

## **52. Integrated M.Tech.in Computer Science and Engineering with specialization in Data Science**

### **52. (a) Mission of the Department**

Mission Stmt - 1	To impart knowledge in cutting edge Computer Science and Engineering technologies in par with industrial standards.
Mission Stmt - 2	To collaborate with renowned academic institutions to uplift innovative research and development in Computer Science and Engineering and its allied fields to serve the needs of society
Mission Stmt - 3	To demonstrate strong communication skills and possess the ability to design computing systems individually as well as part of a multidisciplinary teams.
Mission Stmt - 4	To instill societal, safety, cultural, environmental, and ethical responsibilities in all professional activities
Mission Stmt - 5	To produce successful Data Science graduates with personal and professional responsibilities and commitment to lifelong learning

### **52. (b) Program Educational Objectives (PEO)**

PEO - 1	Graduates will be able to demonstrate their knowledge in technical/managerial roles with right skills and aptitude in software industries and R&D sectors
PEO - 2	Graduates will possess the proficiencies and additional skills in core computer science and engineering discipline in par with industry requirements.
PEO - 3	Graduates will be able to successfully pursue higher education in reputed institutions and also extend their research career.
PEO - 4	Graduates will be self-empowered solution providers and entrepreneurs in Computer Science and Engineering
PEO - 5	Graduates will possess the ability to adapt, contribute and innovate new technologies and systems in the key domains of Data Science

### **52. (c) Mission of the Department to Program Educational Objectives (PEO) Mapping**

	Mission Stmt. - 1	Mission Stmt. - 2	Mission Stmt. - 3	Mission Stmt. - 4	Mission Stmt. - 5
PEO - 1	3				1
PEO - 2			2		
PEO - 3		3	3		
PEO - 4				2	3
PEO - 5		3	3	2	3

### **52. (d) Mapping Program Educational Objectives (PEO) to Program Outcomes (PO)**

	Program Outcomes (PO)											PSO			
	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and Society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
PEO - 1	3		1		2	3	2	3	2	3			3	3	3
PEO - 2		2	2		3		3	2					3	3	3
PEO - 3	3	3	2							2		3	3	3	3
PEO - 4	2	3			3	2			2		2	2	3	3	3
PEO - 5	3				3	3		2		3	3	3	3	3	3

3 – High Correlation, 2 – Medium Correlation, 1 – Low Correlation

PSO – Program Specific Outcomes

PSO - 1	To understand, analyse, design, and develop computing solutions by applying fundamental concepts of computer science and engineering.
PSO - 2	To apply computing principles, skills and practices to develop solutions using logical and reasoning skills for real life problems.
PSO - 3	Ability to understand the requirements, gather a large amount of data, analyze, utilize the tools to extract insights to increase the productivity and efficiency of the business along with better visual representations.

**52. (e) Program Structure: Integrated M.Tech. in Computer Science and Engineering with specialization in Data Science**

Humanities & Social Sciences including Management Courses (H)						Basic Science Courses (B)									
Course Code	Course Title	Hours/ Week				Course Code	Course Title	Hours/ Week							
		L	T	P	C			L	T	P	C				
21LEH101T	Communicative English	2 1 0 3	2	1	0	3	21PYB102J	Semiconductor Physics and Computational Methods	3	1	2	5			
21LEH102T	Chinese					21CYB101J	Chemistry	3	1	2	5				
21LEH103T	French					21MAB101T	Calculus and Linear Algebra	3	1	0	4				
21LEH104T	German					21MAB102T	Advanced Calculus and Complex Analysis	3	1	0	4				
21LEH105T	Japanese					21MAB201T	Transforms and Boundary Value Problems	3	1	0	4				
21LEH106T	Korean					21MAB301T	Probability and Statistics	3	1	0	4				
21LEH107T	Spanish					21MAB302T	Discrete Mathematics	3	1	0	4				
21GNH101J	Philosophy of Engineering	1	0	2	2	21BTB102T	Introduction to Computational Biology	2	0	0	2				
21PDH201T	Social Engineering	2	0	0	2	Total Credits				32					
21GNH401T	Behavioral Psychology	2	1	0	3										
Total Credits															
Engineering Science Courses (S)						Professional Core Courses (C)									
Course Code	Course Title	Hours/ Week				Course Code	Course Title	Hours/ Week							
		L	T	P	C			L	T	P	C				
21EES101T	Electrical and Electronics Engineering	3	1	0	4	21CSC101T	Object Oriented Design and Programming	2	1	0	3				
21MES101L	Basic Civil and Mechanical Workshop	0	0	4	2	21CSC201J	Data Structures and Algorithms	3	0	2	4				
21MES102L	Engineering Graphics and Design	0	0	4	2	21CSC202J	Operating Systems	3	0	2	4				
21CSS101J	Programming for Problem Solving	3	0	2	4	21CSC204J	Design and Analysis of Algorithms	3	0	2	4				
21CSS202T	Fundamentals of Data Science	3	2	0	5	21CSC205P	Database Management Systems	3	1	0	4				
21DCS201P	Design Thinking and Methodology	1	0	4	3	21CSC206T	Artificial Intelligence	2	1	0	3				
21CSS301T	Full Stack Development	1	1	0	2	21CSC206P	Advanced Object Oriented Programming	2	1	0	3				
21GNS502J	Research Methodology	2	1	2	4	21CSC301T	Formal Language and Automata	3	0	0	3				
Total Credits						21CSC302J	Computer Networks	3	0	2	4				
						21CSC303J	Software Engineering and Project Management	2	0	2	3				
						21CSC304J	Compiler Design	2	0	2	3				
						21CSC307P	Machine Learning for Data Analytics	2	1	0	3				
						21CSC502J	Applied Deep Learning	3	0	2	4				
						21CSC501T	Natural Language Processing Techniques	3	1	0	4				
Total Credits						Total Credits									
Project Work, Seminar, Internship In Industry / Higher Technical Institutions (P)						Mandatory Courses (M)									
Course Code	Course Title	Hours/ Week				Code	Course Title	Hours/ Week							
		L	T	P	C			L	T	P	C				
21GNP301L	Community Connect	0	0	2	1	21PDM101L	Professional Skills and Practices	0	0	2	0				
21CSP302L	Project	0	0	6	3	21PDM102L	General Aptitude	0	0	2	0				
21CSP303T	MOOC	3	0	0		21PDM201L	Verbal Reasoning	0	0	2	0				
21CSP401L	Major Project	0	0	30		21PDM202L	Critical and Creative Thinking Skills	0	0	2	0				
21CSP402L	Major Project	0	0	20	15	21PDM301L	Analytical and Logical Thinking Skills	0	0	2	0				
21CSP403L	Internship#	0	0	10		21PDM302L	Employability Skills and Practices	0	0	2	0				
21CSP501L	Specialization Project	0	0	40		21CYM101T	Environmental Science	1	0	0	0				
21CSP502L	Specialization Project	0	0	30	20	21LEM101T	Constitution of India	1	0	0	0				
21CSP503L	Domain Internship	0	0	10		21LEM102T	Universal Human Values – Introduction	1	0	0	0				
Total Credits						21LEM201T	Professional Ethics	1	0	0	0				
						21LEM202T	Universal Human Values– Understanding Harmony and Ethical Human Conduct	2	1	0	3				
						21LEM301T	Indian Art Form	1	0	0	0				
						21LEM302T	Indian Traditional Knowledge	1	0	0	0				
						21GNM101L	Physical and Mental Health using Yoga								
						21GNM102L	NSS								
						21GNM103L	NCC	0	0	2	0				
						21GNM104L	NSO	Total Credits							
Open Elective Courses (Any 4 Courses)						5. Professional Elective Courses (E) (Any 13 Courses)									
Course Code	Course Title	Hours/ Week				Course Code	Course Title	Hours/ Week							
		L	T	P	C			L	T	P	C				
21CSO351T	Web Programming	2	1	0	3	21CSE227T	Big Data Tools and Techniques	3	0	0	3				
21CSO352T	Python Programming	2	1	0	3	21CSE224T	Computer Architecture	3	0	0	3				
21CSO353T	Mobile Application Development	2	1	0	3	21CSE253T	Internet of Things	2	1	0	3				
21CSO354T	Data Analytics	2	1	0	3	21CSE251T	Digital Image Processing	2	1	0	3				
Total Credits						21CSE321T	Data Warehousing and Data Mining	2	1	0	3				
						21CSE322T	Multivariate Techniques for Data Analytics	2	1	0	3				
						21CSE323T	Marketing Analytics	2	1	0	3				
						21CSE359T	Information Storage Management	2	1	0	3				
						21CSE325T	Applied Social Network Analysis	2	1	0	3				
						21CSE326T	Artificial Neural Networks	2	1	0	3				
						21CSE373T	Streaming Analytics	2	1	0	3				
						21CSE425T	Advanced Machine Learning	2	1	0	3				
						21CSE327T	Cloud Computing for Data Analytics	2	1	0	3				
						21CSE422T	Convolutional Neural Networks	2	1	0	3				
						21CSE426T	Financial Machine Learning	2	1	0	3				
						21CSE427T	Augmented and Virtual Reality	2	1	0	3				
						21CSE428T	Healthcare Analytics	2	1	0	3				
						Total Learning Credits									

**51. (f) Programme Articulation: Integrated M.Tech. in Computer Science and Engineering with specialization in Data Science**

Course Code	Course Name	Program Outcome (PO)										PSO				
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3
21CSS101J	Programming for Problem Solving	2	3	-	-	-	-	-	-	-	-	-	2	-	3	-
21CSS303T	Data Science	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
21CSS201T	Computer Organization and Architecture	3	2	-	-	-	-	-	-	-	-	-	-	1	2	1
21CSC201J	Data Structures and Algorithms	2	3	3	1	-	-	-	-	-	-	-	-	1	1	2
21CSC101T	Object Oriented Design and Programming	-	2	2	-	2	-	-	-	-	-	-	3	-	2	2
21CSC204J	Design and Analysis of Algorithms	2	1	2	1	-	-	-	-	-	3	-	3	3	1	-
21CSC202J	Operating Systems	3	3	3	2	-	-	-	-	-	-	-	3	2	-	-
21CSC303J	Software Engineering and Project Management	-	3	2	-	-	-	-	-	2	-	2	-	3	-	-
21CSC203P	Advanced Programming Practice	3	2	2	1	2	-	-	-	1	-	-	-	2	-	-
21CSC301T	Formal Language and Automata	2	2	2	-	-	-	-	-	-	-	-	-	3	-	-
21CSC302J	Computer Networks	3	-	-	2	3	-	-	-	-	-	-	-	1	-	-
21CSC205P	Database Management Systems	3	2	2	-	-	-	-	-	-	-	-	-	2	1	-
21CSC206T	Artificial Intelligence	1	2	3	-	-	-	-	-	-	-	-	-	1	2	-
21CSC310J	Malware Analysis							2		3		3		3		
21CSC308T	Security Risk Management Principles	3				3						3		3		
21CSC504J	Android Malware Analysis							2		3				3		
21CSC308T	Security Risk Management Principles	3											2		3	
21CSE281T	Cryptography and Network Security	2	2													3
21CSE282T	Information Security			2					2							3
21CSE283T	Cyber Law					2		2								3
21CSE229J	Check Point System Administration			2		2										3
21CSE381T	Forensics And Incident Response			2					2							3
21CSE382T	Security Management			2		2										3
21CSE383T	Security Governance, Risk and compliance	2	2		2											3
21CSE384J	Security Audit and Risk Assessment		2	2					2							3
21CSE385J	Advanced Malware Analysis	2	2		2											3
21CSE386J	Penetration Testing and Vulnerability Assessment	2	2		2	1										3
21CSE387J	Hacker Techniques, Tools, and Incident Handling		2			2										3
21CSE399J	Comprehensive Linux For All	3		2	2	3										
21CSE485T	Database Security		2			2			2		2					3
21CSE486T	Operation System Security	2		3		3										3
21CSE487T	Cyberwarfare			2					2							3
21CSE488T	Hacker Mind: Profiling the IT Criminal			2		2					3					3
21CSE489T	Mobile and Wireless Security	2		3		3										3
21CSE490J	Windows and Linux Internals			2					2							3
21CSE491T	Cyber Crime and Digital Forensics	2		3		3										3
21CSE492T	Cyber Crimes and Cyber Security	2	2						2		3		3			3
21CSE531T	Cyber Security Operations	2						2		3		3				3
21CSE532T	Network Management and Protocols	3				3						3				3
21CSE533T	Firewalls and Access Controls								2		3					3
21CSE534T	Network Programming and Management	3											2			3
21CSE535T	Network Intrusions and Computer Forensics	2	2													3
21CSE536T	Mobile Forensics			2						2						3
21CSE537T	Digital Forensics							2		2						3
21CSE538T	Security Scripting and Analysis			2						2						3
21CSE539T	Principles of Secure Coding Principles			2		2										3
21CSE540T	Android Security and Design Internals	2	2		2											3
21CSP302L	Project	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
21CSP303T	MOOC	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
21CSP401L	Major Project	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
21CSP402L	Internship	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
21CSP501L	Specialization Project	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
21CSP502L	Semester Internship-II	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Program Average	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

**51. (g) Implementation Plan: Integrated M.Tech. in Computer Science and Engineering with specialization in Data Science**

Semester - I						Semester - II								
Code	Course Title	Hours/ Week			C	Code	Course Title	Hours/ Week			C			
		L	T	P				L	T	P				
21LEH101T	Communicative English	2	1	0	3	21LEH102T	Chinese							
21MAB101T	Calculus and Linear Algebra	3	1	0	4	21LEH103T	French							
21PYB102J	Semiconductor Physics and Computational Methods	3	1	2	5	21LEH104T	German							
21MES102L	Engineering Graphics and Design	0	0	4	2	21LEH105T	Japanese							
21EES101T	Electrical and Electronics Engineering	3	1	0	4	21LEH106T	Korean							
21CSS101J	Programming for Problem Solving	3	0	2	4	21LEH107T	Spanish							
21CYM101T	Environmental Science*	1	0	0	0	21GNH101J	Philosophy of Engineering	1	0	2	2			
21PDM101L	Professional Skills and Practices	0	0	2	0	21MAB102T	Advanced Calculus and Complex Analysis	3	1	0	4			
21LEM101T	Constitution of India	1	0	0	0	21CYB101J	Chemistry	3	1	2	5			
		Total Credits			22	21BTB102T	Introduction to Computational Biology	2	0	0	2			
						21CSC101T	Object Oriented Design and Programming	2	1	0	3			
						21MES101L	Basic Civil and Mechanical Workshop	0	0	4	2			
						21PDM102L	General Aptitude*	0	0	2	0			
						21GNM101L	Physical and Mental Health using Yoga							
						21GNM102L	NSS							
						21GNM103L	NCC							
						21GNM104L	NSO							
		Total Credits			21									
Semester - III						Semester - IV								
Code	Course Title	Hours/ Week			C	Code	Course Title	Hours/ Week			C			
		L	T	P				L	T	P				
21MAB201T	Transforms and Boundary Value Problems	3	1	0	4	21MAB301T	Probability and Statistics	3	1	0	4			
21CSS202T	Fundamentals of Data Science	3	2	0	5	21CSC204J	Design and Analysis of Algorithms	3	0	2	4			
21CSC201J	Data Structures and Algorithms	3	0	2	4	21CSC205P	Database Management Systems	3	1	0	4			
21CSC202J	Operating Systems	3	0	2	4	21CSC206T	Artificial Intelligence	2	1	0	3			
21CSC206P	Advanced Object Oriented Programming	2	1	0	3	E	Professional Elective – I				3			
21DCS201P	Design Thinking and Methodology	1	0	4	3	21PDH201T	Social Engineering	2	0	0	2			
21LEM201T	Professional Ethics	1	0	0	0	21PDM202L	Critical and Creative Thinking Skills	0	0	2	0			
21PDM201L	Verbal Reasoning	0	0	2	0	21LEM202T	Universal Human Values– Understanding Harmony and Ethical Human Conduct	2	1	0	3			
		Total Credits			23									
Semester - V						Semester - VI								
Code	Course Title	Hours/ Week			C	Code	Course Title	Hours/ Week			C			
		L	T	P				L	T	P				
21MAB302T	Discrete Mathematics	3	1	0	4	21CSS301T	Full Stack Development	1	1	0	2			
21CSC301T	Formal Language and Automata	3	0	0	3	21CSC303J	Software Engineering and Project Management	2	0	2	3			
21CSC302J	Computer Networks	3	0	2	4	21CSC304J	Compiler Design	2	0	2	3			
21CSC307P	Machine Learning for Data Analytics	2	1	0	3	E	Professional Elective – III				3			
E	Professional Elective – II				3	E	Professional Elective – IV				3			
O	Open Elective – I				3	O	Open Elective – II				3			
21GNP301L	Community Connect	0	0	2	1	21CSP302L	Project	0	0	6	3			
21PDM301L	Analytical and Logical Thinking Skills	0	0	2	0	21CSP303T	MOOC	3	0	0	3			
21LEM301T	Indian Art Form	1	0	0	0	21PDM302L	Employability Skills and Practices	0	0	2	0			
		Total Credits			21	21LEM302T	Indian Traditional Knowledge	1	0	0	0			
Semester - VII						Semester - VIII								
Code	Course Title	Hours/ Week			C	Code	Course Title	Hours/ Week			C			
		L	T	P				L	T	P				
21GNH401T	Behavioral Psychology	2	1	0	3	21CSC502J	Applied Deep Learning	3	1	0	4			
E	Professional Elective – V				3	21CSC501T	Natural Language Processing Techniques	3	0	2	4			
E	Professional Elective – VI				3	21GNS502J	Research Methodology	2	1	2	4			
E	Professional Elective – VII				3	21CSP401L	Major Project	0	0	30				
E	Professional Elective – VIII				3	21CSP402L	Major Project	0	0	20	15			
O	Open Elective – III				3	21CSP403L	Internship#	0	0	10				
		Total Credits			18									
Semester - IX						Semester - X								
Code	Course Title	Hours/ Week			C	Code	Course Title	Hours/ Week			C			
		L	T	P				L	T	P				
E	Professional Elective – IX				3	21CSP501L	Specialization Project	0	0	40				
E	Professional Elective – X				3	21CSP502L	Specialization Project	0	0	30	20			
E	Professional Elective – XI				3	21CSP503L	Domain Internship#	0	0	10				
E	Professional Elective – XII				3									
E	Professional Elective – XIII				3									
O	Open Elective-IV				3									
		Total Credits			18									
#Students have to register either 21CSP401L or 21CSP402L and 21CSP403L both in eighth semester and either 21CSP501L or 21CSP502L and 21CSP503L in tenth semester														