MS1012 – Material Physics

Course Code	MS1012					
Course Title	Materials Physics					
Pre-requisites	NIL					
Pre-requisite for	NIL					
No of AUs	3					
Contact Hours	LECTURES	36	Tutorial	5		

Course Aims

This is an introductory course on General physics for the first year undergraduate students. The objective is to provide a theoretical framework for understanding the electrical and magnetic fields. Based on that, you would gain an understanding of electromagnetic (EM) waves and EM properties of various materials. You will also be introduced to modern physics with basic knowledge of relativity and quantum mechanics. The knowledge and skills you learnt would be useful when you are working with materials that involved magnetism and electricity in the future.

Intended Learning Outcomes (ILO)

After completing this course, the students will

1. explain how electro-magnetism behave using concepts relating to electricity and magnetism
2. Explain real life phenomenon using appropriate Physics concepts relating to magnetism and electric fields
3. Predict the effects of changing various parameters in a magnetic circuit such as field strength, direction, etc.
4. Calculate the changes in forces, speed, current, voltage and energy due to parameter changes in a magnetic circuit as stated in ILO3.
5. Calculate speeds, forces, distances and energy using concepts on relativity

Course Content

Electric fields. Gauss' law. Electric potential and electric potential energy.
Capacitance and dielectrics. Ohm's law. Direct current circuits. Magnetic fields.
Sources of magnetic fields. Ampere's law. Gauss' law in magnetism. Ampere Maxwell law. Faraday's law. Inductance. Electromagnetic waves and spectrum.
Relativity. Blackbody radiation and Planck's hypothesis. Photoelectric effect.
Compton effect. Atomic spectra. Bohr model of the atom. Quantum numbers. Pauli exclusion principle and Hund's rule. Electronic configurations. Wave particle duality.
Heisenberg uncertainty principle. Molecular Orbitals. Ionic bonding. Madelung Constant.

Reading and References

1. Young & Freedman, University Physics with Modern Physics 12th edition, Pearson – Addison Wesley, 2008
2. R A Serway & R J Beichner: Physics for Scientists and Engineers with Modern Physics, 5th Edition, Saunders College Publishing, 2000
3. D Halliday, R Resnik and Walker: Fundamental of Physics, 6th Edition, John Wiley & Sons, 2001

Course Policies and Student Responsibilities

You are required to be punctual for lectures and tutorials.
You are to strictly observe NTU exam policy during continual assessments and final exam.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.