INDIAN INSTITUTE OF INFORMATION TECHNOLOGY DESIGN AND MANUFACTURING
(IIITDM) KANCHEEPURAM

INTRODUCTION OF NEW COURSE

<table>
<tr><td>Course Title</td><td>Materials Fabrication and Characterization Techniques</td><td>Course No</td><td colspan="4">PH5102</td></tr>
<tr><td rowspan="2">Department/ Specialization</td><td rowspan="2">Materials Science, Mechanical, Electronic and Design Engineering</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Offered for</td><td>UG, PG/DD and PhD</td><td>Status</td><td colspan="4">Core □ Elective ■</td></tr>
<tr><td>Faculty proposing the course</td><td>Dr. Y. Ashok Kumar Reddy</td><td>Type</td><td colspan="4">New □ Revision ■</td></tr>
<tr><td colspan="2">Recommendation from the DAC</td><td>Date of DAC</td><td colspan="4">12-07-22 (Approved in 38th senate with 3 credits)</td></tr>
<tr><td>External Expert(s)</td><td colspan="6">1. Dr. K.R. Gunasekhar, Principle Scientist, IISc Bangalore,
2. Prof. S.P. Venkateshan, Professor Emeritus, IIT Madras & 3. Dr. Dr Annapureddy V., NIT Trichy</td></tr>
<tr><td>Prerequisite</td><td>Consent of Teacher (COT)</td><td>Submitted for approval</td><td colspan="4">48 Senate</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">• To know the deposition techniques for the manufacture of products
• To study the physical, morphological and chemical properties</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">• This course aims to learn the different techniques to fabricate the device samples
• It can be mainly useful for PG, DD and as well as PhD students towards making the products and study the basic properties of the synthesized samples</td></tr>
<tr><td>Course Contents (with approximate breakup of hours for lecture/ tutorial/practice)</td><td colspan="6">I. Preparation of Thin Films
A. Vacuum basics: Production of Vacuum, Pressure measurement Gauges in Vacuum system Tutorial: Lab visit (Hands-on): Operation of Low and High vacuum pumps (5+T2 h)
B. Physical methods: Thermal evaporation, Electron beam evaporation, Pulsed laser deposition and Molecular beam epitaxy, Sputtering: DC and RF sputtering, Glow discharge and Reactive magnetron sputtering
Tutorial: Lab visit (Hands-on): Sputtering, Thermal Evaporation (10+T4 h)
C: Chemical methods: Atomic layer deposition, Chemical vapour deposition, Spray pyrolysis and Spin-coating; Tutorial: Lab visit (Hands-on): Chemical vapour deposition (5+ T2 h)
II. properties and Applications of Thin Films
A. Characterization of thin films:
Crystallography Technique: X-Ray Diffraction
Imaging Techniques: Scanning electron microscopy, Transmission electron microscopy, Atomic force microscopy and Rutherford Backscattering Spectrometry
Spectroscopic Techniques: Energy Dispersive Spectroscopy, X-ray Photo electron Spectroscopy, Raman Spectroscopy, Secondary Ion Mass Spectrometry, Auger Electron Spectroscopy, UV-Vis-NIR Spectroscopy and Fourier Transform Infrared Spectroscopy
Tutorial: Lab visit (Hands-on): Origin and Calculations of crystallite size and Band gap (15+T3 h)
B. Applications of Thin Films:
Photolithography: Photoresists, Mask and pattern generation;
Thin film capacitors, diodes and photodetectors; Thin film solar cells, Thin film micro-batteries;
Thin film sensors: Gas sensors, Bolometers
Tutorial: Lab visit (Hands-on): Photodetector and Gas sensor devices measurements (7+ T4 h)</td></tr>
<tr><td>Essential Reading</td><td colspan="6">1. Handbook of Thin Film Technology, Hartmut Frey, H.R. Khan, Springer, 1st ed. 2015.
2. Materials Science of Thin Films: Deposition and Structure, Milton Ohring , D. Gall, S. P. Baker, Academic Press Inc, 3rd ed. 2014.</td></tr>
</table>

Supplementary Reading	1. Surface Analysis Methods in Materials Science, J. O'Connor, B. Sexton, R.S.C. Smart, Springer-Verlag Berlin Heidelberg, 2nd ed. 2003.