

1.	Title of the course	Physical Techniques in Materials Science
2.	Course number	PH701L
3.	Structure of credits	3-0-0-3
4.	Offered to	PG
5.	New course/modification to	Modification To PH7021/6
6.	To be offered by	Department of Physics
7.	To take effect from	July 2022
8.	Prerequisite	Nil
9.	<p>Course Objective(s): Advances in the design of materials with tailored properties are important in diverse fields like material science, physics and engineering. Comprehensive knowledge of the physical techniques used to characterize varied materials is therefore important to students of basic and applied sciences. This course will provide acquaintance with a wide range of physical techniques used to study physical and chemical properties of materials.</p>	
10.	<p>Course Content: Various material synthesis methods of bulk single crystals and thin films. Scattering and spectroscopy: X-ray diffraction, Neutron scattering, EPR/ NMR/NQR, Moessbauer spectroscopy, Muon Spin Rotation. Microscopy: SEM, TEM, STM, AFM, etc. Cryogenic physics: different cryostats; and thermodynamic properties: specific heat, thermal expansion, thermal conductivity, DSC, TGA, transport properties, magnetic properties, Hall effect; measurements at extreme conditions: very low temperatures, high pressure and high magnetic fields.</p>	
11.	<p>Textbook(s):</p> <ol style="list-style-type: none"> 1. Amelinckx S, van Dyck D, van Landuyt J, and van Tendeloo G, <i>Handbook of Microscopy: Applications in Materials Science, Solid-State Physics, and Chemistry. Methods II</i>, Wiley (2008). 2. Pobell F, <i>Matter and Methods at Low Temperatures</i>, 3rd Edition, Springer (2007). 	
12.	<p>Reference(s):</p> <ol style="list-style-type: none"> 1. Klug H P, Alexander L E, <i>X-Ray Diffraction Procedures: For Polycrystalline and Amorphous Materials</i>, 2nd Edition, Wiley-Interscience (1974). 2. Mundy J N and Rothman S J, <i>Methods of Experimental Physics, Solid State: Nuclear Methods, Volume 21</i>, Academic Press (1984). 3. Bunshah R F, <i>Techniques of metals research</i>, Interscience Publishers (1968). 	