MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

Department of Instrumentation and Control Engineering

B. Tech in Cyber Physical Systems

Program Structure and curriculum-2022 scheme

Year	THIRD SEMESTER						FOURTH SEMESTER					
	Sub. Code	Subject Name	L	T	P	C	Sub. Code	Subject Name	L	T	P	C
II	MAT 2122	Engineering Mathematics - III	2	1	0	3	MAT 2234	Engineering Mathematics - IV	2	1	0	3
	ICE 2121	Analog Electronic Circuits	3	1	0	4	ICE 2222	Microcontroller	3	1	0	4
	ICE 2126	Digital Logic Design	3	0	0	3	ICE 2226	Digital Transmission	3	0	0	3
	ICE 2127	Computer Architecture and Organization	3	0	0	3	ICE 2227	Introduction of Cyber Physical Systems	3	0	0	3
	ICE 2128	Data Structures and Algorithms	3	1	0	4	ICE 2228	Introduction to Control Theory	2	1	0	3
	ICE 2129	Sensor Technology	3	0	0	3	ICE 2225	Communication systems	3	0	0	3
	ICE 2142	Sensors and Circuits Lab	0	0	3	1	ICE 2243	Communication Systems lab	0	0	3	1
	ICE 2144	Data Structures Lab	0	0	3	1	ICE 2242	Microcontroller Lab	0	0	3	1
			17	**3**	**6**	**22**			**16**	**3**	**6**	**21**
	Total Contact Hours (L + T + P)		**26**				**Total Contact Hours (L + T + P)**		**25**			

Year	FIFTH SEMESTER						SIXTH SEMESTER					
	Sub. Code	Subject Name	L	T	P	C	Sub. Code	Subject Name	L	T	P	C
III	HUM3022	Essentials of Management	3	0	0	3	HUM 3021	Engineering Economics and Financial Management	3	0	0	3
	ICE 3126	Cyber Physical system design	3	1	0	4	ICE ****	Flexible Core – 2 (A2/B2/C2)*	3	0	0	3
	ICE 3127	Data Communication and networks	3	1	0	4	ICE ****	Flexible Core – 3 (A3/B3/C3)*	3	0	0	3
	ICE 3128	Embedded systems design and programming	3	0	0	3	ICE ****	PE – 1 / Minor Specialization	3	0	0	3
	ICE ****	Flexible Core – 1 A1/ B1/C1)*	3	0	0	3	ICE ****	PE – 2 / Minor Specialization	3	0	0	3
	IPE 4302	OE 1 – Creativity, Problem Solving and Innovation** (MLC) - mandatory	3	0	0	3	*** ****	OE – 2** (MLC)	3	0	0	3
	ICE 3143	Cyber physical systems design Lab	0	0	3	1	ICE 3244	CPS Interface Lab	0	0	3	1
	ICE 3144	Embedded system programming Lab	0	0	3	1	ICE 3245	Networking lab	0	0	3	1
			18	**2**	**6**	**22**			**18**	**0**	**6**	**20**
	Total Contact Hours (L + T + P)		**26**				**Total Contact Hours (L + T + P)**		**24**			

*Courses of three independent tracks A, B, C
** Performance of students to be recorded in Eighth semester grade sheet

Year	SEVENTH SEMESTER						EIGHTH SEMESTER					
	Sub. Code	Subject Name	L	T	P	C	Sub. Code	Subject Name	L	T	P	C
IV	ICE ****	PE – 3 / Minor Specialization	3	0	0	3	ICE 4291	Industrial Training (MLC)				1
	ICE ****	PE – 4 / Minor Specialization	3	0	0	3	ICE 4292	Project Work				12
	ICE ****	PE – 5	3	0	0	3	ICE 4293	Project Work (B Tech – honours)* (V - VIII sem)				20
	ICE ****	PE – 6	3	0	0	3	ICE ****	B Tech – honours Theory – 1* (V semester)				4
	ICE ****	PE - 7	3	0	0	3	ICE ****	B Tech – honours Theory – 2* (VI semester)				4
	XXX****	OE – 3** (MLC)	3	0	0	3	ICE ****	B Tech – honours Theory – 3* (VII semester)				4
	ICE 4191	Mini Project (Minor specialization)***				8						
			18	**0**	**0**	**18/26*** **						**13/33***
	Total Contact Hours (L + T + P)		**18**				**Total Contact Hours (L + T + P)**					

*Applicable to eligible students who opted for and successfully completed the B Tech – honours requirements
** Performance of students to be recorded in Eighth semester grade sheet
***Applicable to students who opted for minor specialization

Flexible Core:

I Automation (A)

ICE 3129 Industry 4.0 (A1)
ICE 3225 Industrial Automation (A2)
ICE 3227 Design of Safe systems (A3)

II System Intelligence(B)

ICE 3130 Introduction to Augmented and Virtual Reality(B1)
ICE 3226 Unsupervised intelligence in CPS (B2)
ICE 3228 CPS Interface (B3)

III L&TEdutech

- Foundations of EV & Hybrid Vehicles (C1)
- Automotive Mechanics for Electric Vehicles (C2)

Minor Specialization

I. Control Systems

ICE 4401: Modern Control Theory
ICE 4402: Nonlinear control theory
ICE 4403: Digital Control Systems
ICE 4404: System Identification

II. Sensor Technology

ICE 4405: Sensor Design
ICE 4406: Biosensors and BioMEMS
ICE 4407: Multi Sensor Data Fusion
ICE 4408: Automotive Sensors

III. Systems Engineering

ICE 4409: Introduction to Systems Engineering
ICE 4410: System architecture and Design
ICE 4411: SysML and MBSE
ICE 4412: System Verification and validation

IV. Smart Transportation Systems

ICE 4413: Automotive Electronics
ICE 4414: In-vehicle Networking
ICE 4415: Intelligent Transportation Systems
ICE 4416: Advanced Driver Assistance Systems

V E-Mobility (L&T Edutech)

- EV Battery Technology and Power Train Development
- EV Charging Infrastructure, Vehicle Testing & Homologation
- EV Vehicle Design & Analysis
- EV Data Analytics & Cyber Security

Other Program Electives

ICE 4461: Big Data Analytics
ICE 4462: Blockchain Technology
ICE 4464: CPS Assurance
ICE 4465: CPS for internal and external security
ICE 4466: Cyber Security
ICE 4467: Design of Safe Systems
ICE 4468: E-Vehicles
ICE 4469: Intelligent Manufacturing Automation
ICE 4470: Metaverse
ICE 4471: Next Generation Networks
ICE 4472: Smart Farming and Agriculture
ICE 4473: Smart Grid
ICE 4474: Smart Infrastructure
ICE 4475: Virtual and Augmented Reality
ICE 4476: Wireless Sensor Technology
ICE : Smart Sensors

Open Electives

ICE 4311 Feedback Control Theory
ICE 4312 Industrial Automation
ICE 4313 Industrial Instrumentation
ICE 4314 Sensor Technology
ICE 4315 Smart Sensor
ICE 4316 Virtual Instrumentation
ICE 4317 Farm Automation