

# Centre for Product Design and Manufacturing

## M Tech Programme in Smart Manufacturing 2021-

Duration and total credits: 2 years; 64 credits

**Hard Core:** 22 credits by taking all the courses below

MN 201	3:0	Materials and Processes
MN 202	3:0	Digital Manufacturing
PD 203	2:1	Creative Engineering Design
IN 221	3:0	Sensors & Transducers
EO 238	3:1	Intelligent Agents
MG 261	3:0	Operations Management
MN 205	1:2	Maker's projects (for second year)

**Soft Core:** (Min 6 credits from Basket 1; Min 6 credits from the Basket 2) 12 credits total

*Basket 1: Design, Materials, Manufacturing (at least 6 credits)*

MN 203	3:0	Design for Additive Manufacturing
MN 204	2:1	Human Machine Interfaces for Manufacturing
ME 291	3:0	Analysis of Manufacturing Processes
ME 246	3:0	Introduction to Robotics
MN207	2:1	Intelligent Mobile Robots: Perception, Action and Control

*Basket 2: Sensors, Systems, Analytics (at least 6 credits)*

IN 222	2:1	Sensor & Transducers Laboratory
E3 257	2:1	Embedded System Design
E3 258	2:1	Design for Internet of Things
E0 259	3:1	Data Analytics
MG 225	3:0	Decision Models
MG 265	3:0	Data Mining
PD 215	2:1	Mechatronics
MG 223	3:0	Applied Operations Research

**Final Project:** 24 Credits

MN 206      0:24 Dissertation Project, mandatory for all

**Electives:** 6 credits

PD 202	3:0	Elements of Solid and Fluid Mechanics
PD 204	2:1	Basic Electronics for Design & Manufacturing
PD 206	2:1	Basics of Computing, AI and Data Science for Design and Manufacturing
E3 276	2:1	Process Technology & System Engg for Adv Microsensors and Devices

The balance of credits to make up to a minimum of 64 credits to complete the program may be chosen as electives from within/outside the department, with approval of DCC/Faculty Supervisor.

## Explanation

MTech Smart Manufacturing is a programme to train students in the interdisciplinary area of Smart Manufacturing, so as to prepare students to become future leaders of manufacturing academia, practice, and innovation.

**Hard Core:** 22 credits from all the courses below: These mandatory courses provide a 360-degree exposure to the smart manufacturing lifecycle through Design (PD 203), Materials, Processes and Digital Manufacturing (MN 201, MN 202), Sensing & Mechatronics ((IN 221), Artificial Intelligence (EO 238), and Factory Operations (MG 261). Maker's Projects (MN 205) provide opportunity to apply all the individual knowledge gained in assemble-program-test projects where student build small machines/robots/VR/Haptic sets and test their performance.

MN 201	3:0 Materials and Processes
MN 202	3:0 Digital Manufacturing
PD 203	2:1 Creative Engineering Design
IN 221	3:0 Sensors & Transducers
EO 238	3:1 Intelligent Agents
MG 261	3:0 Operations Management
MN 205	1:2 Maker's projects

**Soft Core:** (Min 6 credits from Basket 1; Min 6 credits from the Basket 2 below) 12 credits:

Each basket of courses below provides a chance for a student to delve deeper into his/her areas of interest. In Basket 1 the courses are: Additive Manufacturing (MN 203); HCI (MN 204), Manufacturing Processes (ME 291), or Robotics (ME 246 or MN 207). In Basket 2 the courses comprise: more in-depth course on Sensors and Mechatronics (IN 222), Embedded Systems and IoT (E3 257, E3 258), Data Analysis (E0 259, MG 225 or MG 265), and Factory Operations (MG 223). The requirement of at least two courses from each basket ensures a balanced training in both these baskets as both are essential in Smart Manufacturing.

*Basket 1: Design, Materials, Manufacturing (at least 6 credits)*

MN 203	3:0 Design for Additive Manufacturing
MN 204	2:1 Human Machine Interfaces for Manufacturing
ME 291	3:0 Analysis of Manufacturing Processes
ME 246	3:0 Introduction to Robotics
MN 207	2:1 Intelligent Mobile Robots: Perception, Action and Control

*Basket 2: Sensors, Systems, Analytics (at least 6 credits)*

IN 222	2:1 Sensor & Transducers Laboratory
E3 257	2:1 Embedded System Design
E3 258	2:1 Design for Internet of Things
E0 259	3:1 Data Analytics
MG 225	3:0 Decision Models
MG 265	3:0 Data Mining
PD 215	2:1 Mechatronics
MG 223	3:0 Applied Operations Research

**Final Project: 24 Credits**

MN 206          0:24 Dissertation Project, mandatory for all

The final project can be on a topic of research (leading to new scientific/technological understanding), or development (leading to new technologies/products in manufacturing). Each project is undertaken by a team of two students who are jointly guided by two project supervisors. While each such project has a common goal, the specific work carried by each student in the team will have adequately distinct emphasis (as well as common work) so that each student can write his/her individual thesis.

**Electives: 6 credits**

PD 202          3:0 Elements of Solid and Fluid Mechanics  
PD 204          2:1 Basic Electronics for Design & Manufacturing  
PD 206          2:1 Basics of Computing, AI and Data Science for Design and Manufacturing  
E3 276          2:1 Process Technology & System Engg for Adv Microsensors and Devices

The balance of credits to make up to a minimum of 64 credits to complete the program may be chosen as electives from within/outside the department, with approval of DCC/Faculty Supervisor.

The specific electives suggested above are to provide bridge courses to students who need priming up in the areas of mechanical engineering (PD 202), electronics (PD 204), computing (PD 206), or electronic prototyping (E3 276).