

# **Introductory Physics**

Yearlong 2020/21



# **ELIGIBLE STUDENTS:**

**9-10<sup>th</sup> graders (11<sup>th</sup> grade welcome)** who are either taking Algebra I concurrently or have already taken Algebra I. Students must also 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 will need to be collected prior to class and the students must be ready to conduct the experiments during organized class time. The student completing this course earns one high school course credit.

Class Dates: Begin Wednesday, September 9, 2020; running through Friday, May 28, 2021. Class Times: Monday, Wednesday & Fridays: 9:30 — 10:45am (EST) Instructor: Dr. Kathryn Morton E-mail: kmorton.scholeacademy@gmail.com

**OFFICE HOURS: Mondays 11:30am-12:30pm and by appointment**. In addition to scheduled class times, this is an *optional* weekly session where students may raise questions, seek assistance, or review class material. Students do NOT need to stay for the whole hour, but they must let the instructor know by 11:30 if they will be attending that day.

# **SCHEDULE FOR INTRODUCTORY PHYSICS:**

# **CLASS SESSIONS DATES:**

Classes will take place on Monday, Wednesday & Fridays: 9:30 — 10:45am (EST) for 32 weeks and 95 classes on the following dates\* --

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

\*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.

### **INTRODUCTORY PHYSICS COURSE MAP**

#### QUARTER 1 (Sept 8-Oct 30)

- 1. (1) The Nature of Scientific Knowledge
- 2. (2) Motion
- 3. (3) Newton's Laws of Motion
- 4. (4) Energy

#### QUARTER 2 (Nov 2-Jan 22)

- 1. (5) Momentum
- 2. (6) Atoms, Matter and Substances
- 3. (7) Heat and Temperature

#### QUARTER 3 (Jan 25-Mar 19)

- 1. (8) Pressure and Buoyancy
- 2. (9) Waves, Sound, and Light
- 3. (10) Introduction to Electricity

#### QUARTER 4 (Mar 22-May 28)

- 1. (11) DC Circuits
- 2. (12) Field and Magnetism
- 3. (13) Geometric Optics

### **REQUIRED COURSE TEXTS AND SUPPLIES:**









- 1) *Introductory Physics* by John D. Mays, Novare Science and Math. 3<sup>rd</sup> Edition. <u>https://classicalacademicpress.com/products/introductory-physics-3rd-edition</u>
- 2) The Student Lab Report Handbook: A Guide to Content, Style, and Formatting for Effective Science Lab Reports 2<sup>nd</sup> Ed. by John D. Mays. Novare Science and Math. 2014. <u>https://classicalacademicpress.com/products/the-student-lab-report-handbook-2nd-edition?\_pos=1&\_sid=1f2cb4224&\_ss=r</u>
- 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). <u>https://classicalacademicpress.com/products/solutions-manual-for-introductory-physics-2e?\_pos=1&\_sid=1f41e405a&\_ss=r</u>
- 4) Lab Kit for Use with Novare Introductory Physics, Home Science Tools (NV-KITPHYS) <u>https://www.homesciencetools.com/product/lab-kit-for-use-with-novare-introductory-physics/</u>
- 5) Scientific calculator
- 6) Index cards and storage box
- 7) Spiral notebook or loose-leaf
- 8) 3-ring binder
- 9) Wacom Intuos tablet (see technical requirements)

**OPTIONAL COURSE TEXTS:** 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.

# **INTRODUCTORY PHYSICS COURSE DESCRIPTION:**

**Preparedness**: 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.

**Content**: The course text, *Introductory Physics* by John D. Mays, 3<sup>rd</sup> Ed., 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.

**Mastery**: 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.

**Integration**: This course approaches science holistically, integrating history, mathematics, English language, and the epistemology of science.

**Laboratory**: A good scientist must understand well-designed experimentation, the proper interpretation of results, and precise communication of his/her 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".

**NOTE:** Parents will be expected to be present during 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 prior to class time. Procedures will be followed during scheduled class time. Questions can be asked to the instructor during the exercise.

**Grading**: The grade will be based on: weekly cumulative quizzes, final exams and written laboratory reports. Completion of homework and regular review of past material using the Weekly Review Guide will ensure success on quizzes and a course grade of Cum Laude or Magna Cum Laude.

# **STUDENT EXPECTATIONS: EXECUTIVE FUNCTION SKILLS**

Students enrolling in Scholé Academy's Science Program 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/her own set of requirements and skills he requires students to bring to their studies. I believe there are five such qualities that are necessary for my students and I believe they would be accepted as "good" by many other teachers as well.

**1. An Engaged Student:** One who is 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 who during and after being engaged with the class has been trained to note important and relevant content in an organized fashion (Flash cards and

Cornell Notes are two great options). His notes would then be consulted, independently, for application in assignments and assessments.

**3. Attention to Detail & Preparedness:** This student is one who consistently adheres to deadlines, submission requirements, style guides and codes. He/she confirms that technology is working prior to the start of class, is responsible to determine how to proceed after an absence and is responsible for consulting his course syllabus.

**4. Employ Critiques:** A critically important skill for successful students is to receive feedback on his submissions, make corrections, and then apply that feedback to future assignments rather than repeating mistakes. This student also gleans information from live in-class critiques to improve his understanding.

**5. Initiative/Maturity:** This student would hear the teacher comments and be able to assess whether or not the teacher was describing his work, and then take the initiative to schedule office hours with his teacher if necessary.

# **STUDENT EXPECTATIONS IN ACTION**

In this class, students will be expected to listen attentively, 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 <u>the re-</u> <u>sponsibility for staying up to date with classwork and assignments ultimately falls to the</u> <u>student.</u>

Students who have not submitted their homework to the appropriate Schoology assignment folder prior to the start of class will not be permitted to join the live class session. Those students will be invited into a separate Zoom breakout room to work privately until they have completed the day's assignment. After they have completed their homework submission, they will be permitted to rejoin the class in session. A day spent in a breakout room will constitute an absence from class.

All assignments will be due into 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. <u>Photographs of completed assignments will not be accepted as they are incredibly difficult to read.</u>

John D. Mays outlines the following method of study for mastery learning in his resource "A Letter from Teachers to Parents" at www.novarescienceandmath.com.

#### "The Study Plan"

"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 (applies primarily to students in grades 7–9)

- With these tools in hand, students should study according to the following comprehensive study strategy. This strategy, or one similar to it, is presented in the Student Preface in the textbook for the course. Note in particular the references to the Weekly Review Guide, a key study tool for students in grades 7–9, although in some cases the Weekly Review Guide applies to students in other grades as well.
- Study the Objectives List for each new chapter carefully. Make it your policy that you will be able to do everything on the list (that is, for the objectives that have been 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 the 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 or 15 minutes (or perhaps 30 minutes for students in upper-level courses), 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." (Taken from John D. Mays "A Letter from Teachers to Parents" Novarescienceandmath.com)

# **STUDENT EVALUATION: GRADING**

While pursing *Introductory Physics* through Scholé Academy will be "restful" (I'd also like to say it's going to be a lot of fun), it's a delicate balance to achieve both restful learning and excellent academic performance. 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, not cram in the information, pass the test, and move on to the next topic. Physics is one type of science, and mastery of Introductory Physics will strengthen a student's understanding in other disciplines like math, biology, physics and technology. I will assign the following Scholé grades to your student's level of achievement: *magna cum laude* (with great praise); *cum laude* (with praise); *satis* (sufficient, satisfactory) and *non satis* (not sufficient), however, I expect with diligence and mastery learning that everyone will receive cum laude and magna cum laude marks.

Parents of students receiving satis and non-satis grades will receive updates and schedule video conferences with me for tips on how to assist with study habits and techniques for success.

Dr. Morton 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.

Mastery portrait: Students who are prepared to take this class are typically early to midteens, adolescents approaching young adulthood. This developmental stage is an interesting one, brimming with lots of new characteristics. It's 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 to 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 metric system and significant figures fluently.
- Demonstrate solid understanding both verbally and computationally the Standard Problems List based on the topics covered in the text
- Students will also be guided in development of the virtues of love, humility, patience, constancy, perseverance, and temperance. They will be expected to make concerted effort in these areas and to fight against vices like pride, dishonesty, envy, slothfulness, sensuality, irritation/impatience, and excessive ambition.

# **STUDENT EVALUATION: ASSIGNMENTS, TYPES & WEIGHTS**

Dr. Morton 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 and access to the Introductory Physics course page. Students grades will be comprised of:

- 1. Quizzes: 70% of the grade
- 2. Homework Completion: 10 % of the grade
- 3. Laboratory Reports: 20%

# **STUDENT EVALUATION: ACADEMIC DISHONESTY**

Students will often take assessment tests and/or quizzes privately at home. Students are on their honor to abide by <u>Scholé Academy's Learning Philosophy</u> which assumes the personal cultivation of Student-Virtues and honesty 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 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 (via email) that will enable them to join the virtual classroom.

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

Students will submit documents by scanning and uploading them to their personal computer, then attaching those files as .pdfs to an email. They will submit their work to the *Introductory Physics* Schoology assignment page (access granted after enrollment is secured). Parents will receive individual parent access codes for their child's Schoology page.

# **ABOUT THE INSTRUCTOR:**

**Kathryn Morton** has a BA in Biology from Illinois Wesleyan University and a DVM from the University of Illinois. Upon graduation from veterinary school, she moved to Pennsylvania to work as a clinical research veterinarian on a large dairy farm. From there she transitioned to a busy, small animal practice doing medicine and surgery. When the call of homeschooling touched her heart, she left private practice to focus on her husband and six children.

She has been teaching math and science courses to homeschooled students in her local community for 14 years and she heads a robotics club at her town's public library. She is a lifetime learner and enjoys teaching students about the beauty of creation and helping them grasp complex topics.