Physics Modeling Nature

Yearlong Course

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Students of Physics Modeling Nature

Physics Modeling Nature is a preparatory course for **11-12th Grade** students who aspire to pursue a technical career. Students who will be taking physics in college toward a stem degree will want to take this course to provide a big picture without the demands of Calculus. Students should have completed **Algebra I** and have a basic knowledge of **Trigonometry** to use this book. Additionally, Modeling Nature will incorporate the essential historical background to enhance awareness of the legacy and present-day community of scientists.

Students must read the text, take notes, work examples and exercise in the text as well as be able to express concepts 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 oversee at home 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 Physics Modeling Nature

Course starts **Wednesday, September 5, 2023,** and will end **Friday, May 24, 2024**

Section TBD	Monday, Wednesday, Friday*	9:30 – 10:45 am CT
Section TBD	Monday, Wednesday, Friday*	3:30 – 4:45 pm CT

95 sessions (in 32 Weeks)

Important Dates:

- September 19, 2023: last day to add/drop
- October 27, 2023: last day of Quarter 1 (closing of Q1 progress report)
- November 20 – 24, 2023: Thanksgiving holiday (no classes)
- December 15, 2023 – January 8, 2024: Christmas and New Year's holidays (no classes)
- January 19, 2024: last day of fall semester and Quarter 2 (closing of Q2 progress report)
- February 19 – Friday, February 23, 2024: winter break (no classes)
- March 22, 2024: last day of Quarter 3 (closing of Q3 progress report)
- Monday, March 25 – Friday, March 29, 2024: Holy Week/Easter holiday (no classes)

OFFICE HOURS: Tuesday and Thursday mornings by appointment.

*These are anticipated dates for this course. However, they are subject to change as circumstances might dictate. Session(s) canceled will be rescheduled at an alternate time.

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Tentative Content Map for Introductory Physics

First Quarter (September 5th - October 27th)

Chapter 1. Mathematical Tools
Chapter 2. Uniform Motion
Chapter 3. Forces, Fields, and Newton's Laws of Motion
Chapter 4. Static Equilibrium and Torque

Second Quarter (October 30st - January 19th)

Chapter 5. Energy
Chapter 6. Momentum
Chapter 7. Rotating Systems
Chapter 8. Energy and Momentum in Rotating Systems

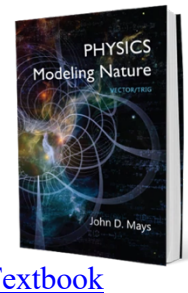
Third Quarter (January 22nd – March 22nd)

Chapter 9. Pressure and Buoyancy
Chapter 10. Gases, Kinetic Theory, and Heat
Chapter 11. Thermodynamics
Chapter 12. Simple Harmonic Motion, Waves, and Sound

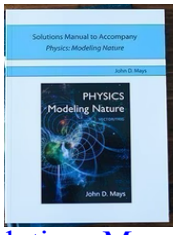
Fourth Quarter (March 25th – May 24th)

Chapter 13. Electrostatic Circuits
Chapter 14. Magnetism and Time-Varying Circuits
Chapter 15. Geometric Optics: A Brief Introduction
Chapter16. Nuclear Physics: A Brief Introduction

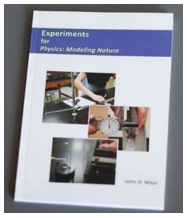
Required Materials for Physics Modeling Nature



Textbook



Solutions Manual



Experiment Manual

- A list of Lab materials will be provided two to three weeks before each lab.
- Bound composition style Lab Journal with grid paper,
- Scientific Calculator
- Binder with 2 x 2 graph paper and notebook paper.
- Microsoft Word, PowerPoint, and Excel (or equivalent software).
- Ability to create PDF files for submitting coursework is required.
- Printer with scanner (ability to print worksheets and scan homework)
- Students must obtain a tablet and stylus pen to enable them to participate in class exercises.

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Course Description for Physics Modeling Nature

Preparedness: Modeling Nature is an advanced class for juniors or seniors who have taken Algebra I and are concurrently taking Algebra II. The course utilizes algebraic manipulations of equations, unit conversions, and significant figures as well as trigonometry to do vector analysis. Students are also expected to read and work examples in the text, take notes, and write in full sentences.

Content: This course focuses on mastery of content with the integration of critical thinking, and a kingdom perspective. Topics will be covered with more complexity than the *Introductory Physics* course and will include Newtonian mechanics, energy, momentum, and conservation, rotating systems, pressure and buoyancy, kinetic theory, thermodynamics, simple harmonic motion, electrostatics, geometric optics, nuclear physics and more. Students will also be introduced to the basics of quantum mechanics that includes outside class readings of *In Search of Schrodinger's Cat* by John Gribbin."

Mastery: This course uses a mastery approach to achieve confidence for advanced science courses. This is achieved by covering fewer concepts at a conceptual level. Our goal is to have a solid, working comprehension of these concepts and to apply the mathematical calculations accompanying them. Mastering these concepts will create a tremendous foundation upon which higher level concepts can be built in Biology, Chemistry, and advanced Calculus based 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 the scientific enterprise holistically, integrating logic, natural philosophy, 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 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). Lab supplies and equipment can be purchased locally or online at Amazon, and *Home Science Tools* (note: the Lab Kit for Novare provided by *Home Science Tools* is not necessary as items may be substituted with materials recommended by Mrs. Joslin). A list of materials will be provided two to three weeks before each lab. Parents are expected to oversee home laboratory exercises to ensure the safety of students 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 is expected and will ensure mastery. Missed work and late submissions will be conditionally accepted

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, it is encouraged for parents to provide help. It is also strongly encouraged for students to reach out to Mrs. Joslin, either in class or via email for help or clarification.

Student Expectations- Executive Function Skills

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 and align closely with Student Virtues contained in the Student-Parent Handbook. 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 and 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 Canvas for class information and updates, communicates with the instructor promptly with questions and requests for help, and makes use of offered resources.

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.

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 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, students or parents should contact the instructor via email to request an extension.

Students will submit their work by scanning their assignment pages to PDF and uploading them to the Canvas. Unless otherwise approved, photographs of completed assignments will NOT be accepted as they are incredibly difficult to read.

Student Evaluation: Grading

Students will work alongside the instructor and other students as they learn and grow in their understanding of Physics. Grades will reflect the students understanding of concepts as well as class participation, class attentiveness, work ethic, ability to ask for help, and collaboration with others. Grades are associated with the following levels of mastery:

- **Master:** a student whose work shows mastery of the material. This grade is comparable to achieving a 90% or above and is a letter A.

- **Journeyman:** a student whose work shows that he is approaching mastery of the material will earn a grade comparable to 80-89% or a letter B.

- **Apprentice:** a student who needs to spend more time studying and learning the content will earn a grade comparable to 79% or below. Students in this range will be encouraged to re-work the assignment and may be provided with additional practice or tutoring if needed

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Student Evaluation: Types and Weights of Assignments

Mrs. Joslin will maintain a record of grades within the Canvas Learning Management System. A student's grades will be comprised of:

1. Assessments, Projects, Quizzes: 60% of grade.
2. Homework Completion: 20% of grade.
3. Written Laboratory Reports: 10% of grade.
4. Participation: Classwork 10%

All assignments are due on Canvas by the start of class on the due date unless otherwise specified. If there are extenuating circumstances that prevent a student from completing a homework assignment, Mrs. Joslin should be notified by email (prior to class time if possible) 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, 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 Canvas that will enable students to join the virtual classroom. Canvas will be used to convey course information and assignments, to 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, iPad, or Chrome tablets) to allow students to write and draw (with a stylus pen) in response to class activities/problems and share these responses with their instructor and classmates. Students should have a digital tablet during class sessions 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.