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

<table>
<tr><td>Course Code</td><td></td><td>Course Title</td><td colspan="4">Conventional and Additive Manufacturing with Thermoplastic Composites</td></tr>
<tr><td rowspan="2">Dept./Faculty proposing the course</td><td rowspan="2">ME / Venkata Timmaraju Mallina</td><td rowspan="2">Structure (LTPC)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>2</td><td>4</td></tr>
<tr><td rowspan="2">To be offered for</td><td rowspan="2">UG/PG</td><td>Type</td><td colspan="2">Core ☐</td><td colspan="2">Elective ▬</td></tr>
<tr><td>Status</td><td colspan="2">New ▬</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="3">Submitted for approval</td><td colspan="2">Senate # 63</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">This course is intended to
• present the types of thermoplastic composites and their characteristics
• discuss the concepts of conventional and additive manufacturing methods for thermoplastic composites
• give a hands-on training in manufacturing actual thermoplastic composite components</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">After the completion of the course, students will be able to
• understand difference between conventional and additive manufacturing methods for thermoplastic composites.
• select the right kind of manufacturing process for sustainable and lightweight engineering components
• get real time experience in manufacturing of recyclable products.</td></tr>
<tr><td>Contents of the course
(With approximate break-up of hours for L/T/P)</td><td colspan="6">Definition of composites materials; Introduction; Classification – based on types of matrix and reinforcement; Characteristics, Applications, progress and role of thermoplastic composite materials in 21st century; Properties and applications of various thermoplastic matrix and reinforcement materials; Concept, formation, action, and damage mechanism of interface; Surface treatment of fibers and other micro and nano fillers. (L6+P2)
Manufacturing of semi-finished thermoplastic composite products – Preparation of granules, mats (GMT) and filaments by extrusion compounding; Fabrication of prepreg tapes and sheets by solution dip and spray, hot melt, and film calendaring; Case studies. (L6+P4)
Conventional processes for manufacturing of finished thermoplastic composite products - hand and automated tape lay-up and winding, Pultrusion, compression molding, hot pressing, Autoclave processing, Diaphragm forming, and, Injection, and liquid composite molding; Case studies. (L14+P10)
Additive processes for manufacturing of finished thermoplastic composite products - Fused deposition modeling with particulate, and, discrete and continuous fiber filaments, Powder bed fusion, Laminated object manufacturing, Binder Jetting; Case studies. (L12+P10)
Design for manufacturing aspects of conventional and additive manufacturing; Characterization and quality assurance of products; Optimization of process parameters. Joining of composites; Case studies. (L6+P2)</td></tr>
<tr><td>Text Books</td><td colspan="6">1. S. K. Mazumdar, Composites Manufacturing: Materials, Product and Process Engineering, 1st Ed., CRC Press, ISBN: 0-8493-0585-3, 2002.
2. A. Sola and A. Trinchi, Fused Deposition Modeling of Composite Materials, 1st Ed., Woodhead Publishing, ISBN: 978-0-323-98823-0, 2023.</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. R. J. Crawford, Plastics Engineering, 3rd Ed., Butterworth-Heinmann, ISBN: 978-81-312-0174-9, 2006.
2. M. Puttegowda, S. M. Rangappa and S. Siengchen, Fiber Reinforced Polymer Composites, 1st Ed., Woodhead Publishing, ISBN: 978-0-443-27546-3, 2025.</td></tr>
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