Bangladesh University of Engineering and Technology
Department of Physics

Course Teacher: Dr. Mohammad Jellur Rahman

Course Outline

Program:	**Civil Engineering (**CE)
Course Title:	Electricity and Magnetism, Modern Physics and Mechanics
Course Code:	PHY-151
Semester:	January 2022
Level:	1st year 2nd semester
Credit Hour:	3.0
Name & Designation of the Teacher:	Dr. Mohammad Jellur Rahman
	Professor
	Department of Physics
Office/Room:	OAB 217B, Department of Physics, BUET, Dhaka-1000
Class Hours:	Sunday: 8:00 am- 8:50 am (Sec A)
	Tuesday: 11:00 am- 11:50 am (Sec C)
	Tuesday: 12:00 pm- 12:50 pm (Sec B)
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Rationale: This course in physics is developed on elementary level, which includes Crystal Systems, Different Crystal Structure, Crystal Planes, Bragg's Law, Crystal Defects, etc. The course may provide quantitative and analytic skills needed for analyzing data and solving problems, moreover it is highly relevant to engineering.

Pre-requisite (if any)**:** None

Course Synopsis: Crystalline and non-crystalline solids, single crystal and polycrystal solids, unit cell, crystal systems, co-ordinations number, crystal planes and directions, NaCl and CsCl structure, packing factor, miller indices, relation between interplanar spacing and Miller indices, Bragg's law, methods of determination of interplanar spacing from diffraction patterns; defects in solids: point defects, line defects, bonds in solids, interatomic distances, calculation of cohesive and bonding energy; introduction to band theory: distinction between metal, semiconductor and insulator.

Course Objectives:

Upon successful completion of this course, the student will be able to-

1. Understand the crystal structure and crystal planes.
2. Can describe crystal planes, defects and basic of the band theory of solids.

Tentative Lecture Plan

Lec. No.	Topics
1-5	○ *Types of Solid: Crystalline and non-crystalline solids, Single crystal and poly-crystal solids;* ○ *Crystal Structure: lattice+ basis, Translational vector, unit cell, lattice parameters, lattice constant;* ○ *Crystal systems, lattice point per unit cell;* ○ *Co-ordinations number, Crystal planes and directions, NaCl and CsCl Diamond structure,*
6-9	○ *Density, Packing factor for sc, bcc, fcc, hcp; Problems.* ○ *Crystal Planes, Miller indices, Relation between interplanar spacing and Miller indices, Problems.* ○ *Bragg's Law, Methods of determination of interplanar spacing from diffraction patterns;*
10-13	○ *Defects in solids: Point defects, Line defects;* ○ *Bonds in solids, Interatomic distances, Calculation of cohesive and bonding energy;* ○ *Introduction to band theory: Distinction between metal, Semiconductor and insulator.*

Learning Resources

1. Solid State Physics – M A Wahab
2. Introduction to Solid State Physics – Charles Kittel
3. Elementary Solid-State Physics – M. Ali Omar
4. Concepts of Modern Physics – Arthur Beiser
5. Principle of Modern Physics- A K Saxena
6. Lecture notes: http://mjrahman.buet.ac.bd

Program Outcomes (POs)

- Have advanced theoretical and applied knowledge about physics.
- Examine the concepts and ideas in Physics through scientific methods, express and analyze the problem, formulate a solution based on research, and interpret and evaluate the results.
- Inform people about subjects on Physics, convey ideas and offer solution to problems by supporting them with qualitative and quantitative data.

Teaching Methods:

1. Lecture
2. Discussion
3. Question & Answer
4. Demonstration
5. Problem Solving

Assessment Policies:

Attendance: Class attendance is very important since by missing a class you may miss a class test that may be equivalent to a failed class test and it carries 10% weight of your grade, cannot be recovered unless the absence is appropriately justified and excused.

Class Test/Quizzes: There will be a total of four class tests in this course. Three teachers will be teaching this course and each teacher will be taking at least one class tests. Lowest score of the (four) CT will be dropped. If you

miss any class test, it will count at the lowest score, and will be dropped. **So, no make-up for any class test.** You can expect one/two class test from Modern Physics.

Conduct: Please turn off your cell phones before entering class, and please don't have any sidebar conversations during class. There will be ample opportunity for you to talk during class at certain times. However, it is imperative that the class is quiet at all other times so that your fellow students are not distracted. I encourage you to raise your hand and ask relevant questions in class.

Collaboration Policy: Collaboration during exams is strictly prohibited. Exams will be of the usual closed-book, closed-notes type. On the other hand, in order to learn the materials, collaboration and group discussions outside of classroom are highly encouraged.

Calculators and Laptops: A non-graphic, non-programmable calculator Calculators may be used for exams. While in the class any calculators can be used. You may take notes on a laptop. However, you may not use your laptop for Facebook, web surfing, or other activities not directly related to class.

You will not be allowed to use your cellphone as a calculator in the test.

Grading System:

The total performance of a student in a given course is based on a scheme of continuous assessment. For theory courses this continuous assessment is made through a set of quizzes/in class evaluation, class participation, homework assignments, and a term final examination. Thirty per cent of marks of a theoretical course shall be allotted for continuous assessment i.e., quizzes and homework assignments, in class evaluation and class participation. The remainder of marks will be allotted to Term Final examination of 3-hour duration, which will be conducted centrally by the university. There will be internal and external examiners for each course in the term final examination. The distribution of marks for a given theoretical course will be as follows:

Items	Marks (%)
Class Attendance	10 %
Quizzes	20 %
Term final examination: Internal (Section A) External (Section B)	 35 % 35 %
Total	100 %

All students are expected to attend classes regularly. The university believes that attendance is necessary for effective learning. The first responsibility of a student is to attend classes regularly, and one is required to attend at least 60% of all classes held in every course. Basis for awarding marks for class participation and attendance will be as follows:

Attendance	Marks
90% and above	10
85% to less than 90%	9
80% to less than 85%	8
75% to less than 80%	7
70% to less than 75%	6
65% to less than 70%	5
60% to less than 65%	4
Less than 60%	0

Letter grades and corresponding grade points will be awarded in accordance with the provisions shown below:

Numerical Grade	Letter Grade	Grade Point
80% or above	A+ (A plus)	4.00
75% to less than 80%	A (A regular)	3.75
70% to less than 75%	A- (A minus)	3.50
65% to less tha**n** 70%	B+ (B plus)	3.25
60% to less than 65%	B (B regular)	3.00
55% or less than 60%	B- (B minus)	2.75
50% to less than 55%	C+ (C plus)	2.50
45% to less than 50%	C (C regular)	2.25
40% to less than 45%	D (D regular)	2.00
Less than 40%	F	0.00