



NON - METALLIC MATERIALS

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TYPE OF COURSE : Rerun | Core | UG/PG**COURSE DURATION** : 12 Weeks (24 Jan' 22 - 15 Apr' 22)**EXAM DATE** : 23 Apr 2022**PRE-REQUISITES** : High school knowledge in Chemistry, Physics and Mathematics are required.**INTENDED AUDIENCE** : 3rd or Final year UG and 1st Semester PG students studying Metallurgical and Materials Engineering/Materials Science/Ceramic Technology**INDUSTRIES APPLICABLE TO** : 1. Tata Steel 2. NALCO 3. Cummins India Limited, Pune 4. Various CSIR Labs**COURSE OUTLINE :**

There have been radical development in the study of non-metallic materials over past two decades-think of Li and Na ion rechargeable batteries, graphene, carbon nano-tubes, conducting polymers, sensing materials for air quality monitoring etc. The course aims students to understand the structure -property relationship in a wide spectrum of non - metallic materials. The course is divided into 12 weekly modules containing 5 lectures in each module with 30 min duration. Each module lectures is self contained to encourage student understanding and reinforce key concepts. Carefully designed problem set will help students to grasp the underlying concepts taught in the course.

ABOUT INSTRUCTOR :

Prof. Subhasish Basu Majumder is presently working as a Professor at the Materials Science Center, IIT Kharagpur. He completed his B. Tech in Ceramic Technology from the Government College of Engineering and Ceramic Technology, Kolkata in the year 1988. Subsequently he obtained his M. Tech and Ph.D degree in Materials Science from IIT Kanpur in the year of 1990 and 1997 respectively. He worked as a postdoctoral fellow and subsequently as a research faculty at the University of Puerto Rico, San Juan, USA. As an Alexander von Humboldt fellow he has also worked at RWTH Aachen, Germany. His research encompasses a wide spectrum of ceramic materials including sensors, rechargeable batteries, cementitious composites etc.

COURSE PLAN :**Week 1:** Polymer materials**Week 2:** Defects, and reaction kinetics of non – metallic materials, carbonaceous materials**Week 3:** Diffusion, phase transformation in non – metallic materials, glass and glass - ceramics**Week 4:** Mechanical properties of non –metallic and composite materials**Week 5:** Electrical, magnetic and thermal properties of non – metallic materials**Week 6:** Optical and Electrochemical properties of non - metallic materials**Week 7:** Processing of non - metallic materials, Sintering and microstructure development**Week 8:** Thin film growth and fabrication of devices**Week 9:** Characterization of structure, composition and microstructure of non - metallic materials**Week 10:** Measurement of the mechanical, electrical, thermal, magnetic and optical properties of non - metallic materials.**Week 11:** Corrosion and degradation of non - metallic materials**Week 12:** Economic, Environmental and societal issues