SOLID STATE PHYSICS

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INTENDED AUDIENCE : B.Sc in Physics, Chemistry, Electronics ,B.E and B.Tech in Material Science,Metallurgy, Cryogenics, Electronics

INDUSTRIES APPLICABLE TO : Solid state physics has the most striking impact on the solid state electronics. The industries of electronics, telecommunication and instrumentation will recognize this course.

COURSE OUTLINE :

In universe, matter is observable in everyday life in four states: solid, liquid, gas and plasma. There are other states of mater known to exist only under extreme situations. Matter, whatever the states, is made of atoms. The states are defined in terms of interatomic distance, atomic arrangement and atomic ionization in matter. In solid state of matter, the arrangement of atoms forms different structure of materials. The structure of materials is the key deciding factor for different kind of properties, such as thermal, electrical, optical, magnetic, dielectric etc. In this course we will learn the structure of solid materials and their different physical properties along with underlying physics.

ABOUT INSTRUCTOR :

Prof. Amal Kumar Das after completion of B. Sc (Hons) in Physics and M. Sc in Physics in 1994, Prof. Amal Kumar Das did Ph. D on experimental physics and material science from Institute of Physics, Bhubaneswar. After completing post-doctoral research on experimental physics from Paul Drude Institute, Berlin, Germany, Prof. Das joined as a Faculty in Department of Physics, Indian Institute of Technology Kharagpur in 2004 and teaching different subject to UG and PG students including experiments in teaching laboratory of all levels starting from 1st year of B. tech/ B Sc/integrated M. Sc to Ph. D. Prior to join here, Prof. Das took experimental physics laboratory for four years to B. Sc students in an undergraduate college named Malda College under North Bengal University, West Bengal.

COURSE PLAN :

Week 1: Atom to solid structure

Week 2: Crystal symmetry, unit cells and crystal planes

Week 3: Real space and reciprocal space of crystals

Week 4: X-ray diffraction and determination of crystal structures

Week 5: Thermal Properties of Solids

Week 6: Free electron theory of solids

Week 7: Band structure of solids

Week 8: Semiconducting property of solids

Week 9: Superconductivity

Week 10: Diamagnetism and paramagnetism

Week 11: Ferromagnetism and antiferromagnetism

Week 12: Dielectrics and Ferroelectrics