COURSE OUTLINE:

In universe, matter is observable in everyday life in four states: solid, liquid, gas and plasma. There are other states of matter 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, Dept. of Physics, IIT Kharagpur. After completion of B.Sc (Hons) from Calcutta University in Physics and M. Sc in Physics with specialization in solid state physics in 1994, I did Ph.D on experimental solid state physics and material science from Institute of Physics, Bhubaneswar. After completing post doctoral research on magnetic properties of solids from Paul Drude Institute, Berlin, Germany, I joined as a Faculty in Department of Physics, Indian Institute of Technology Kharagpur (IIT KGP) in 2004 and teaching different subject to UG and PG students including popular courses, namely solid state devices and physics of semiconductor devices. Prior to join IIT KGP, I taught solid state physics for several years to B. Sc students in an undergraduate college (Malda College under North Bengal University), West Bengal.

COURSE PLAN:

**Week 01:** Atom to solid structure

**Week 02:** Crystal symmetry, unit cells and crystal planes

**Week 03:** Real space and reciprocal space of crystals

**Week 04:** X-ray diffraction and determination of crystal structures

**Week 05:** Thermal Properties of Solids

**Week 06:** Free electron theory of solids

**Week 07:** Band structure of solids

**Week 08:** Semiconducting property of solids

**Week 09:** Superconductivity

**Week 10:** Diamagnetism and paramagnetism

**Week 11:** Ferromagnetism and antiferromagnetism

**Week 12:** Dielectrics and Ferroelectrics

INTENDED AUDIENCE: B.E/B.Tech, B.Sc

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.

TYPE OF COURSE: Rerun | Core | UG

COURSE DURATION: 12 weeks (20 Jul’20 - 09 Oct’20)

EXAM DATE: 18 Oct 2020