**, 10, 11, 13, 17. 18, 20, 24, 25, 27
May	**12**	1, 2, 4, 8, 9, 11, 15, 16, 18, 22, 23, 25, **[End 2nd Semester]**
Total Sessions:	**95**	**These are anticipated dates for this course. However, they are **subject to change as Dr. Spraker's circumstances might dictate** (e.g., family emergency). Session(s) canceled will be rescheduled at an alternate time **designated by Dr. Spraker**.*

Introductory Physics

Content Map for Introductory Physics

First Quarter (September 5th - October 28th)

The Nature of Scientific Knowledge

Motion

Newton's Laws of Motion

Second Quarter (October 31st - January 19th)

Energy

Momentum

Atoms, Matter and Substances

Third Quarter (January 23rd – March 23rd)

Heat and Temperature

Pressure and Buoyancy

Waves, Sound and Light

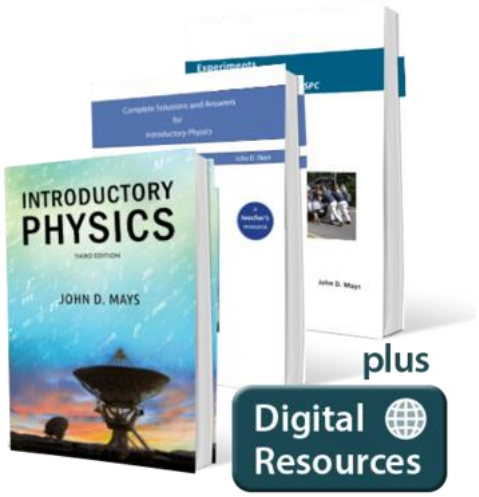
Fourth Quarter (March 27th – May 25th)

Introduction to Electricity

DC Circuits

Field and Magnetism

Required Materials for Introductory Physics



Introductory Physics Program

Lab Kit for Novare Introductory Physics

- Microsoft Word, PowerPoint, and Excel, Printer with scanner, and Scientific Calculator.
- Binder with 2 x 2 graph paper and notebook paper.
- Colored pencils and pens, erasers, metric ruler, and protractor.

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Course Description for Introductory Physics

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

Content: Twelve modules of the course text, ***Introductory Physics*** by John D. Mays, 3rd Ed., will be used to cover: Scientific knowledge; Motion; Newton's laws of motion; Energy, Momentum; Atoms, matter, and substances; Heat and temperature; Pressure and buoyancy, Waves, sound, and light; Electricity; DC circuits; And fields and magnetism.

Mastery: In order to prepare students for upper-level high school Natural Philosophy 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 be built in Biology, Chemistry, and advanced Vector 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 older material (easier as good skills and habits are developed).

Integration: This course approaches Natural Philosophy holistically, integrating history, mathematics, English language, and epistemology.

Laboratory: A good observer understands that well-designed experimentation, proper interpretation of results, and precise communication of findings is part of repeatability. **Quantitative Laboratory Experiments** will be conducted during the course using **Novare** guidelines for lab reports in ***The Student Lab Report Handbook*** (part of the **Introductory Physics Program** by John D. Mays) and Microsoft **Word**, **PowerPoint**, and **Excel**. Lab supplies and equipment must be purchased in **Home Science Tools'**: **Lab Kit for Novare Introductory Physics**.

NOTE: Parents are expected to be present during home laboratory exercises to ensure the safety of their student and the following of proper procedure. Together they will pre-read the exercise and set up supplies and equipment prior to their Lab Time.

Grading: The course grade is based on cumulative assessments, completion of homework and written laboratory reports. Self-checking, and regular review of past material will ensure earning **Cum Laude** or **Magna Cum Laude**.

Goals for My Students: That they would grow in their love of God's orderliness and beauty in His "OPERA DIGITORUM" (i.e., "**The Work of Your Fingers**," Psalm 8: 3) all around us as they gain understanding and confidence in foundations of Natural Philosophy to carry them forward on their path of learning.

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Parent Expectations in Action

The expectations of parents are that they will ensure that their student has all required materials needed for the course, a stable internet connection, a distraction-free environment for class sessions, and adequate time to study and complete assigned work outside of class sessions. Parent assistance with assignments is not expected nor required. If your student is struggling with an assignment and asks for help, I would encourage parents to honor their student's initiative and provide help.

Student Expectations Executive Function Skills

In this class, students will be expected to show development of **Executive Function Skills** throughout the year. **Executive Function Skills** are qualities and skill sets that students can develop and hone to better approach the courses, lectures, readings, and teachers they will encounter in their journey as a student. Students in this class should exhibit the following **Executive Function Skills** throughout the year.

Engagement: The student views class sessions as opportunities to learn and be in fellowship with the instructor and classmates. He is polite and attentive during class sessions, listens actively when others are speaking, and supplies answers, asks questions, and participates in class discussions. The student keeps his video on and stays focused on viewing the **Zoom** screen (not distracted by other screens).

Self-Control: The student raises his hand during class, speaks when called on to do so (and not out of turn), remains on-task, and shares relevant questions, comments, and ideas. He resists temptations to view other screens or use other devices, play games, work on other schoolwork or activities, or distract the instructor and classmates with disruptive behaviors.

Responsibility: The student completes and submits all assignments by the due date, arrives on time to all class sessions, regularly checks the syllabus and **Schoology** page for class information and updates, communicates with the instructor promptly with questions and requests for help, and makes use of offered resources. As the student grows in responsibility, our goal would be that he is able to learn and complete assigned work with independence.

Initiative: The student thinks about his own learning and discerns whether he understands the lesson or topic. He receives instructor feedback humbly and applies it to future assignments. The student actively communicates with the instructor (and/or parents) to seek help and ask questions if necessary. He strives to take ownership of his own learning.

The four skill sets listed above are general **Executive Function Skills** that align closely with Student Virtues. Additionally, students will also practice the important skill of taking notes**, which may or may not have been expected of them in past classes or lessons. Since some students may have little or no experience with taking notes, we will incorporate instruction in notetaking.

** **Notetaking:** The student will learn to discern important information, vocabulary, and example problems to write down for future review and study. He will also learn to finish his notes after a lesson and to write down his own thoughts and questions for later class sessions, independent study, or meetings with the instructor. This skill set will be expected in higher-level courses.

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Student Expectations in Action

The instructor will facilitate learning and will provide plenteous opportunities for practice and growth in our topics of study. It is ultimately the student's responsibility to be an active learner both in and out of the class sessions. The student must stay up to date with assignments and take initiative to ask the instructor and/or parents for help when it is needed.

The student is expected to:

- Arrive on time to class sessions with required materials.
- Attend the entire class with his video on.
- Listen attentively.
- Participate **actively** in class sessions – Including presenting problems, sharing methods or strategies for solving problems, reviewing answers, posing questions, explaining, and justifying answers, and thinking out loud.
- Embrace mistakes as opportunities to learn.
- Seek approved help if struggling with lessons or assignments.
- Use technology (e.g., calculators) as approved by instructor to complete assignments.
- Complete and submit all assignments by the due date.

A student who has not completed assigned work prior to the start of a class session will not be well-prepared to learn or participate in the lesson. For a lower-school student, this could lead to frustration in the learning process and result in an overwhelming "pile-up" of homework. If there are extenuating circumstances that prevent the student from completing an assignment, parents should contact the instructor via email prior to the class session to request an extension.

Students will submit their work by **scanning** their assignment pages to PDF and uploading them to the Schoology assignment window. **Photographs of completed assignments will NOT be accepted as they are incredibly difficult to read.**

Student Evaluation: Grading

Students work alongside the instructor as they learn and grow in their understanding of Introductory Physics, and grades allow the instructor to communicate in a consistent manner with students about their level of mastery. Even more important than a specific grade are the comments and feedback in response to students' methods, solutions, errors, and thought processes on a given assignment. Grades give a reflection of students' levels of mastery, but comments and feedback allow students the opportunity to continue growing in knowledge and skill. As it is our goal to pursue restful learning in Introductory Physics, yet also provide clear, consistent messages about the level of a student's mastery, a **Mastery Grade Scale** will be used to communicate grades for assignments and for the overall course. The Mastery Grade Scale is as follows:

- Master: a student whose work shows mastery of the material will earn this grade.
- Journeyman: a student whose work shows that he is approaching mastery of the material will earn this grade. This grade is considered satisfactory, but the student will be encouraged to continue working on the knowledge and skills assessed on this assignment.
- Apprentice: a student who needs to spend more time studying and learning the content will earn this grade.

The student will be encouraged to re-work the assignment and may be provided with additional practice as needed. Inasmuch as you might be fully on board with this grading scale in theory, there may be a need to complete a transcript with either a numeric or traditional letter grade. Traditional percentage grades will be provided upon request. **Dr. Spraker** will provide a transcript of that grade to the requesting parent at the **end of the year**.

Student Evaluation: Types and Weights of Assignments

Dr. Spraker will communicate with students regarding assignment feedback and grading through the **Schoology** **Learning Management System**. A student's grades will be comprised of:

1. **Assessments:** **75%** of grade.
2. **Homework Completion:** **10%** of grade.
3. **Written Laboratory Reports:** **15%** of grade.

All assignments are due to the appropriate **Schoology** assignment folder by Midnight of the due date. If there are extenuating circumstances that prevent a student from completing a homework assignment prior to class, a parent must contact the instructor prior to class time to ask for an extension.

Students and parents should understand that *normally* assignments turned in late will earn a **10%** penalty. Assignments turned in more than one week past the assigned due date *normally would* not be awarded credit, nor would they be corrected.

Student Evaluation: Academic Dishonesty

Students will often complete 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***.

Unless otherwise noted, all assignments are to be completed without the use of outside materials. Additionally, plagiarism and the use of homework websites/apps is a serious and punishable offense. Any assignment found to be completed dishonestly will result in a failing grade.

The Virtual Classroom

We will be using the free online "virtual classroom" software provided by **Zoom**, one of the leading companies that provides such software. 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 (to be sent via email and posted on the **Schoology** page) that will enable students to join the virtual classroom.

We will also be using the **Schoology** **Learning Management System** where students will find course information and assignments, communicate with the instructor, and upload and submit assignments. Students will use scanning technology/apps (like ClearScan) to create single-file PDFs of completed assignments to submit through **Schoology**.

Finally, we will be using digital tablets (like Wacom Intuos tablets) to allow students to write and draw in response to class activities/problems and share these responses with their instructor and classmates. Students should have a digital tablet during class sessions in order to participate actively and fully in the lessons.

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.***

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About the Instructor:

Greetings **Introductory Physics** students, from glacially-formed **Lake Louise** in **Banff National Park**, Alberta, Canada (on left above). Notice all three states (ice, mist, and liquid) of water are in the picture!

I'm **Dr. Ralph "Rafe" E. Spraker, Jr.** and I look forward to interacting with each of you! I maintain a two-mile segment of the **Mountains to the Sea Trail** from the "**Raven Rock**" [**BRP Milepost 290** see above right] to the "**Aho Gap**" [**BRP Milepost 288**, Elevation 3722] which parallels the **Blue Ridge Parkway** near my home in Boone, NC.

I earned: my **Ph.D.** from the **University of South Carolina** (2010); 3 Master's degrees including an **MSSE** from **Montana State University, Bozeman** (2011); and my Bachelor's degree from **BIOLA University** (1983). My cognates include: **BioLogica**: Biochemistry, Molecular and Systems Biology; **MatheMatica**: Information Technology, Mathematics, and Physics; And **GeoLogica**: Astronomy, Geochemistry, Geophysics, Hydrology, and Physical Geography. I currently teach **Physics** for **Southern New Hampshire University** and **Ohio Christian University**.

I enjoy studying Lutheran and Patristic theology (Solus Christus) and Revolutionary War history [I just finished Chernov's ***Hamilton*** and ***George Washington: A Life***].

In the Lamb,
Dr. Rafe Spraker

QUIA LEX PER MOSEN DATA EST
GRATIA ET VERITAS PER IESUM CHRISTUM FACTA EST
IOANNES I : XVII

Introductory Physics

"The Study Plan" by John D. Mays

In his resource "A Letter from Teachers to Parents," John D. Mays wrote,

"The keys to success in the course are for students to master each new topic as it arises and study in a way that promotes long-term retention of these topics. To be prepared for the cumulative quizzes or tests that occur in the course, students should establish a weekly study regimen encompassing the tasks listed below. Students should spread out their review work, so they spend time with the material at least two or three separate days each week. These are the documents students must pay attention to and use in their weekly studies:

- **Chapter Objectives Lists**, located at the beginning of each chapter in the text.
- **Scientists List**, if applicable.
- **Table of Conversion Factors**, **Metric Prefixes**, and **Constants** required for memory.
- **Weekly Review Guides.**

With these tools in hand, students should study according to the following comprehensive study strategy.

- **Study the Objectives List** for each new chapter carefully. Make it your policy that you will be able to do everything on the list (i.e., for the objectives covered so far in class) before quiz day each week.
- **Look over Objectives Lists** from previous chapters regularly. Identify any item that you cannot do or cannot remember how to do and follow up on it.
- **Develop, maintain, and practice Flash Cards** for each major category of information that you need to know. We recommend these four separate stacks of flash cards: 1) technical terms, laws, and equations; 2) scientists and experiments; 3) special lists to memorize (as indicated by the Objectives Lists); and 4) conversion factors, prefixes, and constants. Also, on cards for equations, indicate the units of measure for variables involved and make saying those units part of your flash card practice routine.
- **Read every chapter** in the text at least once, preferably twice. Ideally, every time your instructor or tutor covers new material you should read the sections in this book corresponding to that material within 24 hours.
- Go through the exercises described in the **Weekly Review Guide** every week. If the Review Guide includes review computations, work each of them. The Review Guide prompts you to rehearse your flash cards, review older topics, and so on. Take the Weekly Review Guide seriously and do what it says.
- **Raise questions** as often as you can. Asking questions and interacting with the instructor (or tutor) and the rest of the class is an effective way to help your brain engage, focus, and remember.
- **Go back and read the chapters** in this book again when you are a month or two down the road. You will be amazed at how much easier it is to remember things when you have reread a chapter. (Besides, reading is more fun than rehearsing flash cards.)
- When you are working on exercises involving computations, check your answers against the answer key. Every time you get an incorrect answer, dig in and stay with the problem until you identify your mistake and obtain the correct answer. **If you can't figure out a problem after 10 raise the question in class**.
- Every time you lose significant points on a quiz or test, **follow up and fill in the gaps in your learning**. If you didn't understand something, raise the question with your instructor. If you forgot something, rehearse it more thoroughly until you have it down. If you failed to commit something to memory or didn't have it in your flash cards, then add it to the cards and commit it to memory. If you were not proficient enough at one or more of the computations, look up some similar problems from the exercises or from previous quizzes and practice them thoroughly, with mastery as your goal. **Always follow up before the next quiz.** Remember, the quizzes are cumulative, and the same questions come up again and again."