TENNESSEE STATE UNIVERSITY
DEPARTMENT OF MATHEMATICAL SCIENCES
COURSE SYLLABUS - SPRING 2021 Jan 25 to April 29

PHYS 2020-80: College Physics II CRN 11447 (online synchronized course), must attend on scheduled time

Instructor: Dr. Moinuddin Sarkar, Professor of Physics Office: PMB 316C, Phone: (615) 963-5850
Primary email: msarkar@tnstate.edu Secondary email: msarkar@elearn.tnstate.edu
Office Hours: MWR: 5:25pm –6:25pm By Appointment: R- 9:30 to 10:30pm
Class Hours: MW: 3:55-5:20PM Room – Zoom Online synchronous

Course Description & Pre-requisites: This is a second course in a non-calculus-based physics sequence. Topics included are heat, light, electricity, magnetism, and modern physics. Pre-requisite: grade of C or better in PHYS 2010.

Purpose: It satisfies 3 of the 8 hours of physics required by the American Medical Association for admission to medical school or the allied health program.

Goals and Objectives: Goal is to provide a basic knowledge of natural laws and their mathematical basis for further study in the natural or health sciences.

Learning Objective: Students will be able to apply the principles of physics in medical, chemical or biological contexts.

Course Audience: This course is primarily for biology, chemistry, and allied health sciences students.

Attendance & Disciplines: Students are required to attend regularly all courses in which they are enrolled for credit and complete all required work in such courses in time. According to undergraduate catalogue, **More than three days of any absence by any means is not allowed. If you have excessive absences it is your responsibility to withdraw from the class by the last day to withdraw: Mar 19, 2021. A student with excessive absences may only be readmitted to class by the instructor. If not readmitted by official withdrawal date, will receive a mandatory F-grade.** Latecomers of more than **5 minutes will not be allowed to enter the class**. Side talk and any kind of disruption of class (decided by the instructor) are prohibited and will give F-grade in the course.

Learning Resources: **Textbook: College Physics – *Openstax* eText**; STEM tutorials (room 106); Office Hours of Faculty members, Library Opportunities, reference materials, internet, handouts, solved example problems in any college physics textbook, etc.

METHOD of INSTRUCTION: Lecture/discussion/demonstration (as applicable).

Learning Competencies: Operational definitions and units of the physical quantities are to be kept in mind. Students will be expected to handle the analysis and solution of problems in heat, electricity, magnetism, circuits, optics, nuclear physics, quantum physics, and atomic physics. Also, students will be responsible for all the materials in the syllabus even if not covered (see TEXT and COVERAGE).

Evaluation of Learning Competencies: Scores in quizzes, tests, and online webassign HW will be the basis for evaluation. Score better than 70% will constitute grasping the material which is deemed as minimum mastery.

Grade Determination: HW (10% - **must do to get A-grade, no extension)**; two short answer(SA) unannounced Quizzes (20%); SA and MC TEST-1 (20%), MC TEST-2 (20%) and MC Final Comprehensive Exam (30%), all scores are added for final grade. Make-up Quiz is **not allowed, period.** You will receive a zero for the Quiz you have not taken. Make-up hourly test is allowed only for extreme emergency situation decided by the instructor. **Any kind of disruptions of class; cheating (decided by the Instructor); profanity; fear mongering; belittling; or disrespect will give F-grade in the course. Do not sell your integrity to anything.** Have respect for others and keep education environment in the class so that teaching and learning flourish & we all benefit. Take one step at a time sincerely & you don't have to beg anything from anybody.

Grading Scale (Tentative): A: 90-100%, B: 80-89%, C: 70-79%, D: 60-69%, F: 0 - 59%.

Practice Problems: Problems are assigned below for your skill improvement. Do it. **Materials shown in the tentative schedule are expected to be covered. Study the lecture and the textbook side-by-side everyday two hours with paper & pencil, and solve one problem everyday. Shortcut path will deprive nobody but yourself.**

Bibliography: Physics – Jones and Childers – McGraw Hill; *Physics by Hecht- Brooks/Cole*; http://scienceworld.wolfram.com; http://howstuffworks.com; Schaum's Outline of College Physics, ISBN: 0071448144 / 9780071448147

TENTATIVE COURSE COVERAGE **CP2@3:55 MW, SP2021**

WEEK	DATE		DAY	**TENTATIVE** SCHEDULE
1	Jan	25	M	Ch. 13- Temperature & Ideal Gas
		27	W	Ch. 13
2	Feb	01	M	Ch. 14- Heat
		03	W	Ch. 14
3		08	M	Ch. 15–Thermodynamics
		10	W	Ch. 15
4		15	M	Ch. 18
		17	W	Ch. 18 - Electric Charge & Fields
5		22	M	Ch. 19- Electric Potential
		24	W	Ch. 20- Electric Current, Ohm's Law
6	Mar	01	M	Ch. 21 – Circuits & DC Instruments
		03	W	Ch. 22 – Magnetism
7		08	M	Ch. 23- Electromagnetic Induction, AC circuits
		10	W	**MID-TERM (TEST 1, Ch. 18 – 21)**
8		15	M	Ch.24- EM Waves & CH.25- Geometric Optics
		17	W	Ch.25-
09		18-21	R-S	SPRING BREAK (no class) **(March19-last day to withdraw)**
10		22	M	Ch.26- Optical Vision
		24	W	Ch. 27 - Wave Optics
11		29	M	Ch. 27-
		31	W	Ch. 29 – Quantum Physics
12	Apr	05	M	Ch. 29 -
		07	W	Ch. 30- Atomic Physics
13		12	M	Ch. 31 – Radioactivity & Nuclear Physics
		14	W	**TEST-2 (Ch 25, 26, 27, 29)**
14		19	M	Ch. 32- Medical Application of N.P.
		21	W	Ch. 32 and Left out material and review
15		**26**	**M**	**COMPREHENSIVE FINAL EXAM – 3:55 - 5:55pm**

Solve these problems, do not neglect (for skills):

CH.13- 5,11,14,18,20,23,26,29,31& 35 CH. 14 – 2,6,12,15,17,20,28,35,39,44,47,51,57
CH. 15 - 12,14,19,25,29,32,36,39,42,43,47,55 CH. 18 – 2,6,12,15,17,20,28,35,39,44,47,51,57
CH. 19 - 12,14,19,25,29,32,36,39,42,43,47 CH.20 - 6,9,15,16,20,23,33,37,49,50,53
CH. 21 – 2,6,12,15,17,20,28,35,39,44,47,51,57 CH. 22:12,14,19,25,29,32,36,39,42,43,47,55
CH. 23 - 6,9,15,16,20,23,33,37,49,50,53 CH. 24 - 6,11,26,39,53,54.
CH. 25 - 4,7,18,25,30,35,38,40,47,53 CH. 26 - 8,17,23,27,33,34,40,45
CH. 27 - 4,9,14,21, 29,33,37,40, 41 CH. 29- 6,15,18,22,26,34,43,53,59
CH. 30 - 3,6,12,15,17,20,28,35,39

Note: Online Web Assign HW (10%) will be administered. You have to go to link (www.WebAssign.net), write the class key: **tsu 4559 4753 and** buy code (~ $50).
Use tsu email like Abcd@tnstate.edu as ID.

DEPARTMENT OF PHYSICS AND MATHEMATICS
TENNESSEE STATE UNIVERSITY
PHYS2020 (COLLEGE PHYSICS II) COMMON COMPETENCIES

Upon successful completion of PHYS 2020, the student will be able to define and use in problem solving the following laws, principles and/or concepts:

I. **Temperature, heat, phases of matter and its changes, and laws of thermodynamics**.

II. **Electric Charge and Electric Fields** - Properties of Electric Charges, Coulomb's Law, Electric Force, Electric Field, Electric Field Lines, Superposition Principle, Insulators and Conductors, Motion of Charged Particles in a Uniform Electric Field, Gauss's Law, Electric Dipole

III. **Electric Potential and Capacitance** - Electric Potential and Potential Difference, the Electron Volt, Equipotential Surfaces, Potential Differences in a Uniform Electric Field, Electric Potential and Potential Energy Due to Point Charges, Applications of Electrostatics, Definition of Capacitance, Calculating Capacitance, Combinations of Capacitors, Energy Stored in a Charged Capacitor, Capacitors with Dielectrics, Atomic Description of Dielectrics

IV. **Electric Current and Resistance** - Electric Current and Electromotive Force (EMF), Resistance and Ohm's Law, A Model for Electrical Conduction and Resistivity, Resistance and Temperature, Electrical Energy and Power, Elements of a Simple Circuit, Short Circuits, Open Circuits, Resistors in Combinations, Kirchhoff's Rules, Internal Resistance of a Battery, Electrical Instruments, Household Wiring and Electrical Safety

V. **Magnetism** – Magnets and Magnetic Field, Electric Current and Magnetism, Magnetic Force Acting on a Current-Carrying Conductor, Torque on a Current Loop in a Uniform Magnetic Field, Motion of a Charged Particle in a Uniform Magnetic Field, Charged Particles Moving in a Magnetic Field, The Biot-Savart Law, The Magnetic Force Between Two Parallel Conductors, Ampere's Law, The Magnetic Field of a Solenoid, Magnetism in Matter, The Magnetic Field of the Earth

VI. **Electromagnetic Induction** - Faraday's Law of Induction, Motional EMF, Lenz's Law, Induced EMF and Electric Fields, The Transformer and Power Transmission, Generators and Motors, Inductance, Eddy Currents, Introduction to Maxwell's Equations, Electromagnetic Waves, Energy in a Magnetic Field

VII. **Alternating Current Circuits** - RL Circuits, RC Circuits, The RLC Series Circuit, AC Sources and Phasors, Resistors in an AC Circuit, Inductors in an AC Circuit, Capacitors in an AC Circuit, Power in an AC Circuit, Resonance in a Series RLC Circuit

VIII. **Geometrical Optics** - The Nature of Light, Models of Light: Rays and Waves, Measurements of the Speed of Light, The Ray Approximation in Geometric Optics, Reflection, Refraction, Total Internal Reflection, Fermat's Principle, Applications of Geometrical Optics, Mirrors, Thin Lenses, Image Formation, Ray Tracing, Thin-Lens Equation, Lens Aberrations

IX. **Optical Instruments** - The Eye, The Camera and Projector, The Simple Magnifier, The Compound Microscope, The Telescope, Other Lenses

X. **Wave Optics** - Huygens's Principle, Reflection and Refraction of Light Waves, Conditions for Interference, Interference in Thin Films, Introduction to Diffraction, Diffraction from Narrow Slits, Resolution of Single-Slit and Circular Apertures, Rayleigh Criterion, Dispersion, Polarization of Light Waves, Scattering, Young's Double-Slit Experiment, Change of Phase Due to Reflection, The Diffraction Grating, Intensity Distribution of the Double-Slit Interference Pattern, Spectroscopes and Spectra

XI. **Atomic Structure Physics** – Historicity of the Beginnings of Quantum Physics, Atomic Spectra, Atomic Transitions, The Size of Atoms, Diffraction of X-Rays by Crystals, Discovery of the Electron, Radioactivity, Radioactive Decay, Discovery of the Atomic Nucleus

XII. **Quantum Physics** – Classical vs. Quantum Mechanics, The Compton Effect, De Broglie Waves, The Uncertainty Principle, Schrödinger's Equation, Interpreting Wave Functions, A Particle in a Box, The Wave Properties of Particles, Tunneling Through a Barrier, The Wave Functions for Hydrogen, The Exclusion Principle and the Periodic Table

XIII. **Nuclear Physics** - Some Properties of Nuclei, Neutron Discovery, Composition and Size of the Nucleus, Binding Energy and Nuclear Forces, Conservation Rules Radioactivity, and Nuclear Stability; Natural Radioactivity, The Decay Processes, Nuclear Models of Decay Processes, Detectors of Radiation, Radiation measurement and Biological Effects, Nuclear Reactions, Interactions Involving Neutrons, Nuclear Fission, Nuclear Fusion, Uses of Radiation.