**STATE UNIVERSITY COLLEGE AT BUFFALO**

**Department of Physics Course Syllabus**

**PHY 520: Modern Physics for HS Teachers COURSE BY CONTRACT**

**ONLINE / INDEPENDENT Course Spring 2022 CRN4043/4112**

**Professor:** Dr. Dan MacIsaac, SAMC278
**E-mail:** macisadl@buffalostate.edu (leave voicemail; response within 48h)

**Phone:**  (716) 878-3802 (Office voicemail; email is preferred)
**Course** **BlackBoard LMS:** buffalostate.open.suny.edu

**Classtime**: Twice monthly via Zoom, tentatively Weds 7:00-8:00pm weekly and itinerantly

**Office hours:** F 3:00-5:00pm; T 3:00-3:50pm; M-R 3:00-4:00pm; or by appointment (preferably Zoom).

**Course Particulars:** This is a 3 credit-hour online course with optional attendance weekly help session via Zoom. There will be one required attendance Zoom meeting near the end of the course to present projects.

**Pre-requisites:** An introductory course sequence in college or university physics, plus ***either*** enrollment in a STEM Masters’ degree program for science teachers, ***or*** instructor’s permission.

**Textbook and Materials:** The required text is *widely* *available* from many sources in several editions (including electronic versions): **Taylor, J.R., Zafiratos, C.D. & Dubson, M.A. (2015). *Modern Physics for Scientists and Engineers, Second Edition*. University Science Books** (an identically titled earlier version with different blue cover by the same authors was published by Addison-Wesley in 2003, you may also use that text). In addition, you will be submitting online homework and documents via Blackboard. Computer access, printer access and a smartphone camera or document scanner will also be required to submit some assignments as .pdf files created using ***CamScanner*** or similar software.

We will follow the textbook taking most of material in Ch1-10, plus two later chapters, and from some instructor supplied resources materials.

**Course Description and Objectives:** An introductory survey of major developments in twentieth-century physics and how they changed our understanding of the nature of space and time and the structure of matter. Application of physics education research to teaching relativity and quantum physics in a high school physics course.

A survey of the major conceptual ideas underlying "modern and atomic physics" appropriate for scientists teachers. This course will be taught using a collection of techniques including readings, take home exams, homework and a project. We will act as an online community to develop understandings of powerful scientific ideas underlying special relativity, modern physics, atomic, and solid state physics, introductory quantum mechanics principles, semiconductor physics and superconductivity. Usually, you will have a reading and homework due every week.

**Course Schedule:** We will roughly complete a chapter per week of Taylor. Most weeks you will have an online homework set of 5-10 chapter problems and workbook exercises (expect 2-3 hours of homework and similar time for reading weekly). *Tentative due dates for some homework and exams are set in a separate course schedule; I reserve the right to modify topics and pacing to suit needs.*

**Grading and Evaluation:** Overview as above, details given below and in class as required.
Below is the guaranteed grading scale. I reserve the right to lower grade cutoffs but will not raise them.
 ≥ 90% A ≥ 80% B ≥ 70% C ≥ 60% D

**Reflective Writing via Reading Logs (20% of grade):** A conscientiously completed one page (two faces) Reading Log for each chapter on the provided paper form is due at least weekly. Expect to spend at least 2-3 hours per chapter reading the approximately twelve text chapters. READ AHEAD! Blank forms and examples will be provided. You are expected to do these the old-fashioned way with pencil or ink on paper, then process and submit them as a .pdf file (CamScanner works well for this) via a drop folder on Blackboard. Reading Logs are ordinarily due before midnight on the Sunday of the week, as indicated on Blackboard.

**Homework (30% of grade):** roughly weekly there will be homework and internet activities due (plan on 2-3 hours/week). This will include about 5-10 conceptual and numeric questions, and may include brief online tutorials. **While you are strongly encouraged to communicate and work on your homework with others in Zoom study groups, homework is expected to represent your own individual efforts, thoughts and language.** In past courses, students have formed their own online study groups to work together on homework on Sunday afternoon, etc. Homework is ordinarily due before midnight on the Sunday of the week, as indicated on Blackboard. You are expected to do these the old-fashioned way with pencil or ink on paper, then process and submit them as a .pdf file (CamScanner works well for this) via a drop folder on Blackboard. Late homework will not be accepted due to the restrictive nature of the online submission system, though homework will be made available in advance. Solutions will be posted on Blackboard, and homework will partially be used to construct the midterm and final exams. There will also be one written midcourse evaluation given after the first exam that will be graded for completeness only and counted with the homework. Some conceptual and attitudinal assessments graded on completeness only will also be counted in this category.

**Exams (30% of grade):** there will be one midterm exam and one final exam. These will be open-book and open-notes take-home exams built from homework like problems. You will have to submit a short <3min FlipGrid video of yourself explaining some selected exam questions. The final exam will be only partially cumulative. Exams are solo efforts.

**Final Video Project (20% of grade):** You will individually negotiate and then complete a group video project related to a course topic of your choice, and present that via Zoom. This project will include multiple artifacts such as a proposal, planning documents, a group video report, and a final individual reflected written report presenting a constructed device, or documenting an experiment, or producing software simulation code. You will make a presentation of your group project during the final weeks of class. You will also submit an individual brief 5-10 page double spaced word processed reflective report submitted both on paper and as an electronic attachment at the end of the course reflecting on your project and including at least five appropriate scholarly references. You must use reviewed literature (journals) and can also use the web as references. Examples already exist on the instructor’s YouTube channel <https://www.youtube.com/user/DanMacVids> , and more details will be forthcoming.

**Statement On Plagiarism And Cheating:**

Anyone caught cheating or verbatim copying may receive a failing grade in the course, and/or a recommendation to leave a teacher preparation program if applicable. **Solo effort is expected for the take home exams. Working with other people on homework and project activities is not considered cheating, and is in fact encouraged, though your submitted work must reflect your own choice of words and interpretation for credit.**