### Indian Institute of Technology Palakkad Curriculum

Program: Master of TechnologyStream: Data ScienceYear: 2020 Onwards



#### **Program Description**

Centre for Research and Education in Data Science (CREDS) of IIT Palakkad presents curriculum of a transdisciplinary master program M. Tech degree in Data Science (MDS).

The program is going to be jointly contributed by faculty members from CSE, EE, MA, CE, ME, HSE, PHY. The curriculum contains core courses and electives along with capstone project. Along with training on theoretical foundation the curriculum also supports considerable training on hands on and practical skills through projects, lab courses. Electives will help students to pick appropriate tracks for their specialization.

#### **Semester I**

No.	Code	Course Title	L	Т	Ρ	С	Category
1	MA5007	Probability & Statistics	4	0	0	4	PST
2	EE5007	Linear Algebra for Engineers	3	0	0	3	PMT
3	CS5011	Optimisation	3	0	0	3	PMT
4	CS5512	Machine Learning	3	0	0	3	PMT
5	CS5101	Machine Learning Lab	0	0	3	2	РМР
6	CS5015	Data Engineering	3	0	0	3	PMT
7	CS5103	Data Engineering Lab	0	0	3	2	PMP
8	GN5001	Communication and Technical Writing Skills <sup>1</sup>	2	0	0	0	IDC
		Semester Total	18	0	6	20	

#### Notes if any.

Since it is a multi disciplinary program, there could be an option by which a student who has already done a core course of the program during their bachelors, can replace it with an elective with the consent of the faculty adviser.

<sup>&</sup>lt;sup>1</sup> Institute Core for all M.Tech Programs

No.	Code	Course Title	L	Т	Р	С	Category
1	CS5007	Deep Learning	3	0	0	3	PMT
2	CS5104	Big Data Lab	1	0	3	3	PMP
3	CS5012	AI for Cyber Security	3	0	0	3	PMT
4		Elective				6	PME
		Semester Total	9	0	3	15	

*Notes if any.* Curriculum has a total PME requirement of 9 credits. It can be earned by doing any number of courses.

#### Summer Term

No.	Code	Course Title	L	Т	Р	С	Category
1		Project (phase 0)/ Internship	0	0	0	0	PMP
		Semester Total	0	0	0	0	

Notes if any.

#### Semester III

No.	Code	Course Title	L	Т	Р	С	Category
1		Elective				3	PME
2	DS5110	Project (phase 1)				10	PMP
		Semester Total	0	0	0	13	

Notes if any.

#### **Semester IV**

No.	Code	Course Title	L	Т	Р	С	Category
1	DS5120	Project (phase 2)				10	PMP
		Semester Total	0	0	0	10	

Notes if any.

#### **Category-wise Summary**

Code	Category Description	Credits
PMT	ProfessionalMajor Theory (Lecture based core courses)	22
PMP	Professional Major Practise(Lab based core courses) (Project/Internship based core courses)	27
PME	Professional Major Elective (Electives courses from program pool)	9
OE	Open Electives (Any post-graduate course)	0
IDC	Interdisciplinary Course	0
	Total	58

### Indian Institute of Technology Palakkad Curriculum

Program: Master of TechnologyStream: Computing and MathematicsYear: 2020 Onwards



#### **Program Description**

M.Tech program in Computing and Mathematics provides a unique mix of computer science and mathematics courses, thus addressing the increasing demand for individuals with expertise in both these areas. This program also brings in an opportunity for peer learning of students with a background in either of these areas. Candidates posessing a valid GATE score in CS/MA and having completed the requirements of either 1) B.Tech/B.E in Computer Science and Engineering / Information Technology or (2) M.Sc in Mathematics are eligible to apply. First semester curriculum is designed with the above diversity in mind. Apart from the common courses, M.Sc. Mathematics students will be trained in certain basic core courses from computer science and B.Tech. Computer Science and Engineering students will be trained in some core mathematics courses. Later semesters will comprise of a wide spectrum of advanced courses in both the domains. Major areas include Algorithms, Graph Theory, Combinatorics, Logic, Computational Methods and Foundations of Data Science & Machine learning. The program culminates with an year long Project/Dissertation in the second year, that prepares students to pursue careers that require innovations involving sophisticated applications of mathematics in computer science.

#### Semester I (For students with Computer Science and Engineering background)

No.	Code	Course Title	L	Т	Ρ	С	Category
1	CS5013	Topics in Discrete Mathematics	3	0	0	3	PMT
2	CS5009	Algorithms	3	1	0	4	PMT
3	MA5007	Probability and Statistics <sup>1</sup>	4	0	0	4	PMT
4	MA5001	Linear Algebra <sup>2</sup>	4	0	0	4	PMT
5	CS5107	Programming Lab <sup>3</sup>	1	0	3	3	PMP
6	GN5001	Communication and Technical Writing Skills <sup>4</sup>	2	0	0	0	IDC
		Semester Total	17	1	3	18	

### Semester I (For students with Mathematics background)

No.	Code	Course Title	L	Т	Р	С	Category
1	CS5013	Topics in Discrete Mathematics	3	0	0	3	PMT
2	CS5009	Algorithms	3	1	0	4	PMT
3	MA5007	Probability and Statistics <sup>5</sup>	4	0	0	4	PMT
4	CS5017	Theory of Computation <sup>6</sup>	3	1	0	4	PMT
5	CS5107	Programming Lab <sup>7</sup>	1	0	3	3	PMP
6	GN5001	Communication and Technical Writing Skills <sup>8</sup>	2	0	0	0	IDC
		Semester Total	16	2	3	18	

Note : If a student has already credited a course with a similar content as some core course prescribed in this curriculum, during his/her previous degree, then a program elective course may be credited instead of that course, for completing the credit requirements. For this, the permission of the faculty advisor is to be obtained.

7 Same course as in M.Tech in SoCD

<sup>1</sup> Same course as in M.Sc Mathematics

<sup>2</sup> Same course as in M.Sc Mathematics

<sup>3</sup> Same course as in M.Tech in SoCD

<sup>4</sup> Institute Core for all M.Tech Programs

<sup>5</sup> Same course as in M.Sc Mathematics

<sup>6</sup> The syllabus of this course is the same as that of fifth semester B.Tech CS course CS3050. The examination and evaluation pattern of the two courses may differ.

<sup>8</sup> Institute Core for all M.Tech Programs

No.	Code	Course Title	L	Т	Ρ	С	Category
1	CS5016	Computational Methods and Applications	2	0	3	4	РМТ
2	CS5010	Graph Theory and Combinatorics	3	0	0	3	PMT
3	CS5014	Foundations of Data Science and Machine Learning	3	0	0	3	РМТ
4		Professional Major Elective	3	0	0	3	PME
5		Open Elective	3	0	0	3	OE
		Semester Total	14	0	3	16	

#### Summer Term

No.	Code	Course Title	L	Т	Ρ	С	Category
1							
		Semester Total	0	0	0	0	

#### Semester III

No.	Code	Course Title	L	Т	Ρ	С	Category
1		Professional Major Elective	3	0	0	3	PME
2		Open Elective	3	0	0	3	OE
3	CM5110	Project / Dissertation Phase 1	0	0	12	8	PMP
		Semester Total	6	0	12	14	

Note : The students are free to take Open Electives either from the set of Program Electives or from the set of any research or PG level electives in the institute.

No.	Code	Course Title	L	Т	Ρ	С	Category
1	CM5120	Project / Dissertation Phase 2	0	0	18	12	PMP
		Semester Total	0	0	18	12	

Notes : Minimum credit requirements is 58 credits

### Category-wise Summary

Code	Category Description	Credits
PMT	Professional Major Theory (Lecture based core courses)	25 (Minimum 23)
PMP	Professional Major Practise(Lab based core courses) (Project/Internship based core courses)	23
PME	Professional Major Elective (Electives courses from program pool)	6
OE	Open Electives (Any post-graduate course)	6
IDC	Interdisciplinary Course	0
	Total	60 (Minimum 58)

### Indian Institute of Technology Palakkad Curriculum

IIT PALAKKAD

Program: Master of TechnologyStream: System-on-Chip DesignYear: 2020 Onwards

#### **Program Description**

With ever-increasing complexity of workloads, the demand for increased performance from a computational system cannot be met only through isolated advances in device technology, circuit design, or system-level design decisions. Therefore, it is important that future graduates: (i) understand the performance requirements of complex systems under various operational constraints, (ii) understand different components and design abstractions that contribute towards building complex systems, and (ii) apply this understanding to improve state-of-the-art in System-on-Chip (SoC) design.

This curriculum is designed to meet these objectives and produce graduates with expertise at the intersection of devices, circuits and systems. At the end of this program, a student would be able to appreciate and apply advances made across domains to design better SoCs.

No.	Code	Course Title	L	Т	Р	С	Category
1	EE5011	VLSI design	3	0	2	4	PMT
2	EE5009	Nanoelectronics for Circuits & Systems	3	0	0	3	PMT
3	CS5019	Advanced Computer Architecture	3	0	0	3	PMT
4	CS5119	Advanced Computer Architecture Lab	0	0	3	2	PMP
5	CS5107	Programming Lab	1	0	3	3	PMP
6	GN5001	Communication and Technical Writing Skills <sup>1</sup>	2	0	0	0	IDC
		Semester Total	12	0	8	15	

#### Semester I

Notes if any.

Institute Core for all M.Tech Programs

No.	Code	Course Title	L	Т	Р	С	Category
1	CS5XXX	SoC Design Lab	1	0	3	3	PMP
2		Professional Elective 1	3	0	0	3	PME
3		ProfessionalElective 2	3	0	0	3	PME
4		ProfessionalElective 3	3	0	0	3	PME
5		ProfessionalElective 4	3	0	0	3	PME
6		Mini Project	0	0	5	3	PME
7	GN5001	Research Methodology and Professional Ethics <sup>2</sup>	2	0	0	0	IDC
		Semester Total	15	0	8	18	

"Mini Project" is intended to give a student an early start into the major project, knowledge transfer from seniors, and hands-on experience in using tool-chains, experimental set-up. Therefore, based on the interest of a student, this could be a directed reading into a topic, a seminar, or an open-ended project. It is called "Mini project" for lack of a better title.

#### **Summer Term**

No.	Code	Course Title	L	т	Ρ	С	Category
1							
		Semester Total	0	0	0	0	

#### Notes if any.

#### Semester III

No.	Code	Course Title	L	Т	Ρ	С	Category
1		ProfessionalElective 5	3	0	0	3	PME
2		Professional Elective 6	3	0	0	3	PME
3	SD5110	M.Tech Thesis/Project Phase 1	0	0	14	9	PMP
		Semester Total	6	0	14	15	

Notes if any.

<sup>&</sup>lt;sup>2</sup> Stream Core. Each stream can decide if this course is to be made compulsory

No.	Code	Course Title	L	Т	Р	с	Category
1	SD5120	M.Tech Thesis/Project Phase 2	0	0	18	12	PMP
		Semester Total	0	0	18	12	

Notes if any.

#### **Category-wise Summary**

Code	Category Description	Credits
PMT	Professional Major Theory (Lecture based core courses)	10
PMP	Professional Major Practise (Lab based core courses) (Project/Internship based core courses)	32
PME	Professional Major Elective (Electives courses from program pool)	18
OE	Open Electives (Any post-graduate course)	0
IDC	Interdisciplinary Course	0
	Total	60

#### **Program Electives**

Below is a list of likely electives, and the tentative semester (in the curriculum) students would be able to take them. (\* - indicates that the course is yet to be approved)

Electives likely to be offered in 2nd Semester (or even semesters) (4 electives to be taken as per curriculum)

- 1. AI for Cybersecurity
- 2. Cryptography
- 3. VLSI Architectures for Signal Processing and Machine Learning
- 4. Digital Verification and Testing\*
- 5. Nanoelectronic Devices
- 6. Analog Integrated Circuits\*
- 7. RF and Microwave Passive Circuits

Electives likely to be offered in 3rd Semester (or odd semesters) (2 electives to be taken as per curriculum)

- 1. Digital Image Processing
- 2. RF and Microwave Active Circuits
- 3. Principles and Design of Microelectromechanical System\*
- 4. CAD for VLSI\*
- 5. Multirate Signal Processing\*

## **Indian Institute of Technology Palakkad**

Curriculum

Program : Master of Technology

- **Stream** : Power Electronics and Power Systems
- Year : 2020 Onwards



#### **Program Description**

In the modern era, power electronics is a key enabling technology and understanding of the diverse disciplines like Semiconductor devices, Power converters, control theory Power conversion techniques and its application in power system etc. is therefore essential to all power engineers. Our vision in starting an M. Tech Programme in Power Electronics and Power System is to "Develop and maintain a high quality teaching and research environment in Power Electronics, Power Systems, and Control and to emerge as a centre of excellence for contributing towards the society"

#### Semester I

No.	Code	Course Title	L	Т	Р	С	Category
1	EE5021 Powe	r Converter Analysis and Design	3	0	0	3	РМТ
2	EE5017 Powe	r System Analysis And Operation	3	0	0	3	РМТ
3	EE5019 Mode	lling and Analysis of Electrical Machines	3	0	0	3	РМТ
4	EE5022 Synth	esis of control	3	0	0	3	PMT
5	EE5xxx	Professional Elective - 1*	3	0	0	3	PME
	EE5xxx Semir	nar**	-	-	-	2	Seminar
6	GN5000 Cor	nmunication and Technical Writing Skills <sup>1</sup>	2	0	0	0	IDC
		Semester Total	17	0	0	17	

Notes if any. \*Programme elective- Typically Elective offered by EE department and relevant to the M.Tech programme or relevant electives from other department with the concent of faculty advisor. \*\*pass or fail evaluation scheme will be implemented for seminar evaluation

<sup>1</sup> Institute Core for all M.Tech Programs

No.	Code	Course Title	L	Т	Р	С	Category
1	EE5015 Powe	r Converters - modulation, control and applications	3	0	0	3	РМТ
2	EE5xxx	Professional Elective- 2	3	0	0	3	PME
3	EE5xxx	Professional Elective-3	3	0	0	3	PME
4	EE5103 Powe	r converters design lab	0	0	2	2	PMP
5	EE5105 Powe	r electronics simulation lab 0	02		2		PMP
6	EE5101 Powe	r systems simulation lab 0	0 2		2		PMP
7	EE5xxx	Open Elective*	3	0	0	3	OE
8	GGN5001 Re	search Methodology and Professional Ethics <sup>2</sup>	2	0	0	0	IDC
		Semester Total	14	0	6	18	

#### Notes if any.

\*Students have the freedom to choose open elective in any of the semesters except 4th Sem. Ideally it is slotted in second semester.

#### **Summer Term**

No.	Code	Course Title	L	Т	Р	С	Category
1	PE5190 Intern	ship/Miniproject	-	-	-	2	Internship
		Semester Total	0	0	0	2	

#### Notes if any.

#### **Semester III**

No.	Code	Course Title	L	Т	Ρ	С	Category
1	PE5110	Professional Major Project Phase -1	-	-	-	11	PMP
2							
3							
4							
		Semester Total	0	0	0	11	

2 Stream Core. Each stream can decide if this course is to be made compulsory

#### Notes if any.

#### **Semester IV**

No.	Code	Course Title	L	Т	Р	С	Category
1	PE5120	Professional Major Project Phase -1	-	-	-	12	PMP
2							
3							
4							
		Semester Total	0	0	0	12	

#### Notes if any.

#### **Category-wise Summary**

Code	Category Description	Credits
PMT	Professional Major Theory (Lecture based core courses)	15
PMP	Professional Major Practise (Lab based core courses)	6
	(Project/Internship based core courses)	23
	Internship	2
	Seminar	2
PME	Professional Major Elective (Electives courses from program pool)	9
OE	Open Electives (Any post-graduate course)	3
IDC	Interdisciplinary Course	
	Total	60

#### List of Program Major Electives

- 1. Optimal Control
- 2. Sensors and Signal Conditioning Circuits
- 3. Control of Nonlinear Dynamical Systems
- 4. Electric Drives
- 5. Digital Control of Power converters
- 6. Power System Dynamics and Control

- 7. Computational Methods in Electrical Engineering\*
- 8. Power System Protection\*
- 9. Renewable Energy Systems\*
- 10. Multi rate signal processing\*
- 11. Embedded Systems\*
- 12. Design of Analog Electronic Circuits and Systems\*
- 13. Graduate Engineering Mathematics\*
- 14. VLSI architectures for signal processing \*
- 15. Machine Learning\*
- \*These courses are already approved by IIT Palakkad BAC

# Indian Institute of Technology Palakkad

Curriculum

IIT PALAKKAD

Program: Master of TechnologyStream: Manufacturing and Materials EngineeringYear: 2020 Onwards

#### Semester I

No.	Code	Course Title	L	Т	Р	С	Category
1	ME5011	Mathematics for Engineers	3	0	0	3	PMT
2	ME5007	Advanced Engineering Materials	3	0	0	3	PMT
3	ME5005	Modern Manufacturing Processes	3	0	0	3	PMT
4	ME5013	Mechanics of Machining	3	0	0	3	PMT
5	ME5009	Digital Manufacturing	3	0	0	3	PMT
6	ME5012	Manufacturing Processes and Characterization Laboratory	1	0	3	3	PMP
7	GN5001	Communication and Technical Writing Skills <sup>1</sup>	2	0	0	0	IDC
		Semester Total	18	0	3	21	

#### Semester II

No.	Code	Course Title	L	Т	Р	С	Category
1	ME5004	Mechanical Behaviour of Materials	3	0	0	3	PMT
2	ME5002	Computer Aided Metrology	3	0	0	3	PMT
3	MEXXXX	Professional Major Elective 1	3	0	0	3	PME
4	MEXXXX	Professional Major Elective 2	3	0	0	3	PME
5	MEXXXX	Professional Major Elective 3	3	0	0	3	PME
6	ME5101	Modeling and Simulation Laboratory	1	0	0	3	PMP
7	GN5001	Research Methodology and Professional Ethics <sup>2</sup>	2	0	0	0	IDC
		Semester Total	18	0	0	18	

<sup>1</sup> Institute Core for all M.Tech Programs

<sup>2</sup> Stream Core. Each stream can decide if this course is to be made compulsory

### Summer Term

No.	Code	Course Title	L	Т	Р	С	Category
1	ME5190	Internship	-	-	-	2	PMP
		Semester Total	0	0	0	2	

#### Semester III

No.	Code	Course Title	L	Т	Ρ	С	Category
1	ME5110	Project I	0	0	0	10	PMP
		Semester Total	0	0	0	10	

#### Semester IV

No.	Code	Course Title	L	Т	Р	С	Category
1	ME5120	Project II	0	0	0	12	PMP
		Semester Total	0	0	0	12	

### Category-wise Summary

Code	Category Description	Credits
PMT	Professional Major Theory (Lecture based core courses)	21
PMP	Professional Major Practise (Lab based core courses) (Project/Internship based core courses)	30
PME	Professional Major Elective (Electives courses from program pool)	9
OE	Open Electives (Any post-graduate course)	
IDC	Interdisciplinary Course	
	Total	60

### List of Professional Major Electives

S. No.	Course Name
1	Surface Degradation and Surface Engineering
2	Total Quality Management
3	Product Design and Development
4	Composite Materials and Characterization
5	Materials Characterization Techniques
6	Advanced Finishing Processes
7	Additive Manufacturing
8	Micro Manufacturing
9	Prognostics and Diagnostics of Machine Tools
10	Robotics
11	Soft Computing
12	Design for Manufacturing
13	Computational Methods
14	Welding Technology