

# Curriculum for MTech in Communications, Signal Processing and Learning (CSPL)

The following curriculum is to be followed for the the 3-year MTech (RA) programme in CSPL  
(**August 2023 onwards**)

## Department Core and Soft Skill Courses

Course Number	Course Name	Credits	Semester offered
EE5817	Random Variables and Stochastic Processes	3	odd
EE5609	Matrix Theory	3	odd
EEXXX	Course from the core basket	3	I,II
SS 5901	Industry Lectures	1	I-IV
LA5180	English Comm	1	odd

## Summary

Course type	Credits
Department core	9
Electives (theory + lab)	15
Core (lab)	2
Soft skills	2
Thesis	24
<b>Total</b>	<b>52</b>

Students must take a total of 18 credits across baskets, with at least 2 elective credits from each of the elective baskets (signal processing, communications, and learning).

## List of core courses (theory)

Course number	Course name	Credits	Course type
EE5817	Random Variables and Stochastic Processes	3	Department Core
EE5609	Matrix Theory	3	Department Core
EEXXX	Courses from the core basket	3	Department Core

## Lab Basket

<b>Lab basket (2 credits)</b>			
<b>Students can pick any 2 credits of these lab courses, depending on their thesis topic or interest</b>			
Course code	Course name	Credits	Prerequisites
EE5801	Communications lab	1	Digital communication
EE5803	FPGA lab	1	None
EE5802	DSP lab	1	None
EE5911	Next-gen wireless lab	1	Wireless Communication
EE5901	Machine learning lab	1	PRML or equivalent

## Elective baskets

Students must take a total of 15 elective credits across baskets, with at least 2 elective credits from each of Communications, Signal Processing and Learning baskets.

Any new course proposed in the future will be placed in one of the baskets.

<b>Theory and Foundations Basket (minimum of 3 credits from this basket)</b>		
Course code	Course name	Credits
EE5606	Convex Optimization	3
EE5903	Information theory, coding and inference	3
EE5603	Concentration Inequalities	1
EE5913	Statistical Inference	3
EE5910	Advanced Stochastic Processes	3

The courses in this basket are foundational for project and research in multiple areas: communications, signal processing and learning. This core basket provides flexibility to students in terms of forming a strong theoretical foundation.

## Specialization baskets

<b>Learning basket (min 2 credits from this basket)</b>		
Course code	Course name	Credits
EE5610	Pattern Recognition and Machine Learning	3
EE6380	Deep Learning	3
EE5600	Introduction to Machine Learning	1
EE5601	Representation Learning	1
EE5602	Probabilistic Graphical Models	1
EE5604	Introduction to Statistical Learning Theory	1
EE5605	Kernel Methods	1
EE5611	Machine Learning Applications for Wireless Communications	3
EE5620	Machine Learning for Signal Processing	3
EE5720	Game theory	1
EE5328	Intro to submodular functions	1

EE5901	Machine Learning Lab	1
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<b>Signal Processing Basket (min 2 credits from this basket)</b>		
Course code	Course name	Credits
EE5900	Advanced Digital Signal Processing	3
EE6307	Speech Systems	3
EE5630	Topics in Signal Processing	2
EE5360	Practical Challenges in Image Analysis	3
EE6310	Image and Video Processing	3
EE7350	Adaptive Signal Processing	3
EE5802	DSP lab	1
EE5811	FPGA Lab	1

<b>Communications Basket (min 2 credits from this basket)</b>		
Course code	Course name	Credits
EE5837	Principles of Digital Communication	3
EE6340	Wireless Communications	3
EE6320	Wireless Sensor Network	3
EE5350	Error Correcting Codes	3
EE7330	Network Information Theory	3
EE5161	Introduction to UAV	2
EE6330	Advanced Cellular Communications	3
EE6350	Multiple Antenna Systems	3
EE6341	Communication Networks	3

EE5848	Topics in Information Theory & Coding	2
EE6367	Topics in data storage and communications	2
EE5801	Communications lab	1
EE5911	Next-gen wireless lab	1
SM5010	Autonomous Navigation	2
SM5030	Internet of Things (IoT)	2

### List of thesis courses (3-year MTech)

Course code	Name of course	Number of credits	Semester
EE6815	MTech RA CSPL Thesis stage - 1	1	1
EE6825	MTech RA CSPL Thesis stage - 2	1	2
EE6835	MTech RA CSPL Thesis stage - 3	2	3
EE6845	MTech RA CSPL Thesis stage - 4	4	4
EE6855	MTech RA CSPL Thesis stage - 5	8	5
EE6865	MTech RA CSPL Thesis stage - 6	8	6