Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram

Pioneering Design-Centric Engineering Education in India

Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram (IIITDM) is an Institute of National Importance under Ministry of Education and setup in the year 2007 with a vision to produce a new breed of engineers to support the competitiveness and growth of the Indian manufacturing sector with knowledge-intensive and creative products and processes. In other words, a model of engineering that synthesizes the best practices of IITs (Technology), IIITs (IT), and NIDs (design). IIITDM is also strategically placed in the proximity of the industrial clusters in Chennai and UNESCO heritage sites like Mahabalipuram and Kancheepuram.

In 2009, IIITDM under the mentorship of IIT Madras, introduced an inter-disciplinary and design-oriented engineering curriculum in three streams - mechanical, electronics and computer engineering. In 2014 a major enhancement was done to promote design-centric engineering education. Some of the unique practices implemented in this enhancement include a series of design and management courses from semesters 1-8, vertical integration of the design and management courses between semesters 3-6 to enable students to identify and translate ideas to PoCs, industry open house events (EHIPASSIKO) once every semester to expose students and their concepts/PoCs to industry experts, a 5-month internship at the end of the 6th semester, and a framework to assess design competence. In 2016, IIITDM launched the world’s first undergraduate program in smart manufacturing. These practices along with the development of innovation and incubation ecosystem have been instrumental in IIITDM being placed in the Band-A (Rank 11-25) among the Institutes of National Importance in the Atal innovation ranking (ARIIA 2020). The undergraduate and dual degree programs have got the attention of corporates such as AMD, Daimler, MathWorks, PayPal, Saint Gobain, Samsung, TAFE, Trimble, TVS Motors and several technology startups. IIITDM students have also got admissions into graduate and Direct-PhD programs in institutions such as Dartmouth, Univ of Minnesota, Umass Amherst, Columbia Univ, Trinity College (Dublin), TU Delft (Netherlands/Denmark), NTU/NUS Singapore, IISc, IITs & IIMs.

The disruption unleashed by COVID-19 and the National Education Policy (NEP) launched by the Govt. of India provide strong tailwind to the design-centric model of engineering education pioneered by IIITDM. IIITDM used the COVID lockdown situation to further review its program with reputed experts from industry and academia and create a roadmap to advance interdisciplinary design and innovation. Design-centric education is fundamentally about creating a new learning environment that nurtures curiosity and calls for a more unified approach to development of mind-body-morality, aspects that are fundamental to the NEP. The new undergraduate programs in IIITDM create more options for engineering students to get different levels of maturity in Product Design or get minors in a complementary branch of engineering or science. In the emerging context, where the manufacturing industry in India is re-inventing itself to embrace digital technologies (industry 4.0), and plug the supply chain gaps to create a self-reliant India, IIITDM and its students are poised to play a pivotal role.
Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram, Chennai
(An Institute of National Importance)

Pioneering Design-Centric Engineering Education in India
IIITDM is uniquely positioned among CFTIs, and well-prepared to implement the National Education Policy.

A design-centric education model that blends STEM with Humanities & Social Sciences.
IIITDM’s campus and programs draw inspiration from the local context: proximity to the manufacturing and IT corridors of Chennai and the UNESCO world heritage sites of Mahabalipuram and Kancheepuram
IIITDM produces three types of professionals to address the needs of the industry and student aspirations:

1. **Design-centric engineer**

   - Science & Technology
   - Evaluation/Needs
   - Science/Physics driven
   - B.Tech & Dual Degree

2. **Design-Centric Engineer++ (Minor/Honors in Product Design)**

   - Product
   - Service/value
   - Context driven
   - B.Tech with Minor/Honors in Product Design

3. **Product designer***

   - Society
   - *M.Des (Dual Degree & Regular) – 2021

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*Product designer*
Each program provides a unique blend of digital, design and engineering

- An environment to foster learning & innovation
- Integrated Product Design (Des/Biz/Tech)
- Problem based learning & Interdisciplinary concepts

- 25% PBL – Detail Design & Manufacturing - in 30% Engineering T & L
- Inter-disciplinary engineering subjects (Mech-Elec; Elec-CSE)

IT / Digital

- Programming
- Data structures & Algorithms
- Data Science & Machine Learning

Design Spine
(Product Design & Mgt)

Engineering
(Detail design & Manufacturing)
The carefully curated design spine helps promote interdisciplinary design and product innovation among engineering students

<table>
<thead>
<tr>
<th>Semester</th>
<th>Concept design</th>
<th>Embodiment design</th>
<th>Design-Entrep</th>
<th>Verticalized</th>
<th>Project</th>
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<tbody>
<tr>
<td></td>
<td>Society-&gt;Product</td>
<td>Product-&gt;Tech</td>
<td>Tech-&gt;Product</td>
<td>Product-&gt;Society</td>
<td>Product-&gt;Economy</td>
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<td>Sociology of design</td>
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<td>PBL</td>
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<td>Sys thinking for design</td>
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<td>PBL</td>
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<td>Smart product design</td>
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<td>PBL</td>
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<td>Entrep &amp; Mgt</td>
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<td>PBL</td>
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<td>ELE-2</td>
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<td>ELE-6</td>
<td>Final Project</td>
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<td>1+2=3</td>
<td>1+2*3+2=9</td>
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<td>3+2*2+1=8</td>
<td>1+2=3</td>
<td>1+2*3+2=9</td>
<td>1+1+3=5</td>
<td>2*3=6</td>
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*Level-2 courses will essentially be taken from the portfolio of courses offered in the M.Des program in ODD/Even semester
* This will be applicable for both Design++ and M.Des Dual Degree students
EHIPASSIKO: The bi-annual industry open house event provides opportunity for students to pitch their concepts to industry experts

- 5 Industry Verticals
- 40+ Companies
- 600 Students / 160 Teams
- 75 Business Plans & Product Concepts
- 85 Smart Product Concepts
- 78 Promising Product Concepts recommended for further work
- 2 patentable ideas
- 4 sponsorship interest

Students showcasing their concepts/prototypes in 9th edition of EHIPASSIKO Industry open house, Nov 2019
Examples of inter-disciplinary product innovations developed by students

- Smart window
- Cool patch
- Milk fat & adulteration detector
- HeartWare
- ProLeg
MaDeIT Innovation Foundation: Offers a four-year roadmap for student led innovation

- **Design Thinking**
  - COVIDYA Pre-incubation (1-3 months)
  - Target: Students / Startups (upto 100 participants for Module-1; 35 for Modules 2-3); 4 cohorts every year

- **Product Innovation**
  - PRAYAS Program (18 months)
  - Target: Early Startups (Upto Rs 10 Lakh Grant, 10-12 new companies per year)

- **Incubation**
  - Incubation Program (24 months)
  - Target: Startups (Rs 15-20 Lakh Seed Fund, 10-12 new companies per year) / Self-funded MSMEs

- **Industry outreach**
  - Manufacturing Accelerator Program (6 months)
  - Target: MSMEs (1.5-2 Lakh Support for prototyping, 10-15 companies in a batch)

**Partner Schemes**
Examples of startups and products incubated by MaDeIT

- Digi2o: Automotive electronics
- Sigaram Technologies: Smart Speedo
- Arhunika: Smart lubrication system
- SSD Controls: Smart stabilizer
- Efficienza: Solar panel cleaning
- Way2Grow: Hydroponics
- C4Y-Retrofit switch for home automation
- Scermlind: Wearable for Athlete performance
The design-centric approach and incubation ecosystem have helped IIITDM position itself in Band-A (11-25) among central institutions in the Atal Ranking of Institutions on Innovation Achievements - ARIIA 2020