

## Department of CSE

### Details of Specialization

i) Details of approved Specialization and dual degree programmes in the following Table:

**Table 1:** Summary of Specialization and Dual degree leading to Specialization offered by Dept/School/IDRP

Sr. No.	Dept/School/IDRP	Name of Specialization	Eligible Branches	Dual-Degree Possible (Yes/No)	Name of Dual Degree Programme
1	CS, EE	Visual Computing	CSE, AI, EE, ME	No	NA
2	CS, EE	Socio-Digital Reality	CSE, AI, EE, ME	No	NA
3.	CS	AI	EE, ME, BB, MT, CH, CI	Yes	MTech AI
4.*	CS, EE	AIoT	CSE, AI, EE	Yes	MTech SIoT
5.*	CS, EE	Intelligent Communication and Networking	EE, CS, AI	No	NA

- Details available in the EE department document.

**Specialization 1:** Visual Computing

**Table 1:** List of Specialization Core and Electives as per Senate approved document

List of core courses [8 Credits]		List of Elective courses [12 Credits]	
1	Computer Vision [3-0-0]	1	Computational Imaging [3-0-0]
2	Computer Graphics [3-0-0]	2	3D Shape Analysis [3-0-0]
3	Visual Computing Lab [0-0-4]	3	Introduction to Haptics [3-0-0]
		4	Advance Machine Learning [3-0-0]
		5	Computational Photography [3-0-0]
		6	Video Processing [3-0-0]
		7	Bio-imaging [3-0-0]
		8	Medical Image Analysis [3-0-0]
		9	Image Synthesis [3-0-0]
		10	Animations [3-0-0]
		11	Digital Image Processing [3-0-0]
		12	Visual Perception [3-0-0]
		13	Introduction to AR and VR [3-0-0]
		14	Real-Time Vision Architectures [3-0-0]
		15	Scalable Machine Learning [3-0-0]
		16	Compressive Sensing [3-0-0]
		17	Image and Video Forensics [3-0-0]
		18	Special Topics: Advancements in Computer Vision [3-0-0]
		19	Selected Topics in Computer Vision [3-0-0]
		20	Specialization Project [0-0-6]
		21	Principles of Biological Vision [3-0-0]

**Table 2:** Proposed Semester-wise Structure of **20 Graded Credits** and positioning of core courses for Specialization

Courses		GC	Courses		GC
V Semester			VI Semester		
A student may take specialization course as an overload if eligible		-	SC	Computer Vision	3
		Overload this semester 3 credits			
		Total			
VII Semester			VIII Semester		
SC	Computer Graphics	3	SE	Specialization Electives	9
SC	Visual Computing Lab	2			
SE	Specialization Elective	3			
Overload this semester 4 credits			Overload this semester 3 credits		
Total			8	Total	
				9	

**Specialization 2:** Socio-Digital Reality

**Table 3:** List of Specialization Core and Electives as per Senate approved document

List of core courses [8 Credits]		List of Elective courses [12 Credits]	
1	Introduction to AR and VR [3-0-0]	1	Computer Graphics [3-0-0]
2	Social Networks [3-0-0]	2	Natural Language Understanding [3-0-0]
3	Multimodal Interface [0-0-4]	3	Introduction to Haptics [3-0-0]
		4	Speech Understanding [3-0-0]
		5	Human Computer Interface
		6	Computer Vision [3-0-0]
		7	Image and Video Forensics [3-0-0]
		8	Design Process
		9	Specialization Project [0-0-3]

**Table 4:** Proposed Semester-wise Structure of **20 Graded Credits** and positioning of core courses for Specialization

Courses		GC	Courses		GC
V Semester			VI Semester		
-		SC	Introduction to AR and VR	3	
		Overload this semester 3 credits			
		Total			
VII Semester			VIII Semester		
SC	Social Networks	3	SE	Specialization Electives	9
SC	Multimodal Interface	2			
SE	Specialization Elective	3			
Overload this semester 4 credits			Overload this semester 3 credits		
Total			8	Total	
				9	

**Specialization 3:** Artificial Intelligence

**Table 5:** List of Specialization Core and Electives as per Senate approved document

List of core courses [8 Credits]		List of Elective courses [12 Credits]	
1	AI [3-0-0]	1	Algorithms for big data [3-0-0]
2	Deep Learning [3-0-0] [BB must take elective in place of this course]	2	Computer Vision [3-0-0]
3	ML-Ops [0-0-2]	3	NLU [3-0-0]
4	DL-Ops [0-0-2]	4	machine learning with big data
		5	edge and fog computing
		6	GPU Programming [3-0-0]
		7	Data Visualization [3-0-0]
		8	Introduction to AR and VR [3-0-0]
		9	Dependable AI [3-0-0]
		10	Resource constrained AI [3-0-0]
		11	Social Network Analysis [3-0-0]
		12	Optimization [3-0-0]
		13	Computer Graphics [3-0-0]
		14	Advanced AI [3-0-0]
		15	Advanced ML [3-0-0]
		16	Project [0-0-6]
		17	Autonomous Systems [3-0-0]
		18	ML for Communications [3-0-0]
		19	Planning and Decision Making for Robots [3-0-0]

**Table 6:** Proposed Semester-wise Structure of 20 Graded Credits and positioning of core courses for Specialization

Courses		GC	Courses		GC	
V Semester			VI Semester			
A student may take specialization course as an overload if eligible		SC	DL (BB students can take any course from SE)*	3		
		SC	DL-Ops	1		
		Overload this semester 4 credits				
		Total				4
VII Semester			VIII Semester			
SC	ML-Ops Lab	1	SE	Specialization Electives	9	
SC	AI	3				
SE	Specialization Elective	3				
Overload this semester 3 credits			Overload this semester 3 credits			
Total			Total			
7			9			

**Note:**

\* Since DL is a core for BB students, they can take any other course from SE as part of SC.

## Dual Degree for Specialization on Artificial Intelligence

**Table 7:** Credit requirements for dual degree

	Programme Core Credits	Programme Elective Credits	Open Electives Credits	M.Tech Project	Non-Graded Credits
Semester VI to VII during Specialization	8	3	0	0	0
Semester VIII to X	7	13	3	20	2
<b>Total (As per MTech requirement)</b>	<b>15</b>	<b>16</b>	<b>3</b>	<b>20</b>	<b>2</b>

**Table 8:** List of Dual Degree Programme Core

	List of core courses [18 Credits]
1	Optimization [2-0-0]
2	Artificial Intelligence [3-0-0]
3	Advanced data structure and algorithms [2-0-0]
4	ML-Ops [0-0-2]
5	Deep Learning [3-0-0] <sup>#</sup>
6	DL-Ops [0-0-2]
7	Core bucket: Advanced AI / Autonomous systems [3-0-0]

**Note:** List of Electives will be as per M.Tech. curriculum

\* For all students, ML course is a preparatory course and should be replaced with any of the PEs.

# Since DL is a core for BB students, they can take any other course from PE as part of PC.

**Table 9:** Proposed Semester-wise Structure of **54 Graded and 2 Non-Graded Credits** and positioning of core courses for the specialization leading to dual degree [B.Tech.+M.Tech.]

	Courses	NC	GC		Courses	NC	GC
	VII Semester				VIII Semester		
Up to Semester VII same as Table 6	MC			MC	Advanced AI / Autonomous systems		3
	ME			ME	MTech Program Electives		6
					<b>Overload this semester 4-3 credits</b>		
					Total		<b>9</b>
	IX Semester				X Semester		
MC	Optimization		2	MO	MTech Open Electives		3
MC	Advanced Data Structure and Algorithms		2	MP	Major Project-2 [0-0-15]		15
ME	MTech Program Electives		7				
MP	M.Tech. Project 1 [0-0-5]		5				
NG	System Engineering and Project Management	1		NG	Innovation and IP Management]	1	
	Total	<b>1</b>	<b>16</b>		Total	<b>1</b>	<b>18</b>