



G. S. Mandal's

**Maharashtra Institute of Technology**  
**Chhatrapati Sambhajinagar**

**An Autonomous Institute Affiliated to**  
**Dr. Babasaheb Ambedkar Marathwada University,**  
**Chhatrapati Sambhajinagar, Maharashtra (India)**

**M. Tech Syllabus**  
**(Computer Science & Technology)**

**(NEP 2020 Based Curriculum)**  
**WEF AY 2025-26**

\*\*\*\*\*

**Master Copy**

#### Abbreviations used in this document

AEC	Ability Enhancement Course
ESE	End-Semester Examination
Hrs	Hours
ISE	In-Semester Examination
L	Lecture (Theory)
MIT	Maharashtra Institute of Technology
MCS	M. Tech in Computer Science & Technology
MOC	Open Elective course for M.Tech
MOOC	Massive Open Online Course
NEP	National Education Policy 2020
NPTEL	National Programme on Technology Enhanced Learning
OEC	Open Elective Course
OJT	On-Job Training
P	Practical
PCC	Program Core Course
PEC	Program Elective Course
RM	Research Methodology
RP/DI	Research Project/Dissertation
S1	Semester -I
S2	Semester -II
S3	Semester -III
S4	Semester -IV
SEM	Seminar
SWAYAM	Study Webs of Active-learning for Young Aspiring Minds
T	Tutorial
TA	Teacher Assessment
VSEC	Vocational and Skill Enhancement Course
WEF	With Effect From
Wk	Week

**Master Copy**

**First Year M.Tech (Computer Science & Technology) Syllabus Structure**  
**WEF 2025-26 (NEP 2020 Based Curriculum)**

**Semester-I**

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits	ISE -I	ISE -II	TA	ESE/ Oral Exam	Total
1	PCC	MCS501	Advanced Algorithms	3	1	-	4	4	15	15	20	50	100
2	PCC	MCS502	Advanced Operating System	3	1	-	4	4	15	15	20	50	100
3	PCC	MCS503	Natural Language Processing	3	-	-	3	3	15	15	20	50	100
4	PEC	MCS511	Advanced Image Processing	3	-	-	3	3	15	15	20	50	100
		MCS512	High Performance Computing										
		MCS513	Object Oriented Analysis and Design										
5	RM	MTR521	Research Methodology	3	1	-	4	4	15	15	20	50	100
6	AEC	MCS531	Seminar and Technical Communication	-	-	2	2	1	-	-	25	25	50
7	PCC	MCS541	Advance Operating System Laboratory	-	-	2	2	1	-	-	25	-	25
8	PCC	MCS542	Natural Language Processing Laboratory	-	-	2	2	1	-	-	25	-	25
<b>S1</b>				<b>15</b>	<b>3</b>	<b>6</b>	<b>24</b>	<b>21</b>	<b>75</b>	<b>75</b>	<b>175</b>	<b>275</b>	<b>600</b>

**Master Copy**

**Semester-II**

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits	ISE -I	ISE -II	TA	ESE/ Oral Exam	Total
1	PCC	MCS551	Cyber Security	3	1	-	4	4	15	15	20	50	100
2	PCC	MCS552	Advanced Data Science	3	1	-	4	4	15	15	20	50	100
3	PCC	MCS553	Performance Analysis Method	3	-	-	3	3	15	15	20	50	100
4	PEC	MCS561	Block Chain Technology	3	-	-	3	3	15	15	20	50	100
		MCS562	Multimedia Forensics										
		MCS563	Remote Sensing & GIS										
5	OEC	MOC571 to MOC580	Open Elective Course#	3	-	-	3	3	15	15	20	50	100
6	VSEC	MCS581	Mini Project	-	-	4	4	2	-	-	25	25	50
7	PCC	MCS591	Cyber Security Laboratory	-	-	2	2	1	-	-	25	-	25
8	PCC	MCS592	Advanced Data Science Laboratory	-	-	2	2	1	-	-	25	-	25
<b>S2</b>				<b>15</b>	<b>2</b>	<b>8</b>	<b>25</b>	<b>21</b>	<b>75</b>	<b>75</b>	<b>175</b>	<b>275</b>	<b>600</b>
**	OJT	MCS611	Internship **	To be done In the Summer break (Min 8 Weeks) after 2 <sup>nd</sup> Sem for 08 Credits and to be evaluated in the III <sup>rd</sup> Semester.									

*SVA*  
**Dr. Smita L. Kasar**  
 Chairperson- Board of Studies  
 (Computer Science and Engineering)

*Geny*  
**Dr. Ajj D. Sayyad**  
 Member Secretary- Academic Council  
 MIT, Chhatrapati Sambhajinagar

*Nmy*  
**Dr. Nilesh G. Patil**  
 Chairperson- Academic Council  
 MIT, Chhatrapati Sambhajinagar

### Second Year M. Tech (Computer Science & Technology) Syllabus Structure

WEF 2025-26 (NEP 2020 Based Curriculum)

#### Semester-III

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits	ISE -I	ISE -II	TA	ESE/ Oral Exam	Total
1	PCC	MCS601	Program Specific Course ###	03	-	-	03	3	--	--	--	100	100*
2	OJT	MCS611	Internship **	-	-	\$	01	8	--	--	100	--	100
3	RP/DI	MCS649	Dissertation- I	-	-	20	20	10	--	--	200	100	300
<b>S3</b>				<b>03</b>	<b>-</b>	<b>20</b>	<b>24</b>	<b>21</b>	<b>--</b>	<b>--</b>	<b>300</b>	<b>200</b>	<b>500</b>

#### Semester-IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits	ISE -I	ISE -II	TA	ESE/ Oral Exam	Total
1	RP/DI	MCS699	Dissertation- II	-	-	42	42	21	--	--	300	200	500
<b>S4</b>				<b>-</b>	<b>-</b>	<b>42</b>	<b>42</b>	<b>21</b>	<b>--</b>	<b>--</b>	<b>300</b>	<b>200</b>	<b>500</b>

\$ - The contact hours per week is mentioned for actual contact with the Mentor.

\*\* The duration of the Internship/OJT/Field Project is minimum 8 weeks during summer break after II semester. The work carried is to be evaluated in III semester.

**Open Elective Course: (To be opted through MOOC Platform) ##**


Sr. No.	Course Code	Course Title
01	MOC 571	Intellectual Property & Patenting
02	MOC 572	Cyber Security and Laws
03	MOC 573	Ethics, Law and Society in Artificial Intelligence
04	MOC 574	Indian Constitution
05	MOC 575	Indian Knowledge System
06	MOC 576	Nano-Technology
07	MOC 577	Operations Research
08	MOC 578	Engineering Optimization Techniques
09	MOC 579	Value Engineering
10	MOC 580	Innovative Teaching Pedagogy

Master Copy


Course Code	Course Title
MCS601	BOS recommended program specific course at PG level (Physical or through Online Mode /MOOC###)

###These MOOC Courses as per the availability on the SWAYAM, NPTEL, Coursera, etc. to be completed by the student and certificate of completion to be submitted. Such course should be of minimum 3 credits of 8/12 weeks duration and at PG Level. The marks obtained on the certificate normalized to 100 marks will be considered for grading.

**Students may opt for Exit after successful completion of First Year provided s/he earns 4 additional credits through Internship/OJT/Field Project during the summer break at the end of 2<sup>nd</sup> Semester. S/he will be awarded a 1-Year PG Diploma in Computer Science & Technology. Details are available in the academic rules and regulations.**

  
**Dr. Smita L. Kasar**  
Chairperson- Board of Studies  
(Computer Science and Engineering)

  
**Dr. Ajij D. Sayyad**  
Member Secretary- Academic Council  
MIT, Chhatrapati Sambhajnagar

  
**Dr. Nilesh G. Patil**  
Chairperson- Academic Council  
MIT, Chhatrapati Sambhajnagar

**M. Tech (Computer Science & Technology)**

**Semester-I**

**Detail Course Curriculum**

**(NEP 2020 Based Curriculum)**

**WEF AY 2025-26**

\*\*\*\*\*

**Master Copy**

Faculty of Science & Technology

Syllabus of M.Tech. ( Computer Science & Technology ) Semester – I

<p>Course Code: MCS501</p> <p>Course: Advanced Algorithm</p> <p><b>Teaching Scheme:</b></p> <p>Theory: 3 Hrs /week</p> <p>Tutorial : 1 Hr /week</p>	<p>Credits: 3-1-0</p> <p>In Semester Examination-I: 15 Marks</p> <p>In Semester Examination-II: 15 Marks</p> <p>Teacher Assessment: 20 Marks</p> <p>End Semester Examination: 50 Marks</p> <p>End Semester Examination (Duration): 2 Hrs</p>
<b>Prerequisite</b>	Data Structure design and algorithm analysis.
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To develop the necessary skills from both a theoretical perspective as well as applying their knowledge on various problem sets.</li> <li>To develop the skills to design, implement and analyze algorithm to solve various problems.</li> <li>To analyze the time and space complexity of advanced algorithms and understand asymptotic behavior.</li> </ul>
<b>Course Outcomes</b>	<p><b>CO1:</b> Understand and analyze the design and efficiency of algorithms using asymptotic notations and recurrence relations, and apply strategies like divide and conquer, greedy method, and dynamic programming to solve classical problems.</p> <p><b>CO2:</b> Implement and compare different sorting techniques such as merge sort, quick sort, radix sort, and evaluate their performance using comparison trees and time complexity.</p> <p><b>CO3:</b> Apply algorithmic strategies to solve network flow problems using Ford-Fulkerson and design efficient randomized algorithms for specific computational tasks.</p> <p><b>CO4:</b> Demonstrate understanding of advanced algorithmic concepts including number theory algorithms, string matching techniques, and classify problems based on computational complexity, including NP-complete problems</p>
<b>Unit-I</b>	<p><b>Role of Algorithms in Computing:</b></p> <p>Introduction, Analysis Design, of algorithm, Asymptotic notations, Different methods for solving recurrences. Divide and Conquer: The maximum- sub array problem, The master method for solving recurrences; Greedy Algorithm: An activity selection problem; Dynamic programming: Rod Cutting.</p> <p style="text-align: right;"><b>(9 Hrs.)</b></p>

*Handwritten signature*

<b>Unit-II</b>	<p><b>Sorting Methods:</b></p> <p>Merge sort, Quick sort, comparison sort, comparison tree, Radix sort, Analysis of different sorting methods.</p> <p style="text-align: right;"><b>(8 Hrs.)</b></p>
<b>Unit-III</b>	<p><b>Network-flow algorithm and Randomized algorithm:</b></p> <p>Ford-Fulkerson method, maximum flow, minimum cost flow, Randomized algorithm.</p> <p style="text-align: right;"><b>(8 Hrs.)</b></p>
<b>Unit-IV</b>	<p><b>Number theory algorithms:</b></p> <p>Polynomial multiplication, Euclid's GCD algorithm, an asymptotically fast algorithm for polynomial GCD, DFT and FFT.</p> <p style="text-align: right;"><b>(9 Hrs.)</b></p>
<b>Unit-V</b>	<p><b>String and Pattern Matching Algorithms:</b></p> <p>The naïve string-matching algorithm, Rabin Karp algorithm, String matching with finite automata, Knuth-Morris-Pratt algorithm, Boyer-Moore algorithm.</p> <p style="text-align: right;"><b>(9 Hrs.)</b></p>
<b>Unit-VI</b>	<p><b>NP Completeness:</b></p> <p>P and NP classes, Cooks theorem, NP Complete problems: 3 SAT, Clique, Vertex Cover problem, Hamiltonian Cycle, Feedback Edge set problem, Graph color problem.</p> <p style="text-align: right;"><b>(9 Hrs.)</b></p>

Textbooks and Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Introduction to Algorithms	Thoms H. Cormen, Charle , Ronald L.	MIT Press	3 rd Edition,
	2.	The Design and Analysis of Computer Algorithms.	Aho, Hopcrpft, Ulman	Wesley.Pearson.	



Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

Following are the list of tutorial for Advance Algorithm:

- 1) Derive and compare time complexities using asymptotic notation ( $O$ ,  $\Omega$ ,  $\Theta$ ) for given algorithms.
- 2) Analyze three given recurrences using **Master Theorem** and **Akra-Bazzi Method**.
- 3) Design and implement a **Greedy Algorithm** (e.g., Activity Selection or Huffman Coding).
- 4) Perform memory optimization using **Rod Cutting** and **Matrix Chain Multiplication** using DP.
- 5) **Compare Merge Sort, Quick Sort, and Heap Sort.**
- 6) Compare deterministic vs randomized performance statistically (using variance and mean execution times)
- 7) Discuss **Ford-Fulkerson** and **Edmonds-Karp** algorithms.
- 8) Infer **Euclid's GCD, Extended Euclidean, and Polynomial Multiplication** using FF
- 9) Illustrate **KMP, Rabin-Karp, and Boyer-Moore** algorithms.
- 10) Prepare a technical report on **P, NP, NP-Hard, NP-Complete** problems.

**CO-PO mapping:**

Cos	PO1	PO2	PO3
CO1	2	3	1
CO2		1	
CO3	2		2
CO4	1	2	1

**CO-PSO mapping:**

COs	PSO1	PSO2	PSO3
CO1	1	2	1
CO2		1	
CO3	1		2
CO4		1	1

  
 Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**This page is left blank intentionally**

Faculty of Science & Technology

Syllabus of M.Tech. (COMPUTER SCIENCE & TECHNOLOGY) Semester – I

Course Code: MCS502 Course: Advanced Operating System <b>Teaching Scheme:</b> Theory: 03Hrs /Week Tutorial: : 01 Hr /Week	Credits: 3-1-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 hrs
<b>Prerequisite</b>	Knowledge of Operating Systems, System Programming, Unix / Linux is must.
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To get a comprehensive knowledge of the architecture of distributed system.</li> <li>To understand the deadlock and shared memory issues and their solution in distributed environments.</li> <li>To know the security issues and protection mechanisms for distributed environments.</li> </ul>
<b>Course Outcome:</b>	<p><b>CO1:</b> Understand the architectures of distributed systems and analyze foundational concepts such as logical clocks, global states, and mutual exclusion algorithms.</p> <p><b>CO2:</b> Identify and evaluate strategies for distributed deadlock detection and resolution, and apply agreement protocols and resource management techniques in distributed environments.</p> <p><b>CO3:</b> Analyze distributed shared memory systems, load distribution strategies, and design efficient algorithms for task migration and distributed scheduling.</p> <p><b>CO4:</b> Demonstrate knowledge of multiprocessor and database operating systems, including concurrency control mechanisms, fault tolerance strategies, and recovery techniques in distributed databases.</p>
<b>Unit-I</b>	<p><b>Architectures of Distributed System:</b></p> <p>System Architecture types – Issues in distributed operating systems – communication networks- primitives. Theoretical Foundations – inherent limitations of a distributed system – lamp ports logical clocks – vector clocks – global state- cuts of a distributed computation – termination detection. Distributed Mutual Exclusion – Introduction – the classification of mutual exclusion and associated algorithms – a comparative performance analysis.</p>
	<b>(9 Hrs)</b>

<b>Unit-II</b>	<p><b>Distributed Deadlock Direction:</b></p> <p>Introduction: Deadlock handling strategies in distributed systems – issues in deadlock detection and resolution - control organization for distributed deadlock detection centralized and distributed deadlock detection algorithms – hierarchical deadlock detection algorithms. Agreement protocols introduction the system model, solution to the Byzantine agreement problem, application of agreement algorithms. Distributed resource management – introduction- architecture – mechanisms for building distributed file systems – design issues log structured file systems.</p> <p style="text-align: right;"><b>(8Hrs)</b></p>
<b>Unit-III</b>	<p><b>Distributed shared memory:</b></p> <p><b>Architecture</b> – algorithms for implementing DSM- memory coherence and protocols – design issues. Distributed Scheduling – introduction – issues in load distributing – components of a load distributing algorithm-stability-load distributing algorithm-performance comparison-selecting a suitable load sharing algorithm-requirements for load distributing-task migration and associated issues.</p> <p style="text-align: right;"><b>(8 Hrs.)</b></p>
<b>Unit-IV</b>	<p><b>Multiprocessor Operating Systems:</b></p> <p>Basic multiprocessor system architectures – inter connection networks for multiprocessor systems –caching-hypercube architecture. Multiprocessor Operating System- Structure of multiprocessor operating system, operating system design issues –threads-process synchronization and scheduling.</p> <p style="text-align: right;"><b>(9 Hrs)</b></p>
<b>Unit-V</b>	<p><b>Database Operating System:</b></p> <p>Introduction requirements of database operating system Concurrency control : theoretical aspects – introduction, database systems – a concurrency control model of database systems, the problem of concurrency control – serializability theory – distributed database systems, consequence control algorithms – introduction, basic synchronization primitives, lock based algorithms- timestamp based algorithms.</p> <p style="text-align: right;"><b>(9 Hrs.)</b></p>

<b>Unit-VI</b>	<p><b>Failure Recovery and Fault Tolerance:</b></p> <p>Failure Recovery and Fault tolerance :Introduction-basic concepts – classification of failures – backward and forward error recovery, backward error recovery- recovery in concurrent systems consistent set of check points – synchronous and asynchronous check pointing and recovery check pointing for distributed database systems – recovery in replicated distributed databases.</p>
<b>(9 Hrs)</b>	

	Sr. No.	Title	Author	Publication	Edition
<b>Textbooks and Reference Books</b>	1.	Advanced Concepts in operating systems	Mukesh Singhal, Niranjan G. Shivaratri,	Tata McGraw Hill	2001
	2.	Modern operating system	Andres S. Tannenbaum	P H I	2003
	3.	Distributed operating system- Concepts and design	Pradeep K. Sinha	P H I	2003
	4.	Distributed operating system	Andres S. Tannenbaum	Person Education	2003

**Following are the list of tutorial for Advance Operating System:**

- 1) Study & Prepare comparative chart showing communication primitives (message passing, RPC, RMI).
- 2) Discuss **Lamport's Logical Clock** and **Vector Clock** algorithms for event ordering in distributed processes.
- 3) Explain distributed computation and determine **consistent global states** using the **Chandy-Lamport algorithm**.
- 4) Compare at least two algorithms (e.g., **Ricart-Agrawala**, **Token Ring**). Measure message complexity and delay.
- 5) Illustrate a **centralized, hierarchical, and fully distributed** deadlock detection algorithm using resource allocation graphs.
- 6) Design a simulation to demonstrate **page-based DSM** with simple memory consistency protocols
- 7) Infer a **load sharing algorithm** (sender-initiated, receiver-initiated, or symmetric).
- 8) Discuss **Checkpoint and Rollback Recovery** (synchronous/asynchronous). Simulate process failure and system recovery.
- 9) What are memory coherence mechanisms and DSM design challenges?
- 10) Study agreement problem and fault-tolerant decision-making in unreliable systems



**CO-PO mapping:**

Cos	PO1	PO2	PO3
CO1			1
CO2	1	2	
CO3			2
CO4	1	2	1

**CO-PSO mapping:**

COs	PSO1	PSO2	PSO3
CO1	1	1	1
CO2		2	
CO3	1		
CO4		1	1

  
Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)

**Master Copy**

**This page is left blank intentionally**

Faculty of Science & Technology

Syllabus of M.Tech.( COMPUTER SCIENCE & TECHNOLOGY) Semester – I

<p>Course Code: MCS503</p> <p>Course: Natural Language Processing</p> <p><b>Teaching Scheme:</b></p> <p>Theory: 3 hrs /week</p>	<p>Credits: 3-0-0</p> <p>In Semester Examination-I: 15 Marks</p> <p>In Semester Examination-II: 15 Marks</p> <p>Teacher Assessment: 20 Marks</p> <p>End Semester Examination: 50 Marks</p> <p>End Semester Examination (Duration): 2 hrs</p>
<b>Prerequisite</b>	Basic understanding of probability theory, Theory of Computer Science, Systems Software
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>Understand the core concepts of Natural language processing and levels of language analysis.</li> <li>Learning state of art NLP research areas such as parsing algorithms, ambiguity resolution and machine translation.</li> <li>To apply machine learning approaches to NLP tasks like text classification, sentiment analysis, named entity recognition, and topic modeling</li> </ul>
<b>Course Outcomes:</b>	<p><b>CO1:</b> Understand the foundational concepts of natural language understanding, including levels of language analysis, system organization, and language representations.</p> <p><b>CO2:</b> Analyze English syntax using grammars and parsing techniques, and apply tools like top-down and bottom-up parsers, finite state models, and Stanford Parser for syntactic analysis.</p> <p><b>CO3:</b> Apply feature-based grammars, probabilistic models, and statistical parsing methods including POS tagging and probabilistic context-free grammars for efficient language understanding.</p> <p><b>CO4:</b> Explore practical applications of NLP such as machine translation, information extract'on, sentiment analysis, and semantic interpretation using resources like WordNet and ontologies.</p>
<b>Unit-I</b>	<p><b>Introduction To Natural Language Understanding:</b></p> <p>The Study of Language Applications of Natural Language. Understanding Evaluating Language Understanding Systems the Different Levels of Language Analysis, Representations and Understanding. The Organization of Natural Language Understanding Systems.</p> <p style="text-align: right;">(6 Hrs)</p>

<b>Unit-II</b>	<p><b>Linguistic Background: Grammars And Parsing:</b></p> <p>An Outline of English Syntax Words- The Elements of Simple Noun Phrases Verb Phrases and Simple Sentences Noun Phrases Revisited Adjective Phrases Adverbial Phrases, Grammars and Sentence Structure What Makes a Good Grammar a Top-Down Parser A Bottom-Up Chart Parser Top-Down Chart Parsing Finite State Models and Morphological Processing Grammars and Logic Programming Parsing tools such as Stanford Parser.</p> <p style="text-align: right;"><b>(8Hrs)</b></p>
<b>Unit-III</b>	<p><b>Features And Augmented Grammars:</b></p> <p>Feature Systems and Augmented Grammars Some Basic Feature Systems for English Morphological Analysis and the Lexicon A Simple Grammar Using Features Parsing with Features, Augmented Transition Networks Definite Clause Grammars Generalized Feature Systems and Unification Grammars.</p> <p style="text-align: right;"><b>(7 Hrs)</b></p>
<b>Unit-IV</b>	<p><b>Toward Efficient Parsing:</b></p> <p>Human Preferences in Parsing Encoding Uncertainty: Shift-Reduce Parsers Statistical Methods-Basic Probability Theory Estimating Probabilities Part-of-Speech Tagging Obtaining Lexical Probabilities Probabilistic Context-Free Grammars Best-First Parsing A Simple Context-Dependent Best-First Parser.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>
<b>Unit-V</b>	<p><b>Applications And Recent Trends In NLP:</b></p> <p>Information Extraction, Question answering, Machine Translation, MT evaluation tools such as Bleu, Savitribai Phule Pune University B.E. (Information Technology) Syllabus 2012 Course 33 (word error rate) WER etc. Automatic text summarization, Sentiment Speech Recognition, Semantic web search, Automatic text Clustering.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>
<b>Unit-VI</b>	<p><b>Semantic Interpretation And Ambiguity Resolution:</b></p> <p>Semantics and Logical Form Word Senses and Ambiguity the Basic Logical Form, Language Encoding Ambiguity in Logical Form Verbs and States in Logical Form Case Relations. Representation of meaning – model theoretic representation, description logic, Lexical Resources such as WordNet, Semantic web Ontologies.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>

	Sr. No.	Title	Author	Publication	Edition
Textbooks and Reference Books	1.	Foundations of Statistical Natural Language Processing	Raj Kamal, Christopher D. Manning,	The MIT Press, Cambridge	-
	2.	“Natural Language Understanding”,	James Allen,	ISBN: 978-81-317-0895- 8	2 <sup>nd</sup>
	3.	, “Speech and Language Processing”,	D. Jurafsky, J. H. Martin	Pearson Education, 2002	2 <sup>nd</sup>

**CO-PO mapping:**

Cos	PO1	PO2	PO3
CO1		2	
CO2	1		1
CO3	2	1	
CO4			1

**CC-PSO mapping:**

COs	PSO1	PSO2	PSO3
CO1	1		
CO2			1
CO3		1	
CO4	2		1

  
Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)

**This page is left blank intentionally**

Faculty of Science & Technology

Syllabus of M.Tech.( COMPUTER SCIENCE & TECHNOLOGY) Semester –I

<p>Course Code: MCS511</p> <p>Course: Program Elective 1A</p> <p><b>Advanced Image Processing</b></p> <p>Teaching Scheme:</p> <p>Theory: 03Hrs /Week</p>	<p>Credits: 3-0-0</p> <p>In Semester Examination-I: 15 Marks</p> <p>In Semester Exam-II: 15 Marks</p> <p>Teacher Assessment: 20 Marks</p> <p>End Semester Examination: 50 Marks</p> <p>End Semester Examination (Duration): 2 hrs</p>
<b>Prerequisite</b>	<ul style="list-style-type: none"> <li>• Basic Image Processing Concepts</li> <li>• Concepts like vectors, matrices, eigenvalues/eigenvectors, matrix operations</li> <li>• Basic knowledge of probability distributions, mean, variance, covariance, and Bayesian concepts</li> <li>• Knowledge of Python or MATLAB for algorithm implementation.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To understand the digital image processing operations and their applications.</li> <li>• To recognize image compression and segmentation techniques enhance digital images.</li> <li>• To develop various feature extraction and object recognition skills.</li> </ul>
<b>Course Outcomes:</b>	<p><b>CO1:</b> Understand the fundamental concepts of digital image processing, including sampling, quantization, histogram equalization, and the application of Fourier transforms.</p> <p><b>CO2:</b> Apply various image compression techniques (lossless and lossy) and segmentation methods such as edge, line, and region-based approaches for effective image analysis.</p> <p><b>CO3:</b> Analyze and implement different image transforms including DFT, DCT, Haar, Hadamard, and KL transforms for image representation and processing.</p> <p><b>CO4:</b> Explore wavelet theory, multi-resolution analysis, and image enhancement techniques using spatial and frequency domain filtering to improve image quality.</p>
<b>Unit-I</b>	<p><b>Fundamentals of Digital Image Processing:</b></p> <p>Fundamental steps in digital image processing, Sampling and quantization, Histogram equalization, Discrete Fourier Transform, Applications of DIP.</p> <p style="text-align: right;"><b>(6Hrs)</b></p>

<b>Unit-II</b>	<p><b>Image Compression and Segmentation:</b>            Image Compression: Redundancy and Compression Models -Loss Less and Lossy. Loss Less-Variable-Length, Huffman, Arithmetic Coding - Bit-Plane Coding, Loss Less Predictive Coding, Lossy Transform (DCT) Based Coding, JPEG Standard - Sub Band Coding. Image</p> <p><b>Image Segmentation:</b>            Segmentation: Edge Detection - Line Detection - Curve Detection - Edge Linking and Boundary Extraction, Boundary Representation, Region Representation and Segmentation</p> <p style="text-align: right;"><b>(7 Hrs)</b></p>
<b>Unit-III</b>	<p><b>Image transforms:</b>            Image Transforms: 2D Orthogonal and Unitary Transforms-Properties and Examples. 2D DFT- FFT – DCT -Hadamard Transform - Haar Transform - Slant Transform - KL Transform -Properties and Examples.</p> <p style="text-align: right;"><b>(8 Hrs)</b></p>
<b>Unit-IV</b>	<p><b>Wavelet Theory:</b>            Wavelets, The basic functions, Specifications, Admissibility conditions, Continuous wavelet transform (CWT), Discrete wavelet transform (DWT). The multi resolution analysis (MRA) of L2(R), The MRA axioms, Construction of an MRA from scaling functions - The dilation equation and the wavelet equation</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>
<b>Unit-V</b>	<p><b>Image Enhancement:</b>            Histogram Equalization Technique- Point Processing-Spatial Filtering-In Space and Frequency -Nonlinear Filtering-Use of Different Masks.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>
<b>Unit-VI</b>	<p><b>Image Fusion:</b>            Image Fusion-Overview of image fusion, pixel fusion, Multi resolution based fusion discrete wavelet transform, Curvelet transform, Region based fusion.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>


<b>Textbooks and Reference Books</b>	2.	Digital Image Processing and Analysis	Chanda, Majumder	PHI	2 <sup>nd</sup>
	3.	Digital Image Processing and CV	Sonka, Hlavac, Boyle	Cengage Learning Publication	2 <sup>nd</sup>
	4.	Digital Image Processing using Matlab	Rafael C. Gonzalez, Richard E. Woods, Steven Eddins	Mcgraw Hill	2 <sup>nd</sup>

**CO-PO mapping:**

Cos	PO1	PO2	PO3
CO1			
CO2	1	1	2
CO3			
CO4	2	1	1

**CO-PSO mapping:**

Cos	PSO1	PSO2	PSO3
CO1	1		1
CO2			
CO3	2		1
CO4		2	1

  
 Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**This page is left blank intentionally**

Faculty of Science & Technology

Syllabus of M.Tech. ( COMPUTER SCIENCE & TECHNOLOGY) Semester – I

<p>Course Code: MCS512</p> <p>Course: Program Elective 1B</p> <p><b>High Performance Computing Teaching</b></p> <p>Scheme: Theory: 3Hrs/week</p>	<p>Credits: 3-0-0</p> <p>In Semester Examination-I: 15 Marks</p> <p>In Semester Exam-II: 15 Marks</p> <p>Teacher Assessment: 20 Marks</p> <p>End Semester Examination: 50 Marks</p> <p>End Semester Examination (Duration): 2 hrs</p>
<b>Prerequisite</b>	<ul style="list-style-type: none"> <li>Understanding of algorithm design, complexity analysis, recursion, sorting, searching, etc.</li> <li>Basic knowledge of CPU architecture, memory hierarchy, cache, and pipelining.</li> <li>Concepts like shared Vs distributed memory, message passing, or GPU computing are helpful.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>Understand the foundational principles of computer architecture, including quantitative design analysis, memory hierarchy, instruction-level parallelism, and GPU architecture.</li> <li>Analyze and compare the performance trade-offs between CPU and GPU architectures, exploring parallel programming models, multithreading, SIMD/vector processing, and instruction scheduling techniques.</li> <li>Develop and implement GPU-based parallel applications using CUDA and Open CL by applying efficient memory usage strategies, kernel optimization techniques, and scalable parallel execution models.</li> </ul>
<b>Course Outcomes:</b>	<p><b>CO1:</b> Understand and analyze core concepts of computer architecture including memory hierarchy, pipelining, instruction-level parallelism (ILP), and quantitative performance design.</p> <p><b>CO2:</b> Explore advanced processor architectures such as superscalar, VLIW, and SIMD, and apply compiler and scheduling techniques to optimize instruction throughput and parallelism.</p> <p><b>CO3:</b> Examine modern GPU architectures and programming models, and implement parallel computing solutions using CUDA, focusing on memory hierarchy and performance optimization.</p> <p><b>CO4:</b> Compare CPU and GPU execution models, evaluate algorithm suitability, and develop parallel applications for multi-device systems using frameworks such as OpenCL.</p>
<b>Unit-I</b>	<p><b>Fundamentals of Computer Architecture:</b></p> <p>Fundamentals of Quantitative Design &amp; Analysis, Memory Hierarchy Design, Memory Technologies &amp; Optimizations, Instruction-Level Parallelism (ILP) and Its Exploitation, Locality Principle in Memory Hierarchy, Pipelining and Instruction Dependencies</p> <p style="text-align: right;"><b>(06 Hrs)</b></p>

<b>Unit-II</b>	<p><b>Advanced Processor Architectures:</b></p> <p>Compiler Techniques for Exposing ILP, Reducing Branch Costs with Advanced Branch Prediction, Overcoming Data Hazards with: Dynamic Scheduling, Static Scheduling, Advanced Instruction Delivery and Speculation Techniques, Introduction to Multithreading, Data-Level Parallelism (DLP): Vector and SIMD Architectures, Superscalar and VLIW Architectures</p> <p style="text-align: right;"><b>(08 Hrs)</b></p>
<b>Unit-III</b>	<p><b>Modern GPU Architecture and Programming Models:</b></p> <p>Architecture of a Modern GPU, Accelerating Real Applications, Overview of Parallel Programming Languages and Models, Unified Graphics and Computing Processors, GPGPU: Concept and Intermediate Step, GPU Computing Overview, Scalable GPU Architectures and Understanding Parallelism in GPUs, Memory Hierarchy in GPUs, Warp and Thread Management.</p> <p style="text-align: right;"><b>(07 Hrs)</b></p>
<b>Unit-IV</b>	<p><b>CUDA Programming Essentials:</b></p> <p>CUDA Programming Model Overview, Structure of a CUDA Program, Vector Addition Kernel Example, Device Global Memory and Data Transfers, Kernel Functions and Threading Concepts, Data-Parallel Execution Model, CUDA Thread Organization, CUDA Memory Types and Hierarchy, Memory Access Efficiency and Optimization, Warps and Thread Execution Mechanism, Global Memory Bandwidth and Performance Considerations.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>
<b>Unit-V</b>	<p><b>CPU vs GPU: Design and Execution Models:</b></p> <p>Comparison of Serial and Parallel Code Execution, Design Goals and Architectures: CPUs vs GPUs, Algorithm Suitability for CPUs vs GPUs, Dataset Processing Considerations, Locality in Parallel Processing, Running Applications Across Various GPU Architectures, Cross-Architecture Application Deployment.</p> <p style="text-align: right;"><b>(06 Hrs)</b></p>
<b>Unit-VI</b>	<p><b>Multi-Device Systems and OpenCL:</b></p> <p>Introduction to Multi-CPU and Multi-GPU Systems, Algorithms for Multiple GPU Execution, Introduction to OpenCL, OpenCL Setup and Environment, Basic OpenCL Programming, Advanced OpenCL Features, OpenCL Device Architectures and Execution Models.</p> <p style="text-align: right;"><b>( 06 Hrs)</b></p>


	Sr. No.	Title	Author	Publication	Edition
<b>Textbooks and Reference Books</b>	1.	Computer Architecture – A Quantitative Approach	John L. Hennessy, David A. Patterson	Morgan Kaufmann, Elsevier	5 <sup>th</sup>
	2.	Programming Massively Parallel Processors: A Hands-on Approach	David B. Kirk, Wen-mei W. Hwu	Morgan Kaufmann	3 <sup>rd</sup>
	3.	CUDA Programming: A Developer's Guide to Parallel Computing with GPUs	Shane Cook	Morgan Kaufmann	1 <sup>st</sup>
	4.	Heterogeneous Computing with OpenCL	Benedict Gaster, Lee Howes, David R. Kaeli, Perhaad Mistry	Morgan Kaufmann, Elsevier	2 <sup>nd</sup>

**CO-PO mapping:**

Cos	PO1	PO2	PO3
CO1			
CO2	1	1	2
CO3			
CO4	2	1	1

**CO-PSO mapping:**

COs	PSO1	PSO2	PSO3
CO1	1		1
CO2			
CO3	2		1
CO4		2	1

  
 Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**This page is left blank intentionally**

Faculty of Science & Technology

Syllabus of M.Tech. (COMPUTER SCIENCE & TECHNOLOGY) Semester – I

<p>Course Code: MCS513</p> <p>Course: <b>Program Elective 1C</b></p> <p>Object Oriented Analysis and Design</p> <p><b>Teaching Scheme:</b> Theory: 3Hrs /week</p>	<p>Credits: 3-0-0</p> <p>In Semester Examination-I: 15 Marks</p> <p>In Semester Examination-II: 15 Marks</p> <p>Teacher Assessment: 20 Marks</p> <p>End Semester Examination: 50 Marks</p> <p>End Semester Examination (Duration): 2 hrs</p>
<b>Prerequisite</b>	<ul style="list-style-type: none"> <li>• Basic Programming Knowledge in at least one object-oriented programming language such as Java, C++, or Python.</li> <li>• Familiarity with fundamental data structures like arrays, linked lists, stacks, queues, trees, and graphs.</li> <li>• Basic knowledge of software development lifecycle (SDLC).</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To understand the fundamentals of Object-Oriented analysis and design.</li> <li>• To understand and differentiate Unified Process from other approaches.</li> <li>• To understand static UML diagrams and dynamic UML diagrams with implementation.</li> </ul>
<b>Course Outcomes</b>	<p><b>CO1:</b> Understand the fundamentals of Object-Oriented Analysis and Design (OOAD), the Unified Process, and model functional requirements using use case diagrams effectively.</p> <p><b>CO2:</b> Develop static and dynamic UML diagrams including class, sequence, communication, state machine, and activity diagrams for system modeling and design.</p> <p><b>CO3:</b> Apply implementation-level UML diagrams such as package, component, and deployment diagrams, and integrate design principles and GoF design patterns for software architecture refinement.</p> <p><b>CO4:</b> Map object-oriented design to code and demonstrate the ability to plan and execute object-oriented testing strategies including unit, integration, GUI, and system testing.</p>
<b>Unit-I</b>	<p><b>Unified Process and Use Case Diagrams:</b></p> <p>Introduction to OOAD with OO Basics Unified Process, UML diagrams, Use Case. Case study, the Next Gen POS system, Inception Use case Modeling, Relating Use case include, extend and generalization When to use Usecases.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>

*SW*  
 Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

<b>Unit-II</b>	<p><b>Static UML Diagrams:</b>                  Class Diagram, Elaboration, Domain Model, Finding conceptual classes and description classes, Associations, Attributes, Domain model refinement, Finding conceptual class Hierarchies, Aggregation and Composition, Relationship between sequence diagrams and use cases, When to use Class Diagrams.</p> <p style="text-align: right;"><b>(7 Hrs)</b></p>				
<b>Unit-III</b>	<p><b>Dynamic UML Diagrams:</b>                  UML Interaction diagrams, System Sequence diagram, Relationship between sequence diagrams and use cases Collaboration diagram, When to use Communication Diagrams, State Machine diagram and modeling, Activity diagram.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>				
<b>Unit-IV</b>	<p><b>Implementation Diagrams:</b>                  UML Package diagram, Component and Deployment Diagrams. Logical architecture refinement, Applying GoF design patterns.</p> <p style="text-align: right;"><b>(8 Hrs)</b></p>				
<b>Unit-V</b>	<p><b>Design Patterns: GRASP:</b>                  Designing objects with responsibilities, Creator Information expert, Low Coupling, High Cohesion, Controller Design Patterns, creational, factory method, structural, Bridge, Adapter, behavioral, Strategy observer.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>				
<b>Unit-VI</b>	<p><b>Coding and Testing:</b>                  Mapping design to code – Testing: Issues in OO Testing, Class, Integration, GUI and System Testing. Impact of object orientation on Testing Develop Test Cases and Test Plans.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>				
	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
	1.	Design patterns: Elements of Reusable Object-Oriented Software.	Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides	Addison-Wesley, 1995.	

*gga*  
 Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

<b>Textbooks and Reference Books</b>	3.	Object-Oriented Analysis & Design with the Unified Processl	Satzinger, Jackson, Burd	Course Technology Inc.	1 <sup>st</sup>
	4.	Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Developmentl,	Craig Larman.	Pearson Education. 2005	3rd Edition
	5.	UML 2 and the Unified Process – Practical Object-Oriented Analysis and Designl.	Jim Arlow, Ila Neustadt	Pearson Education.	-

**CO-PO mapping:**

Cos	PO1	PO2	PO3
CO1	3	3	1
CO2	2	3	2
CO3	2	2	3
CO4	2	2	1

**CO-PSO mapping:**

COs	PSO1	PSO2	PSO3
CO1	1	2	1
CO2	2	2	3
CO3	1		2
CO4	2	1	

  
 Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**This page is left blank intentionally**

#### Faculty of Science & Technology

#### Syllabus of First Year M.Tech (Computer Science & Technology) (Semester I)

<p>Course Category: <b>REM</b>                  Course Code: <b>MTR521</b>                  Course: <b>Research Methodology</b>                  Teaching Scheme:                  Theory: 03 Hrs./week                  Tutorial: 01 Hr./week</p>	<p><b>Credits: 3-1-0</b>                  In-Semester Examination -I: 15 Marks                  In-Semester Examination -II: 15Marks                  Teacher Assessment: 20 Marks                  End Semester Examination: 50 Marks                  End Semester Examination (Duration):02 Hrs.</p>
<b>Prerequisite</b>	----
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To guide students from understanding foundational research concepts to critically formulating research problems, culminating in the adept creation of comprehensive research plans and literature reviews.</li> <li>2. To develop a comprehensive understanding of various research methods, both qualitative and quantitative</li> <li>3. To facilitate students in analysing, evaluating, and creating research proposals.</li> <li>4. To attain mastery in data collection methods, sampling, data analysis techniques, and result interpretation for robust research outcomes.</li> <li>5. To equip students with the skills to proficiently create and present diverse research reports, encompassing various formats, oral delivery, technical writing, and ethical awareness regarding plagiarism.</li> </ol>
<b>Course Outcomes</b>	<p>After successful completion of this course, students will be able to -</p> <p><b>CO1:</b> Develop the ability to comprehend core research concepts, define key elements like variables and hypotheses, and critically evaluate literature to identify research gaps.</p> <p><b>CO2:</b> Justify their chosen research methods and explain their advantages and limitations.</p> <p><b>CO3:</b> Create well-structured research proposals that include clear research objectives, methods, and expected outcomes.</p> <p><b>CO4:</b> Proficient in using data analysis techniques relevant to their chosen research methods, such as statistical analysis for quantitative research or thematic analysis for qualitative research.</p> <p><b>CO5:</b> Create comprehensive research reports in diverse formats, such as academic papers, presentations, and technical reports.</p>
<b>Unit-I</b>	<p><b>Introduction to RM:</b>                  Introduction to RM: Meaning of Research, Objectives of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Defining the Research Problem, Selecting the Problem, Technique Involved in Defining a Problem, Research Design, Important Concepts Relating to Research Design, Developing a Research Plan, Literature review, Impact factor, H-index, citation. <span style="float: right;">(7 Hrs)</span></p>
<b>Unit-II</b>	<p><b>Methods of Research:</b>                  Qualitative and quantitative methods of research like Historical, case study, ethnography, documentary and content analysis, survey (Normative, descriptive, evaluative etc.) field and laboratory experimental studies. Characteristics of methods and their implications in research area. <span style="float: right;">(6 Hrs)</span></p>

<b>Unit-III</b>	<p><b>Methods of data collection:</b> Concept of sampling and other concepts related to sampling. Probability and non-probability samples, their characteristics and implications. Tools of data collections, their types, attributes and uses. Redesigning, research tools-like questionnaire, opinionnaire, observation, interviews, scales and tests etc. <span style="float: right;">(6 Hrs)</span></p>
<b>Unit-IV</b>	<p><b>Statistics:</b> Basic Concepts of Probability, Probability Axioms, Measures of Central Tendency, Measures of Dispersions, Measures of Symmetry, Measures of Peakedness. Regression Analysis – Simple Linear Regression, Multiple linear Regression, Correlation. Tests of Hypothesis and Goodness of Fit: Definition of null and alternative hypothesis, students't' distribution: properties, application with example. Chi-square distribution: definition, constants of Chi-square distribution. Application with example. F-test: example of application. <span style="float: right;">(7 Hrs)</span></p>
<b>Unit-V</b>	<p><b>Development of research proposal:</b> Research proposal and its elements Formulation of research problem-criteria of sources and definition Development of objectives and characteristics of objectives. Development hypotheses and applications. <span style="float: right;">(7 Hrs)</span></p>
<b>Unit-VI</b>	<p><b>Interpretation and Report Writing:</b> Meaning of Interpretation, Techniques of Interpretation, Significance of Report Writing, Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, writing a technical paper, plagiarism and its implications, Introduction to patents and copyrights &amp; filing procedure. <span style="float: right;">(6 Hrs)</span></p>

Textbooks and Reference Books	Sr. No.	Title	Author	Publication	Edition
	T1.	An introduction to Research Methodology	Garg B. L., Karadia R., Agarwal F. and Agarwal U	RBSA Publishers	2002
	T2.	Research Methodology: Methods and Techniques	Kothari C. R	New Age International	1990
	T3.	Qualitative Research: A Guide to Design and Implementation	Merriam S. B., Tisdell E. J.,	John Wiley & Sons, 2016	4th edition
	R1.	Research Design: Qualitative, Quantitative and Mixed Methods Approaches	Creswell J. W.	SAGE Publications, Inc, 2014	4th edition
	R2.	Introduction to Statistics and Data Analysis	Olsen C., Devore J., Peck R.	Brooks/Cole, 2015	5th edition
	R3.	Research Methodology	Panneerselvam R.,	PHI Learning, 2014	2nd edition



Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)

Master Copy

**Guidelines for Teacher's Assessment (TA):**

Course Teacher will internally conduct the following activities during the **tutorial hours**. Based on the submission and participation in the assignment/activity total 20 marks may be given after assessment:

1. Group discussion on identifying a research problem from their M. Tech domain.
2. Preparing a research design for a selected topic.
3. Drafting objectives and hypotheses of a mini research study.
4. Framing a questionnaire and defining sampling techniques.
5. Hands-on: Data coding/Simulation/modern tool usage and/or tabulation using Excel.
6. Data analysis using basic statistical functions in Excel/SPSS or as per domain specific.
7. Write a research proposal based on tutorial outcomes or as per teacher suggestions.
8. Plagiarism check and ethical discussion using Turnitin/similar tools.
9. Referencing and citation using Mendeley/Zotero (Hands-on).
10. Writing the research proposal in Latex/ or any other specific formatting tool

**CO and PO Mapping:** (3- Strong, 2- Medium and 1- Low)

COs	PO1	PO2	PO3
CO1	3	3	1
CO2	2	3	2
CO3	2	2	3
CO4	2	2	1
CO5	1	2	3

  
Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)

**Master Copy**

**This page is left blank intentionally**

**Master Copy**

**Faculty of Science & Technology**  
**Syllabus of First Year M. Tech (Computer Science & Technology) (Semester I)**

Course Category: AEC Course Code: MCS531 Course: Seminar and Technical Communication Teaching Scheme: Practical: 02 Hrs/Week	<b>Credits: 0-0-1</b> Teacher Assessment: 25 Marks End Semester Examination: 25 Marks
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To review the literature (research papers, relevant books and internet) for identifying topics related to domain of Program/Specialization.</li> <li>To develop technical report writing skills and improvise the presentation skills on technical matters.</li> </ul>
<b>Course Outcomes</b>	On successful completion of this course, the students will be able to: <ul style="list-style-type: none"> <li><b>CO1:</b> Identify and review research literature on a contemporary topic in their specialization.</li> <li><b>CO2:</b> Prepare a structured technical report adhering to academic integrity.</li> <li><b>CO3:</b> Deliver effective seminar presentations with clarity, confidence, and proper use of visual aids.</li> <li><b>CO4:</b> Engage in academic discussion and provide constructive peer feedback.</li> </ul>
<b>Evaluation process</b>	<ol style="list-style-type: none"> <li>1. Individual students are required to choose a topic of their interest from topics relevant to their specialization stream.</li> <li>2. The students are required to review literature (research papers, e-books) on the selected topic and deliver a presentation on the same.</li> <li>3. A committee consisting of at least three faculty members (preferably specialized in the respective stream headed by Head of the Department wherein guide should be one of the members) shall assess the presentation of the seminar</li> <li>4. Each student shall submit two copies of the seminar report.</li> <li>5. The student should authenticate that the seminar report submitted does not have any plagiarized content.</li> <li>6. Teacher's assessment marks shall be awarded based on the relevance of the topic, presentation skill, quality of the report and participation.</li> <li>7. It is recommended to the students to do practical /experimental work related to the chosen topic and presents the results at the end of the semester.</li> </ol>

**Week-wise Activity**

Week	Activity	Expected Output
1-2	Orientation, topic selection, and approval by faculty	Topic title + 200-word abstract
3-4	Guided literature survey and reference collection	List of references from journals/conferences
5-6	Drafting seminar report	Draft report (10-12 pages)
7-12	Seminar presentations	Presentation (15-20 minutes) + Q&A
13-14	Peer review and discussion	Written peer review/feedback
15	Final submission and reflection	Final report (20-25 pages)

**Rubrics for Assessment:**

Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (2)	Inadequate (1)
<b>Topic Selection and Proposal</b>	Highly relevant and innovative topic. Clear and feasible proposal.	Relevant and clear topic. Feasible proposal with minor improvements needed.	Adequate topic. Proposal is clear but lacks innovation.	Topic relevance is questionable. Proposal lacks clarity and feasibility.	Irrelevant or inappropriate topic. Poor or no proposal.
<b>Literature Review</b>	Comprehensive and insightful review. Uses a wide range of credible sources.	Thorough review with mostly credible sources.	Adequate review with some credible sources. Basic synthesis of information.	Limited review with few credible sources. Weak synthesis and analysis.	Poor or no review with irrelevant or no credible sources. No synthesis or analysis.
<b>Seminar Outline and Content Development</b>	Clear, logical, and well-organized outline. Content is comprehensive and well-developed.	Good outline and organization. Content is clear with minor gaps.	Adequate outline with some organization. Content covers basic points.	Poorly organized outline. Content is incomplete or lacks coherence.	No clear outline. Content is disorganized and lacks substance.
<b>Presentation Skills</b>	Engaging, clear, and confident presentation. Effective use of visual aids. Handles Q&A expertly.	Clear and confident presentation. Good use of visual aids. Handles Q&A adequately.	Adequate presentation with some clarity issues. Basic use of visual aids. Manages Q&A with difficulty.	Unclear or hesitant presentation. Limited use of visual aids. Struggles with Q&A.	Poor or no presentation. Ineffective or no use of visual aids. Unable to handle Q&A.
<b>Seminar Report</b>	Thorough and well-written Report. Proper formatting and citations. Reflects deep understanding.	Good Report with minor errors. Mostly proper formatting and citations. Shows good understanding.	Adequate Report with some errors. Basic formatting and citations. Shows basic understanding.	Poorly written Report with many errors. Inadequate formatting and citations. Limited understanding.	No or very poorly written Report. Incorrect or no formatting and citations. Lacks understanding.

**CO-PO Mapping**

CO	PO 1	PO 2	PO 3	
CO 1				
CO 2				
CO 3				
CO 4				

**Master Copy**

*S/S*  
 Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**This page is left blank intentionally**

**Master Copy**

Faculty of Science & Technology

Syllabus of M.Tech. (COMPUTER SCIENCE & TECHNOLOGY) Semester – I

Course Code: MCS541

Credits: 0-0-1

Program Core Course: Advanced Operating System  
Laboratory

TA: 25 Marks

Teaching Scheme:

Total Marks: 25 Marks

Practical: 2 Hrs/week

Course Outcomes:

CO1: Understand and analyze the design, performance, and behavior of algorithmic paradigms such as Divide and Conquer, Greedy, and Dynamic Programming.

CO2: Apply various sorting, network flow, randomized, and number theory algorithms to solve real-world computing problems.

CO3: Evaluate and compare different string matching algorithms and use appropriate methods to solve complex computing problems.

Experiments/ Project/ Assignment of Lab-I shall be based on the subject Advanced Operating System

- 1) Implement the Maximum Subarray Problem using the Divide and Conquer approach.
- 2) Write a program to solve recurrences using the Master Method and analyze asymptotic behavior.
- 3) Implement and analyze the performance of Merge Sort and Quick Sort algorithms.
- 4) Implement Radix Sort and analyze its time complexity compared to comparison-based sorts.
- 5) Implement Activity Selection Problem using the Greedy method.
- 6) Implement Rod Cutting Problem using Dynamic Programming.
- 7) Implement Ford-Fulkerson Algorithm to find the Maximum Flow in a network.
- 8) Implement Randomized Quick Sort and evaluate its performance with different inputs.
- 9) Implement Euclid's GCD Algorithm and Fast Fourier Transform (FFT) for polynomial multiplication.
- 10) Implement and compare String Matching Algorithms (Naïve, KMP, and Boyer-Moore).



Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)

**CO -PO Mapping:**

CO	PO1	PO2	PO3
CO1	3	3	2
CO2	3	3	3
CO3	3	3	2

**CO-PSO Mapping:**

CO	PSO1	PSO2	PSO3
CO1	1	-	
CO2		1	1
CO3	1	2	

  
Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)

Faculty of Science & Technology

Syllabus of M.Tech. ( COMPUTER SCIENCE & TECHNOLOGY) Semester - I


Course Code: MCS542 Program Core Course: Natural Language Processing <p style="text-align: center;">Laboratory</p> <b>Teaching Scheme:</b> Practical: 2 Hrs/week	Credits: 0-0-1 TA: 25 Marks Total Marks: 25 Marks
---	---

**Course Outcomes:**

- CO1:** Understand the fundamental concepts of natural language processing and linguistic structures such as syntax, morphology, and grammar.
- CO2:** Apply various parsing and probabilistic techniques to analyze, interpret, and process natural language data effectively.
- CO3:** Develop and evaluate NLP applications such as information extraction, sentiment analysis, and machine translation using semantic and statistical methods.

Experiments/ Project/ Assignment of Lab-I shall be based on the subject Natural Language Processing

- 1) Implement a text preprocessing pipeline including tokenization, stop-word removal, stemming, and lemmatization.
- 2) Develop a part-of-speech (POS) tagging program using statistical or rule-based methods.
- 3) Implement a simple parser using a context-free grammar (CFG) to analyze sentence structure.
- 4) Perform morphological analysis of words using finite state models and visualize the structure.
- 5) Implement a feature-based grammar and demonstrate parsing with feature systems.
- 6) Design a probabilistic context-free grammar (PCFG) and implement best-first parsing using lexical probabilities.
- 7) Develop a sentiment analysis model using supervised learning on a text dataset.
- 8) Implement a named entity recognition (NER) or information extraction system.
- 9) Demonstrate a simple machine translation system using available libraries or APIs and evaluate it using BLEU score.
- 10) Create a semantic similarity application using WordNet or semantic web ontology for meaning representation.

  
 Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

## CO-PO Mapping:

Cos	PO1	PO2	PO3
CO1	3	2	1
CO2	2	3	2
CO3	2	3	3

## CO-PSO Mapping:

CO	PSO1	PSO2	PSO3
CO1	2	-	
CO2	1	1	1
CO3	-	1	



Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)

**Master Copy**

**M. Tech (Computer Science & Technology)**

**Semester-II**

**Detail Course Curriculum**

(NEP 2020 Based Curriculum)

**WEF AY 2025-26**

\*\*\*\*\*

**Master Copy**

Faculty of Science & Technology

Syllabus of M.Tech ( COMPUTER SCIENCE & TECHNOLOGY) Semester – II

Course Code: MCS551

Course: Cyber Security

**Teaching Scheme:**

Theory: 03Hrs/week

Tutorial: 01 Hrs/week

Credits: 3-1-0

In Semester Examination-I: 15 Marks

In Semester Examination-II: 15 Marks

Teacher Assessment: 20 Marks

End Semester Examination: 50 Marks

End Semester Examination (Duration): 2 hrs

<b>Prerequisite</b>	Basic Programming Skills, Networking Fundamentals, Operating Systems Knowledge
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• To Understand the Fundamentals of Cyber security</li> <li>• To equip students with the technical knowledge and skills needed to protect and defend against cyber threats.</li> <li>• To educate students on the ethical and responsible use of social media platforms.</li> </ul>
<b>Course Objective</b>	<p><b>CO1:</b> Understand key concepts, terminologies, threats, and case studies in cyber security, including protection of end-user systems and critical infrastructure.</p> <p><b>CO2:</b> Identify and analyze various types of cyber crimes, social engineering attacks, and understand the procedures for cybercrime reporting and legal response.</p> <p><b>CO3:</b> Explain the cyber law framework in India and globally, including the IT Act, legal implications of emerging technologies, and ethical considerations in cyberspace.</p> <p><b>CO4:</b> Evaluate data privacy and security concerns, apply principles of data protection and compliance with national and international regulations such as PDPB and GDPR, and develop cyber security policies and governance strategies.</p>
<b>Unit-I</b>	<p><b>Overview of Cyber security:</b></p> <p>Cyber security increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyber warfare, Case Studies.</p> <p style="text-align: right;"><b>(9 Hrs)</b></p>
<b>Unit-II</b>	<p><b>Cyber crime:</b></p> <p>Cyber-crimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and</p>

	frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/ credit card fraud, Online payment fraud, Cyber bullying, website defacement, Cyber-squatting, Pharming, Cyber espionage, fake news cyber crime against persons - cyber grooming, child pornography, cyber stalking., Social Engineering attacks, Cyber Police stations, Crime reporting procedure, Case studies.				
	<b>(9 Hrs)</b>				
<b>Unit-III</b>	<b>Cyber Law:</b> Cyber crime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act, 2000. Cyber crime and punishments, Cyber Laws and Legal and ethical aspects related to new Technologies- AI/ML, IoT, Block chain, Darknet and Social media, Cyber Laws of other countries, Case Studies.				
	<b>(8 Hrs)</b>				
<b>Unit IV</b>	<b>Data Privacy:</b> Defining data, meta-data, big data, non- personal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles.				
	<b>(8 Hrs)</b>				
<b>Unit V</b>	<b>Data Security:</b> Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA)., Social media- data privacy and security issues.				
	<b>(9 Hrs)</b>				
<b>Unit VI</b>	<b>Cyber security Management, Compliance and Governance:</b> Cyber security Plan- cyber security policy, cyber crises management plan, Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.				
	<b>(9 Hrs)</b>				
	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
	1.	Cyber Security Understanding Cyber Crimes, Computer Forensics	Sumit Belapure and Nina Godbole	Wiley India Pvt. Ltd	1 <sup>st</sup>

<b>Textbooks and Reference Books</b>	2.	Information Warfare and Security	Dorothy F. Denning	Addison Wesley.	
	3.	Security in the Digital Age: Social Media Security Threats and Vulnerabilities	Henry A. Oliver	Create Space Independent Publishing Platform.	
	4.	Data Privacy Principles and Practice	Natraj V and Ashwin Shriram	CRC Press.	1st

**Following are the list of tutorial for Cyber Security:**

- 1) Prepare a detailed report explaining key cyber security terms – threat, vulnerability, risk, attack vector, exploit, hacker types, and cyber warfare.
- 2) Analyze the importance of securing critical IT and national infrastructure (e.g., power grid, telecom, banking). Suggest preventive strategies and security frameworks.
- 3) Create a chart classifying cybercrimes (DoS, DDoS, spyware, ransomware, logic bomb, APTs).
- 4) Collect and analyze five real-world social engineering or online fraud cases (phishing, vishing, fake job scam, sextortion ).
- 5) Prepare a report summarizing key sections of IT Act 2000 and its 2008 amendment related to cybercrimes and punishments
- 6) Compare with laws from US (CFAA) or EU (GDPR penalties).
- 7) Write a technical report on ethical and legal challenges related to AI, IoT, Blockchain, and Darknet.
- 8) Study the Personal Data Protection Bill (India) and compare it with GDPR (EU).
- 9) Conduct a mini survey or case analysis on data breaches in social media (e.g., Facebook, LinkedIn).
- 10) Design a Cyber Security Policy for your organization.

**CO-PO mapping:**

Cos	PO1	PO2	PO3
CO1			1
CO2	2		
CO3			2
CO4	2	1	1

**CO-PSO mapping:**

COs	PSO1	PSO2	PSO3
CO1			
CO2	2		2
CO3		1	
CO4	1	1	2

*S/S*  
 Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

**This page is left blank intentionally**

**Master Copy**

Faculty of Science & Technology	
Syllabus of M.Tech. ( COMPUTER SCIENCE & TECHNOLOGY) Semester – II	
Course Code: MCS552 Course: Advanced Data Science <b>Teaching Scheme:</b> Theory: 03Hrs/Week Tutorial: 01Hrs/Week	Credits: 3-1-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 hrs
<b>Prerequisite</b>	Basic concepts of Math and Statistics, Machine Learning
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To learn the basics of presentation of data.</li> <li>To study statistics, correlation and regression from data perspective</li> <li>To explore various data visualization tools, patterns, and relationships</li> </ul>
<b>Course Outcomes</b>	<p><b>CO1:</b> Understand the origin, scope, and limitations of statistics, and classify different types of data and measurements for effective tabular and graphical presentation.</p> <p><b>CO2:</b> Compute and interpret various descriptive statistics such as measures of central tendency, dispersion, skewness, and kurtosis to summarize and describe datasets.</p> <p><b>CO3:</b> Analyze relationships between variables using correlation and regression techniques, including Pearson and Spearman correlation and simple linear regression.</p> <p><b>CO4:</b> Apply appropriate tools and techniques for data visualization, identify patterns and relationships in data over time and space, and effectively communicate insights through visual storytelling.</p>
<b>Unit-I</b>	<p><b>Presentation of Data:</b></p> <p>Origin and development of Statistics, Scope, limitation and misuse of statistics. Types of data: primary, secondary, quantitative and qualitative data. Types of Measurements: nominal, ordinal, discrete and continuous data. Presentation of data by tables: construction of frequency distributions for discrete and continuous data, graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions.</p> <p style="text-align: right;"><b>(8Hrs)</b></p>
	<p><b>Descriptive statistics:</b></p> <p>Measures of location or central tendency: Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean. Partition values: Quartiles, Deciles and percentiles. Measures of</p>

*Signature*

**Master Copy**

	dispersion: Mean deviation, Quartile deviation, Standard deviation, Coefficient of variation. Moments: measures of skewness, Kurtosis. <p style="text-align: right;">(9 Hrs)</p>				
<b>Unit-III</b>	<b>Correlation and Regression:</b> Correlation: Scatter plot, Karl Pearson coefficient of correlation, Spearman's rank correlation coefficient, multiple and partial correlations (for 3 variates only). Regression: Concept of errors, Principles of Least Square, Simple linear regression and its properties. <p style="text-align: right;">(8 Hrs)</p>				
<b>Unit-IV</b>	<b>Data Visualization:</b> Telling Stories with Data, gather data, Data Scraping, Choosing Tools to Visualize Data - Microsoft Excel, Google gadgets, Tableau, Python, R, HTML, JavaScript, and CSS <p style="text-align: right;">(9 Hrs)</p>				
<b>Unit-V</b>	<b>Visualizing Patterns:</b> Discrete Points in Time, Continuous Data, Proportions over Time <p style="text-align: right;">(9 Hrs)</p>				
<b>Unit-VI</b>	<b>Visualizing Relationships:</b> Correlation, Distribution, Comparing across Multiple Variables, Reducing Dimensions, Searching for Outliers, Specific Locations, Regions, Over Space and Time. <p style="text-align: right;">(9 Hrs)</p>				
<b>Textbooks and Reference Books</b>	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
	1.	Mathematical Statistics	Mukhopadhyay P	Books and Allied	1 <sup>st</sup>
	2.	Probability and Statistics for Engineers and Scientists	Walpole R.E, Myers R.H, and Myers S.L	Pearson	1 <sup>st</sup>
	3.	Doing Data Science, Straight Talk from the Frontline	Cathy O'Neil, R Schutt	O' Reilly	1st

*AG*  
Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)

**Master Copy**

**Following are the list of tutorials for Advance Data science:**

- 1) Write a short report on the origin, scope, and limitations of statistics.
- 2) Using Excel or Python (matplotlib), prepare a frequency distribution table for a given dataset.
- 3) Compute Mean, Median, Mode, Geometric Mean, and Harmonic Mean for any std datasets using both manual calculation and software (Excel/Python)
- 4) For the same dataset, compute Standard Deviation, Mean Deviation, Coefficient of Variation, Skewness and Kurtosis
- 5) Apply simple linear regression to model one variable based on another (e.g., sales vs. advertisement).
- 6) Explore and compare at least three visualization tools – e.g., Excel, Tableau, and Python.
- 7) Create charts showing discrete points and continuous data over time (e.g., temperature trends, stock prices).
- 8) Using a multivariate dataset (e.g., Iris, COVID, or sales data), create scatter matrix plots, heatmaps, and 3D plots.
- 9) Select a real dataset (from Kaggle or data.gov.in). Clean, analyze, and visualize it using at least two tools (e.g., Python + Tableau)
- 10) Create a brief data story or dashboard explaining insights.

**CO-PO mapping:**

Cos	PO1	PO2	PO3
CO1			1
CO2			1
CO3	3	1	
CO4	1		2

**CO-PSO mapping:**

COs	PSO1	PSO2	PSO3
CO1	1	1	
CO2			2
CO3			
CO4	1	2	2



Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

This page is left blank intentionally

**Master Copy**

Faculty of Science & Technology	
Syllabus of M.Tech. ( COMPUTER SCIENCE & TECHNOLOGY) Semester – II	
Course Code: MCS553 Course: Performance Analysis Method Teaching Scheme: Theory: 03Hrs/week	Credits: 3-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15 Marks Teacher Assessment: 20 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 hrs
<b>Prerequisite</b>	Basic concepts of Math's and Computer Systems
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To be familiar with the fundamental techniques in performance evaluation of Computer Systems</li> <li>To understand and implement various performance analysis techniques</li> <li>To apply various performance analysis techniques to systematically evaluate the performance</li> </ul>
<b>Course Outcomes:</b>	<p><b>CO1:</b> Understand the principles of performance evaluation, identify common mistakes, and apply systematic methods for selecting performance metrics and evaluation techniques.</p> <p><b>CO2:</b> Analyze workload characteristics using various techniques such as averaging, histograms, and clustering, and evaluate tools and methods for workload selection and classification.</p> <p><b>CO3:</b> Apply concepts of probability and statistics for data summarization, sample analysis, hypothesis testing, and construct and evaluate simple linear regression models.</p> <p><b>CO4:</b> Utilize simulation techniques and random-number generation methods, and apply appropriate probability distributions to model real-world performance evaluation scenarios.</p>
<b>Unit-I</b>	<p><b>An overview of Performance Evaluation:</b></p> <p>The art of performance evaluation, common mistakes in performance evaluation, a systematic approach to performance evaluation, selecting an evaluation technique, selecting performance metrics, utility classification of performance metrics, setting performance requirements</p> <p style="text-align: right;"><b>(8 Hrs)</b></p>

*Signature*

Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

<b>Unit-II</b>	<p><b>Measurement Techniques and Tools:</b></p> <p>Types of workloads-addition instruction, instruction mixes, kernels, Benchmarks, the art of workload selection-services exercised, level of detail, representatives, timeliness, other considerations in workload selection, workload characterization techniques: Averaging, specifying dispersion, single parameter histograms, multi-parameter histograms, Principal component analysis, Markov models, Clustering.</p> <p style="text-align: right;"><b>(7 Hrs)</b></p>
<b>Unit-III</b>	<p><b>Probability Theory and Statistics:</b></p> <p>Summarizing measured data: basic probability and statistics concepts, summarizing data by a single number, selecting among the mean, median and mode, common misuses of means, geometric mean, harmonic mean, mean of a ratio, summarizing variability, selecting index of dispersion, determining distribution of data, comparing systems using sample data: sample versus population, determining sample size, confidence interval for the mean, testing for a zero mean.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>
<b>Unit-IV</b>	<p><b>Simple Linear Regression Models:</b></p> <p>Definition of a good model, estimation of model parameters, allocation of variation, standard deviation of errors, confidence intervals for regression parameters, confidence intervals for predictions, visual tests for verifying the regression assumptions.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>
<b>Unit-V</b>	<p><b>Simulation and Random-Number Generation:</b></p> <p>Introduction to simulation, common mistakes in simulation, selecting a language for simulation, types of simulation, Desired Properties of a Good Generator Linear-Congruential Generators, Tausworthe Generators, Extended Fibonacci Generators, Combined Generators, A Survey of Random- Number Generators, Seed Selection, Testing Random-Number Generators: Chi-Square Test, Kolmogorov-Smirnov Test.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>

*SIA*

Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

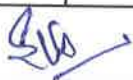
<b>Unit-VI</b>	<p><b>Commonly Used Distributions:</b>                  Bernoulli Distribution, Beta Distribution, Binomial Distribution, Chi-Square Distribution, Erlang Distribution, Exponential Distribution, F Distribution, Gamma Distribution, Geometric Distribution, Lognormal Distribution, Negative Binomial Distribution, Normal Distribution, Pareto Distribution, Pascal Distribution, Poisson Distribution, Student's T Distribution, Uniform Distribution (Continuous), Uniform Distribution (Discrete), Weibull Distribution, Relationships Among Distributions</p> <p style="text-align: right;">( 6 Hrs)</p>				
<b>Textbooks and Reference Books</b>	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
	1.	The Art of Computer System Performance Analysis	Raj Jain	Wiley India Publication	2 <sup>nd</sup>
	2.	Measuring Computer Performance-A Practitioner's Guide	David J.Lilja	Cambridge University Press	1st

**CO-PO mapping:**

Cos	PO1	PO2	PO3
CO1	2		2
CO2		2	1
CO3	1		
CO4		2	1

**CO-PSO mapping:**

COs	PSO1	PSO2	PSO3
CO1	1	1	
CO2			2
CO3	2		
CO4	1	2	1



**Chairman Board of Studies**  
**Computer Science & Engineering**  
**MIT Aurangabad**  
**(An Autonomous Institute)**

**Master Copy**

Faculty of Science & Technology

Syllabus of M.Tech. (COMPUTER SCIENCE & TECHNOLOGY) Semester – II

<p>Course Code: MCS561                  Course: Program Elective-2A                  Block Chain Technology  <b>Teaching Scheme:</b> Theory: 03Hrs</p>	<p>Credits: 3-0-0                  In Semester Examination-I: 15 Marks                  In Semester Examination-II: 15 Marks                  Teacher Assessment: 20 Marks                  End Semester Examination: 50 Marks                  End Semester Examination (Duration): 2 hrs</p>
--	--

<b>Prerequisite</b>	<ul style="list-style-type: none"> <li>Computer Networks fundamentals</li> <li>Cryptography and Network Security</li> <li>Data Structures and Algorithms.</li> </ul>
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To Understand the Fundamentals of Blockchain Technology.</li> <li>To Analyze Distributed Systems and Consensus Mechanisms</li> <li>Apply Cryptographic Concepts in Blockchain</li> </ul>
<b>Course Outcomes:</b>	<p><b>CO1:</b> Understand the fundamentals of distributed ledger technologies, fault models, consensus algorithms, and the cryptographic foundations of blockchain systems.</p> <p><b>CO2:</b> Analyze the architecture, consensus mechanisms, and operational workflows of Blockchain 1.0 (Bitcoin) and Blockchain 2.0 (Ethereum), including smart contract development and execution.</p> <p><b>CO3:</b> Evaluate the structure and components of enterprise-grade permissioned blockchains such as Hyperledger Fabric, and examine their applications and modular design principles.</p> <p><b>CO4:</b> Assess privacy models, cryptographic technologies, security threats, and advanced defense mechanisms in blockchain networks, and explore emerging trends in privacy-preserving blockchain technologies.</p>
<b>Unit-I</b>	<p><b>Introduction to Distributed Ledger Technologies and Blockchain Fundamentals:</b>                  Rationale for Distributed Record Keeping in Modern Systems, Modeling Faults and Adversaries in Distributed Networks, Byzantine Generals Problem: Concept and Implications, Overview of Consensus Algorithms and Scalability Challenges, Origins of Blockchain: From Cryptography to Cryptocurrency, Core Technologies in Blockchain: Hash Pointers, Consensus Protocols, Byzantine Fault Tolerance, Digital Cash System</p> <p style="text-align: right;"><b>(8 Hrs)</b></p>



Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

<b>Unit-II</b>	<p><b>Foundations of Distributed Computing and Cryptography:</b>                      Atomic Broadcast and Consensus in Distributed Systems, Byzantine Fault Tolerance Models and Mechanisms, Cryptographic Primitives: Hash Functions (Collision Resistance, Puzzle-Friendliness), Digital Signatures and Public Key Cryptography, Verifiable Random Functions (VRFs), Zero-Knowledge Proofs and Systems.</p> <p style="text-align: right;"><b>(7 Hrs )</b></p>				
<b>Unit-III</b>	<p><b>Blockchain 1.0: Bitcoin and Its Challenges:</b>                      Bitcoin Blockchain Architecture and Operational Workflow, Challenges in Bitcoin: Scalability, Energy Consumption, Security, Consensus Mechanisms: Proof of Work (PoW) and Proof of Stake (PoS), Alternative Consensus Protocols and Their Trade-offs, Bitcoin Scripting Language and Transaction Capabilities.</p> <p style="text-align: right;"><b>(6 Hrs )</b></p>				
<b>Unit-IV</b>	<p><b>Blockchain 2.0: Ethereum and Smart Contracts:</b>                      Ethereum Platform and Smart Contract Fundamentals, Turing Completeness of Smart Contract Languages (Solidity, Vyper), Verification and Security Challenges in Smart Contracts, Practical Use Cases: Legal Agreements, Automated Transactions, Comparative Analysis: Bitcoin Scripting vs. Ethereum Smart Contracts.</p> <p style="text-align: right;"><b>(6 Hrs )</b></p>				
<b>Unit-V</b>	<p><b>Blockchain 3.0: Enterprise and Permissioned Blockchains:</b>                      Hyperledger Fabric Architecture and Components, Permissioned Blockchain: Features, Use Cases, and Advantages, Modular Design: Consensus, Membership Services, Chaincode, Plug-and-Play Mechanisms for Enterprise Adoption.</p> <p style="text-align: right;"><b>(6 Hrs )</b></p>				
<b>Unit-VI</b>	<p><b>Privacy, Security, and Emerging Challenges in Blockchain:</b>                      Privacy Models: Pseudo-anonymity vs. Full Anonymity, Privacy-preserving Technologies: Zcash, Zk-SNARKs, Bulletproofs, Common Attacks on Blockchains: Sybil Attacks, Selfish Mining 51% Attacks, Advanced Defense Mechanisms: Algorand's Pure Proof-of-Stake , Sharding-based Consensus Algorithms , Future Directions in Blockchain Security and Privacy.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>				
	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>

*gk*

<b>Textbooks and Reference Books</b>	1	'Blockchain Technology: Cryptocurrency and Applications'	S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan,	Oxford University Press, 2019	1st
	2	'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming'	Josh Thompson	Create Space Independent Publishing Platform, 2017.	1st
	3	"Mastering Blockchain"	Imran Bashir	-	-
	4	"Distributed Ledger Technologies: Principles and Applications"	K. R. R. Anjaneyulu, M. S. R. Anjaneyulu	-	-

**CO-PO mapping:**

Cos	PO1	PO2	PO3
CO1		1	
CO2	1		2
CO3	1	1	2
CO4		2	1

**CO-PSO mapping:**

COs	PSO1	PSO2	PSO3
CO1	1	1	
CO2	2		2
CO3		1	
CO4		2	1



Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

This page is left blank intentionally

**Master Copy**

Faculty of Science & Technology

Syllabus of M.Tech. ( COMPUTER SCIENCE & TECHNOLOGY) Semester – II

<p>Course Code: MCS562</p> <p>Course: Program Elective-2B</p> <p>Multimedia Forensics</p> <p><b>Teaching Scheme:</b> Theory: 03 Hrs</p>	<p>Credits: 3-0-0</p> <p>In Semester Examination-I: 15 Marks</p> <p>In Semester Examination-II: 15 Marks</p> <p>Teacher Assessment: 20 Marks</p> <p>End Semester Examination: 50 Marks</p> <p>End Semester Examination (Duration): 2 Hrs</p>
<b>Prerequisite</b>	<ul style="list-style-type: none"> <li>Basic knowledge of Digital Signal Processing</li> <li>Computer Vision and Image Processing fundamentals</li> <li>Programming skills in Python or MATLAB</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To provide students with a comprehensive understanding of multimedia content analysis and forensic methods.</li> <li>To equip learners with the ability to detect and investigate tampering in digital images, audio, and video content.</li> <li>To study tools, techniques, and algorithms for source identification, forgery detection, and content authentication.</li> </ul>
<b>Course Outcomes</b>	<p><b>CO1:</b> Understand the scope, types, and challenges of multimedia forensics, and analyze characteristics of digital evidence across image, video, audio, and document formats.</p> <p><b>CO2:</b> Apply forensic techniques for detecting image and video tampering such as copy-move forgery, deepfake detection, metadata analysis, and source device attribution.</p> <p><b>CO3:</b> Investigate audio forensics including speaker verification, tampering detection, and analysis of synthetic or AI-generated voices using signal processing and machine learning methods.</p> <p><b>CO4:</b> Utilize forensic tools and techniques for multimedia authentication, evaluate legal and ethical implications of evidence handling, and analyze real-world case studies involving multimedia manipulation.</p>
<b>Unit-I</b>	<p><b>Introduction to Multimedia Forensics :</b></p> <p>Need and scope of multimedia forensics, Types of digital content: image, video, audio, documents, Digital evidence characteristics, Multimedia data acquisition and storage formats, Overview of forensic challenges and applications.</p> <p style="text-align: right;"><b>(7 Hrs )</b></p>

*SUN*  
 Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

<b>Unit-II</b>	<p><b>Image Forensics :</b>                      Image acquisition and metadata analysis, Copy-move and splicing forgery detection, Photo manipulation and filtering traces, Error level analysis (ELA), PRNU (Photo Response Non-Uniformity) based device identification, JPEG compression analysis</p> <p style="text-align: right;"><b>( 8 Hrs )</b></p>				
<b>Unit-III</b>	<p><b>Video Forensics :</b>                      Frame analysis and temporal inconsistency detection, Video metadata and encoding patterns, Double compression detection, Frame duplication/insertion detection, Deepfake detection and AI-generated media, Source attribution for video devices.</p> <p style="text-align: right;"><b>( 6 Hrs )</b></p>				
<b>Unit-IV</b>	<p><b>Audio Forensics :</b>                      Basics of digital audio processing, Detection of editing and splicing in audio Noise and echo pattern analysis, Speaker recognition and verification, Audio source identification, Detection of synthetic and tampered voices (AI/ML approaches)</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>				
<b>Unit-V</b>	<p><b>Forensic Tools and Techniques:</b>                      Tools used in image/video/audio forensics (e.g., Cyber Sanskar Multimedia Forensics tool kit for Amped FIVE, Forensically, MATLAB toolkits), Use of machine learning and deep learning in forgery detection, Dataset collection and annotation for forensic research, Authentication and integrity verification methods, Blind and semi-blind forensic techniques.</p> <p style="text-align: right;"><b>(6 Hrs )</b></p>				
<b>Unit-VI</b>	<p><b>Legal, Ethical &amp; Case Studies :</b>                      Legal considerations in handling multimedia evidence, Chain of custody and admissibility in court, Cybercrime cases using multimedia evidence, Ethical implications in surveillance and AI-generated content, Notable case studies: news media forgery, biometric tampering, court trials.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>				
	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
	1.	Digital Image Forensics: There is More to a Picture than Meets the Eye	Husrev T. Sencar, Nasir Memon	Springer	1 <sup>st</sup> Edition
	2.	Multimedia Security: Steganography and Digital	Frank Y. Shih		1 <sup>st</sup> Edition

<b>Textbooks and Reference Books</b>		Watermarking Techniques for Protection of Intellectual Property		IGI Global	
	3.	Visualize This: The FlowingData Guide to Design, Visualization, and Statistics	Cathy O'Neil, Rachel Schutt	O' Reilly	1st Edition
	4.	Mathematical Statistics	MukhopadhyayP	Wiley	1st Edition

**CO-PO mapping:**

Cos	PO1	PO2	PO3
CO1			2
CO2	1	2	
CO3	1		2
CO4		1	2

**CO-PSO mapping:**

COs	PSO1	PSO2	PSO3
CO1		1	
CO2	1		2
CO3	1	1	
CO4			1



Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

**This page is left blank intentionally**

**Master Copy**

Faculty of Science & Technology

Syllabus of M.Tech. (COMPUTER SCIENCE & TECHNOLOGY) Semester – II

<p>Course Code: <b>MCS563</b></p> <p>Course: <b>Program Elective- 2C</b></p> <p>Remote Sensing &amp; GIS</p> <p><b>Teaching Scheme:</b> Theory: 3Hrs/week</p>	<p>Credits: 3-0-0</p> <p>In Semester Examination-I: 15 Marks</p> <p>In Semester Examination-II: 15 Marks</p> <p>Teacher Assessment: 20 Marks</p> <p>End Semester Examination: 50 Marks</p> <p>End Semester Examination (Duration): 2 hrs</p>
<b>Prerequisite</b>	<ul style="list-style-type: none"> <li>Image processing</li> <li>Computer Graphics.</li> </ul>
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To get acquainted with the concepts of Earth observation and remote data acquisition techniques.</li> <li>To understand the concepts of remotely sensed data processing and visualization.</li> <li>To apply data processing and visualization method.</li> </ul>
<b>Course Outcomes:</b>	<p><b>CO1:</b> Explain the physical principles of remote sensing, including electromagnetic radiation interactions, spectral signatures of Earth-surface features, and the historical development of remote-sensing technology in India and worldwide.</p> <p><b>CO2:</b> Compare remote-sensing platforms and sensors—passive vs. active, optical vs. radar—and select appropriate spatial, spectral, radiometric, and temporal resolutions (with suitable band combinations) for diverse environmental and engineering applications.</p> <p><b>CO3:</b> Apply visual and digital image-processing techniques—geo-referencing, rectification, registration, enhancement, and supervised/unsupervised classification—to interpret and extract information from remote-sensing data.</p> <p><b>CO4:</b> Integrate raster and vector datasets within a Geographic Information System (GIS) to perform spatial analyses, terrain mapping, and web-GIS visualization for informed decision-making and problem solving.</p>
<b>Unit-I</b>	<p><b>Fundamental of Remote Sensing :</b></p> <p>Principles of Remote sensing, History of Remote sensing, Remote sensing in India, Electromagnetic radiation, Electromagnetic Spectrum, EMR quantities, Nomenclature and Units, Thermal Emission and Radiation, Principles, Interaction of EMR with Earth Surface, Spectral signature, Reflectance Characteristics of earth cover type, Remote sensing systems, Human vision colors, Spectral signatures and their interpretation.</p> <p style="text-align: right;"><b>(6Hrs)</b></p>

<b>Unit-II</b>	<p><b>Remote Sensing Platforms and Sensors:</b>                  Platforms, Types of sensors, Sensor resolutions, Passive and Active sensors, Optical sensors, Classification of RS, Selection of sensor parameter, Spatial resolution, Spectral resolution, Radiometric resolution, Temporal resolution, Band combinations and optimum index factor, False and pseudo color composites, Errors in imaging process.</p> <p style="text-align: right;"><b>(6Hrs)</b></p>				
<b>Unit-III</b>	<p><b>Visual Image Interpretation:</b>                  Elements of image interpretation, Interpretation key, Hardware and software aspects of digital image processing, Concept of data editing, Properties of digital remote sensing data, concept of geo-referencing, Errors due to geo-referencing, Physical and mathematical models, Hybrid models, Rectification of Images, Interpolation methods in the rectification of images, nearest neighbor, bilinear and bi-cubic methods, Concepts of world file and embedding of projection information in the images.</p> <p style="text-align: right;"><b>(8Hrs)</b></p>				
<b>Unit-IV</b>	<p><b>Remote Sensing Image Processing:</b>                  Image Registration, Image Enhancement techniques, The Classification Process, Image Classification techniques, supervised and unsupervised techniques.</p> <p style="text-align: right;"><b>(7Hrs)</b></p>				
<b>Unit-V</b>	<p><b>Geographic Information System:</b>                  Definition of GIS, Elements of GIS, Coordinate system, Need for GIS, Data models, Raster and vector, GIS data acquisition, Data input for GIS, Integration of satellite images, Aerial photographs and GIS, Concept of web GIS.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>				
<b>Unit-VI</b>	<p><b>Data Exploration &amp; Analysis:</b>                  Data display and Cartography, Data exploration, Vector data analysis, Raster data analysis, Terrain Mapping, and analysis.</p> <p style="text-align: right;"><b>(6 Hrs)</b></p>				
	<b>Sr. No.</b>	<b>Title</b>	<b>Author</b>	<b>Publication</b>	<b>Edition</b>
	1.	Remote Sensing and Image Interpretation	Lillesand Kiefer, Chipman	Wiley Publications	

**Master Copy**

<b>Textbooks and Reference Books</b>	2.	Remote Sensing Models & methods for Image Processing	Robert A. Schowengerdt	Academic Press	3 <sup>rd</sup> Edition
	3.	Introduction to Geographic Information Systems	Kang- tsung Chang	Tata McGraw Hill	4 <sup>th</sup> Edition
	4.	Fundamental of Remote Sensing	George Joseph	Universities Press (India) Pvt. Ltd.	-
	5.	Remote Sensing- Principles & Applications	Dr, B C Panda	Viva Books Pvt. Ltd.	-
	6.	Introduction to Remote Sensing	J. B. Campbell and R. H. Wyne	Guilford Press, 2011	-

**CO-PO mapping:**

Cos	PO1	PO2	PO3
CO1			2
CO2	2	2	1
CO3	1		2
CO4		2	1

**CO-PSO mapping:**

COs	PSO1	PSO2	PSO3
CO1	1		1
CO2	2	1	2
CO3			
CO4	2	2	1

*S/S*

Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

This page is left blank intentionally

**Master Copy**

Faculty of Science &amp; Technology

**Syllabus of Second Year M. Tech (COMPUTER SCIENCE & TECHNOLOGY) Semester II**  
**Open Elective Course ( To be opted through MOOC Platform)****MOC571 to MOC580**

Sr No	Course Code	Course Title
01	MOC571	Intellectual Property & Patenting
02	MOC573	Ethics, Law & Society in AI
03	MOC574	Indian Constitution
04	MOC575	Indian Knowledge System
05	MOC576	Nano Technology
06	MOC577	Operation Research
07	MOC578	Engineering Optimization Technique
08	MOC579	Value Engg
09	MOC580	Innovative Teaching Pedagogy

Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)**Master Copy**

**Mil CSN**

**Maharashtra Institute of Technology**  
Chhatrapati Sambhajnagar  
(An Autonomous Institute)

**This page is intentionally left blank**

**Master Copy**

Faculty of Science & Technology

Syllabus of M.Tech. ( COMPUTER SCIENCE & TECHNOLOGY ) Semester – II

Course Code: MCS581

Course: Mini Project

Practical: 4 Hrs/week

Credits: 0-0-2

TA Marks: 25 Marks

ESE/Oral Exam :25 Marks

Objectives:


- To provide hands-on experience in identifying, analyzing, and solving a small-scale real-world or research problem.
- To develop practical skills in project planning, implementation, testing, and documentation.
- To foster critical thinking, teamwork, and technical writing skills.

Course Outcomes:

- CO1:** Formulate and analyze a technical or research problem and identify suitable objectives.
- CO2:** Apply appropriate theoretical knowledge, tools, and techniques to design and implement a working solution.
- CO3:** Evaluate, test, and analyze the developed solution, and document results effectively.
- CO4:** Demonstrate effective presentation, communication, and project management skills.

Students are required to complete the implementation of the mini project covering the following content.

1. **Problem Identification:** Study literature, surveys, and technology trends; finalize problem statement. (2-3 Weeks)
2. **Requirement Analysis & Design:** Define objectives, scope, functional requirements; design methodology, block diagrams, and algorithms. (2-3 Weeks)
3. **Implementation / Development:** Develop the project prototype/software/system using relevant tools, languages, or hardware platforms. (4-5 Weeks)
4. **Testing & Evaluation:** Test the system, validate results, analyze performance, optimize if required. (2-3 Weeks)
5. **Documentation:** Prepare project report including introduction, literature review, methodology, results, discussion, conclusion, and references. (1-2 Weeks)
6. **Presentation & Demonstration:** Prepare presentation and demonstrate project to faculty / peers. (1 Week)

  
 Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

## CO-PO Mapping

CO	PO1	PO2	PO3
CO1	3	3	2
CO2	3	3	3
CO3	3	2	2
CO4	2	2	1

## CO-PSO Mapping:

COs	PSO1	PSO2	PSO3
CO1			2
CO2	1	1	2
CO3	2		
CO4		1	2

  
Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)

**Master Copy**

Faculty of Science & Technology

Syllabus of M.Tech. ( COMPUTER SCIENCE & TECHNOLOGY ) Semester – II

Course Code: MCS591

Credits: 0-0-1

Course: Cyber Security Laboratory – 4

TA Marks: 25 Marks

Practical: 2 Hrs/week

**Course Outcomes:**

CO1: Understand fundamental concepts of cyber security, cyber attacks along with preventive measures.

CO2: Analyze various types of cybercrimes, social engineering, and cyber laws including IT Act, 2000 and global frameworks.

CO3: evaluate and implement cyber security management, compliance, and governance policies for data protection.

Experiments/ Project/ Assignment shall be based on the subject Cyber Security

- 1) Study of Common Cyber Security Terminologies and Threat Landscape
- 2) Demonstration of Malware Types (Virus, Trojan, Ransomware) in a Controlled Environment
- 3) Simulation of DoS / DDoS Attack using Tools (e.g., LOIC, Hping3)
- 4) Detection and Prevention of Phishing, Vishing, and Smishing Attacks
- 5) Hands-on Practice on Social Engineering Awareness and Case Studies
- 6) Study of IT Act, 2000 and Cyber Laws Related to Cyber Crimes
- 7) Analysis of Data Privacy and Data Protection Principles (PDP Bill, GDPR)
- 8) Study of Cyber Crime Reporting Procedure and Role of Cyber Police Stations
- 9) Development of Cyber Security Policy for an Organization
- 10) Conducting a Mini Cyber Security Audit or Risk Assessment Exercise

**CO & PO Mapping:**

CO	PO1	PO2	PO3
CO1	3	3	2
CO2	2	-	2
CO3	2	2	1

**CO-PSO Mapping**

CO	PSO1	PSO2	PSO3
CO1		2	1
CO2	1	1	
CO3	2		

*Signature*

Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

Faculty of Science &amp; Technology

Syllabus of M.Tech. (COMPUTER SCIENCE &amp; TECHNOLOGY ) Semester – II

Course Code: MCS592

Credits: 0-0-1(1)

Course: Advanced Data Science Laboratory – 5

TA Marks: 25 Marks

Practical: 2 Hrs/week

**Course Outcomes:**

CO1: Understand and apply methods of data presentation and descriptive statistics for real-world datasets.

CO2: Analyze relationships among variables using correlation and regression techniques.

CO3: Develop and interpret data visualizations using modern tools like Excel, Tableau, and Python for effective data storytelling.

Experiments/ Project/ Assignment of Lab-I shall be based on the subject Advance Data Science

- 1) Create frequency distribution tables for discrete and continuous data; draw histogram, frequency polygon, and cumulative frequency curve.
- 2) Identify variables as nominal, ordinal, discrete, or continuous using a given dataset.
- 3) Compute Mean, Median, Mode, Geometric Mean, and Harmonic Mean using sample datasets.
- 4) Calculate Range, Quartile Deviation, Mean Deviation, Standard Deviation, and Coefficient of Variation.
- 5) Analyze data symmetry and peakness using formulas and visual methods.
- 6) Compute Karl Pearson and Spearman correlation coefficients and plot scatter diagrams
- 7) Fit a regression line using least squares and interpret regression coefficients.
- 8) Demonstrate multiple and partial correlation using dataset of three variables.
- 9) Create visualizations using Tableau or Python for storytelling with data (bar, pie, line, area charts).
- 10) Represent trends, proportions, and correlations over time and space using real-world data (e.g., COVID, population, or weather data).

Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)**Master Copy**

Page 71 of 83

**CO-PO mapping:**

CO	PO1	PO2	PO3
CO1	3	2	–
CO2	3	3	2
CO3	2	2	3

**CO-PSO Mapping:**

CO	PSO1	PSO2	PSO3
CO1	3	2	1
CO2	1	-	2
CO3	2	1	



Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)

**Master Copy**

**M. Tech (Computer Science & Technology)**

**Semester-III**

**Detail Course Curriculum**

**(NEP 2020 Based Curriculum)**

**WEF AY 2025-26**

\*\*\*\*\*

**Master Copy**

**Faculty of Science & Technology**  
**Syllabus of Second Year M. Tech (Computer Science & Technology) (Semester III)**

Course Category: **Internship**  
Course Code: **MCS611**  
Course: **Internship**

**Credits: 0-0-8**  
Teacher Assessment: 100 Marks

**1. Period of Internship:**

Internship of 8 weeks (full-time, 36-40 hours per week) to be completed in the **summer vacation/break** in the respective field of specialization after the completion of the end semester examination of the **second semester** as per the guidelines of the department and the evaluation is to be done in the III semester.

**2. Objectives:** The internship aims to:

- Expose students to real-world professional environments in their field of specialization.
- Enable students to apply theoretical knowledge to practical engineering problems.
- Develop professional competencies, technical skills, and ethical practices.
- Encourage industry-academia collaboration for mutual learning and innovation.
- Promote understanding of project management, teamwork, & communication in an organizational context.

**3. Scope of Internship:**

Internship should be preferably in a reputed industry, R&D organization, government department, or academic research lab relevant to the specialization. The student should undertake activities in consultation with the employer and as per the instruction from the department. This Internship may be a project-oriented and should align with objectives but not limited to: Enhancing productivity, Cost reduction, Developing, improving, or effectively using software/systems, Implementing energy conservation measures, Applying process improvement techniques, Developing applications, Working with handling different materials, Engaging in hardware/software projects.

**4. Obligation of Students:**

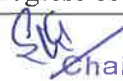
- Student must maintain a minimum attendance of 90% of total working days for the period of Internship.
- To learn subject field in Engineering/Technology consciously and diligently at the place of training.
- To abide by the Rules and Regulations of the Industry/Establishment in all matters of conduct and discipline.
- To carry out the obligation under the agreement of Internship.
- Except in case of extreme urgency, the M. Tech. student shall submit an application for all other leaves except the medical leave to the Manager/Gen. Manager (Personnel) of the concerned industry, where he/she is undergoing internship and obtain sanction before the leave is taken. In case of Medical Leave, he/she shall submit an application to Maharashtra Institute of Technology, Chhatrapati Sambhajinagar

**5. Maintenance of Record:**

Every student of M. Tech. course shall maintain a daily record of the work done by him/her relating to the internship available in Internship Instruction Manual.

**6. Monitoring of Internship:**

M.Tech. students are expected to follow all the rules and discipline of the industry. However, because of other academic requirements and the nature of the project, the student may have to work in other places outside the industry. The faculty and Industry supervisor will work out a suitable arrangement to review the progress of the work from time to time.

  
Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)

**Master Copy**

**7. Conduct and Discipline:**

In all matters of the conduct and discipline, M. Tech. student shall be governed by the rules and regulations (applicable to employees of the corresponding category) in the Establishment, where he/she is undergoing internship.

**8. Undertaking for the Internship:**

The M.Tech. Student undergoing for the Internship should provide the undertaking to the institute that institute/employing organization will not be responsible for any mishap / accident during the training/Internship period and any act contrary to law. Also, it is highly recommended to get insured by taking Accidental Insurance Policy before joining the internship for the prescribed training period.

**9. Holding of Test and Grant of Certificate:**

The progress in internship of every student shall be assessed by the industry and Maharashtra Institute of Technology faculty from time to time. Every M. Tech. student undergoing internship has to submit a certificate of completion and the document as per the formats provided by the department and as made applicable by the industry.

**10. Teacher's Assessment (Total 100 Marks):**

Component of Evolution	Evaluator	Maximum Marks
Internship Diary / Logbook	Faculty Mentor	05
Attendance, performance, attitude, skill, initiative, teamwork, discipline, etc.	Faculty Mentor based on reports/ evaluation received from Industry Supervisor/ Authority	15
Internal Reviews (minimum 2 )	Evaluation Committee at Department	50
Quality of the Internship report	Faculty Mentor	10
Final Presentation & Viva-Voce	Evaluation Committee at Department	20

**Course Outcomes (CO)**

CO	Statement	Bloom's Level
CO1	Identify and understand industrial processes, technologies, and organizational structure related to the field of specialization.	Understand
CO2	Apply theoretical and technical knowledge to solve real-world engineering problems in an industrial context.	Apply
CO3	Analyze and evaluate engineering practices, standards, and safety procedures adopted in the organization.	Analyze / Evaluate
CO4	Demonstrate professional behavior, teamwork, ethics, and communication skills in a multidisciplinary environment.	Apply / Evaluate
CO5	Prepare a comprehensive technical report and deliver a professional presentation summarizing internship work and outcomes.	Create

**CO-PO Mapping:**

CO	PO 1	PO 2	PO 3	
CO 1				
CO 2				
CO 3				
CO 4				
CO 5				

**Master Copy**



Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

Faculty of Science & Technology	
Syllabus of Second Year M.Tech (Computer Science & Technology) (Semester III)	
Course Category: <b>Research Project/Dissertation</b> Course Code: <b>MCS649</b> Course: <b>Dissertation-I</b> Teaching Scheme: Practical: 20 Hrs./week	<b>Credits: 0-0-10</b> Teacher Assessment: 200 Marks End Semester Examination: 100 Marks
	Students are expected to produce quality research project that addresses current problems of interest in the real world, demonstrate a mastery of skills learnt during their study in the Institute, and demonstrates writing skills semester. Each student is to carry out the independent Research Project in core domain of study starting from Semester III and Final submission of dissertation in Semester IV.
<b>Objectives</b>	<ul style="list-style-type: none"> <li>To identify a <b>research-worthy problem</b> in the specialization area.</li> <li>To conduct a <b>comprehensive literature review</b> and identify research gaps.</li> <li>To define clear <b>objectives, scope, and methodology</b>.</li> <li>To demonstrate <b>preliminary results or design/implementation progress</b>.</li> </ul>
<b>Course Outcomes</b>	After completing the dissertation-I phase, the student will be able to: <b>CO1:</b> To conduct a comprehensive literature Survey on in the area of specialization. <b>CO2:</b> Identify research gaps and formulate a research problem. <b>CO3:</b> Define research objectives, hypothesis, methodology, and work plan <b>CO4:</b> Prepare and present a progress report with academic integrity.

### CO-PO Mapping

CO	PO 1	PO 2	PO 3	
CO 1				
CO 2				
CO 3				
CO 4				

### ❖ Guidelines for Students

1. The research topic must be **relevant to the core domain** of the M. Tech specialization.
2. Each student shall work **individually under a supervisor** from the department. Co-supervision from other department/industry/research labs may be allowed.
3. Students should maintain a **logbook/progress diary** for keeping the discussion with the supervisor, recording activities, references, and results.
4. Students should submit **periodic progress reports** (monthly or as decided by department).
5. Research work must demonstrate **originality, novelty, or application-oriented contribution**.
6. Students are encouraged to refer the good quality journal/conference papers and citations.
7. Student has to submit **dissertation-I report in the prescribed format** mentioned here.

  
 Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**Master Copy**

**❖ Guidelines for Research Supervisor/s**

1. Guide students in selecting a **viable and research-worthy problem**.
2. Ensure that students follow **ethical research practices** and avoid plagiarism.
3. Regularly monitor student progress through **presentations and discussions**.
4. Encourage students to perform **in-depth literature survey, design of experiments**

**❖ Evaluation Strategies**

Total Marks: 300 (200 Internal + 100 External)

**Internal Evaluation (200 Marks)**

- Literature review & problem definition – 50 marks
- Research objectives & methodology – 50 marks
- Progress review seminars (at least 2 reviews) – 50 marks
- Draft report submission (Introduction, Literature Review, Methodology) – 50 marks

**External Evaluation (100 Marks)**

Conducted by an **External Examiner + Internal Examiner** (Supervisor/HoD):

- Dissertation-I Report Quality – 50 marks
- Presentation & Communication – 50 marks

**❖ Format of the Dissertation-I Report**


- **Paper size:** A4
- **Font:** Times New Roman, size 12, 1.5 line spacing
- **Margins:** Top 1.25", Bottom 1.25", Left 1.5", Right 1.0"
- **Page Numbering:** Roman (i, ii, iii) for initial pages; Arabic (1, 2, 3...) from Chapter 1 onwards
- **Figures/Tables:** Numbered chapter-wise (e.g., Fig. 3.2, Table 4.1)
- **References:** IEEE / APA format (as per departmental guidelines)
- **Binding:** Spiral

**❖ Typical Dissertation-I Report Scheme****Initial Pages**

1. Title Page
2. Certificate from Supervisor(s)
3. Declaration by Student
4. Acknowledgements
5. Abstract (100–150 words)
6. Table of Contents
7. List of Figures
8. List of Tables
9. List of Abbreviations / Symbols

**Chapter Scheme**

- Chapter 1: Introduction (problem definition, objectives, scope)
- Chapter 2: Literature Review (research gaps identified)
- Chapter 3: Research Methodology (planned methods, tools, datasets)
- Preliminary results (if available)
- References

  
Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)

**Master Copy**

**This page is left blank intentionally**

**Master Copy**

**M. Tech (Computer Science & Technology)**

**Semester-IV**

**Detail Course Curriculum**

(NEP 2020 Based Curriculum)

**WEF AY 2025-26**

\*\*\*\*\*

**Master Copy**

Faculty of Science & Technology	
Syllabus of Second Year M.Tech (Computer Science & Technology) (Semester IV)	
Course Category: <b>Research Project/Dissertation</b> Course Code: <b>MCS699</b> Course: <b>Dissertation-II</b> Teaching Scheme: Practical: 42 Hrs./week	<b>Credits: 0-0-21</b> Teacher Assessment: 300 Marks Final viva-voce Examination: 200 Marks
<b>Prerequisite</b>	This is a continuation of work in research project identified in semester III, where each student is doing the independent Research Project in core domain of study.
<b>Objectives</b>	1. To provide students with an opportunity to conduct <b>independent research</b> in a specialized area of engineering/technology. 2. To enable students to apply research methodologies, tools, and techniques to address a <b>problem of significance</b> in their domain. 3. To develop critical thinking, analytical ability, technical writing, and professional presentation skills. 4. To encourage innovation, original contributions, and possible publications/patents in the chosen area.
<b>Course Outcomes</b>	After completing the dissertation, the student will be able to: <ul style="list-style-type: none"> <li>• <b>CO1:</b> Apply appropriate research methodology, tools, and techniques to investigate the problem.</li> <li>• <b>CO3:</b> Analyze and interpret experimental/simulation results and draw meaningful conclusions.</li> <li>• <b>CO3:</b> Evaluate experimental/simulation results/findings with the research objectives/hypothesis.</li> <li>• <b>CO4:</b> Document and present research work effectively in the form of a dissertation and defend it in oral examinations.</li> </ul>


**Important to note:**

1. Students are expected to produce quality research projects (identified in semester III) that addresses current problems of interest in the real world, demonstrate a mastery of skills learnt during their study in the Institute, and demonstrates writing skills.
2. Student should go through the Academic rules and regulations for the requirement and procedure of submitting/undergoing examination/assessments for the dissertation

**CO-PO Mapping**

CO	PO 1	PO 2	PO 3	
CO 1				
CO 2				
CO 3				
CO 4				

**Master Copy**

 Chairman Board of Studies  
 Computer Science & Engineering  
 MIT Aurangabad  
 (An Autonomous Institute)

**❖ Guidelines for Students**

8. The research topic must be **relevant to the core domain** of the M. Tech specialization.
9. Each student shall work **individually under a supervisor** from the department. Co-supervision from other department/industry/research labs may be allowed.
10. Students should maintain a **logbook/progress diary** for keeping the discussion with the supervisor, recording activities, references, and results.
11. Students should submit **periodic progress reports** (monthly or as decided by department).
12. Research work must demonstrate **originality, novelty, or application-oriented contribution**.
13. Students are encouraged to publish papers in **peer-reviewed journals or conferences** based on their dissertation work.
14. Final submission should follow the prescribed **dissertation format** mentioned here.

**❖ Guidelines for Research Supervisor/s**

5. Guide students in selecting a **viable and research-worthy problem**.
6. Ensure that students follow **ethical research practices** and avoid plagiarism.
7. Regularly monitor student progress through **presentations and discussions**.
8. Encourage students to perform **in-depth literature survey, design of experiments, and analysis**.
9. Support students in preparation of **research papers/patents**.
10. Certify the student's work before submission for **external examination**.

**❖ Evaluation Strategies**

Total Marks: 500 (300 Internal + 200 External)

**Internal Evaluation (300 Marks)**

- **Problem formulation & extended literature survey** – 20 marks
- **Research methodology & design of research work** – 30 marks
- **Research project implementation (Hardware/Software)** – 50 marks
- **Progress review presentations (minimum 2 reviews)** – 50 marks
- **Draft dissertation quality** – 50 marks
- **Regularity, logbook maintenance** – 50 marks,
- **publications/patents (as per the quality of Journal/Conference)** – 50 marks

**External Evaluation (200 Marks)**

Conducted by an **External Examiner + Internal Examiner (Supervisor/HoD)**:

- **Final Dissertation Report Quality** – 50 marks
- **Oral Defense / Viva-voce** – 50 marks
- **Presentation & Communication** – 50 marks
- **Novelty/Contribution/Outcome (Publication, Prototype, Patent)** – 50 marks

  
Chairman Board of Studies  
Computer Science & Engineering  
MIT Aurangabad  
(An Autonomous Institute)

**Master Copy**

**❖ Format of the Dissertation Report**

- **Paper size:** A4
- **Font:** Times New Roman, size 12, 1.5 line spacing
- **Margins:** Top 1.25", Bottom 1.25", Left 1.5", Right 1.0"
- **Page Numbering:** Roman (i, ii, iii) for initial pages; Arabic (1, 2, 3...) from Chapter 1 onwards
- **Figures/Tables:** Numbered chapter-wise (e.g., Fig. 3.2, Table 4.1)
- **References:** IEEE / APA format (as per departmental guidelines)
- **Binding:** Hardbound with black cover & golden embossing

**❖ Typical Dissertation Report Scheme****Initial Pages**

10. Title Page
11. Certificate from Supervisor(s)
12. Declaration by Student
13. Acknowledgements
14. Abstract (300–500 words)
15. Table of Contents
16. List of Figures
17. List of Tables
18. List of Abbreviations / Symbols

**Chapter Scheme**

1. **Chapter 1: Introduction**
  - Background, problem statement, objectives, scope, organization of dissertation.
2. **Chapter 2: Literature Review**
  - Related work, critical review, research gap identification.
3. **Chapter 3: Research Methodology**
  - Approach, algorithms, models, tools, datasets, design of experiments.
4. **Chapter 4: Implementation / Experimentation**
  - Development, experiments, case studies, data collection.
5. **Chapter 5: Results and Discussion**
  - Results obtained, performance analysis, validation, comparison with existing work.
6. **Chapter 6: Conclusions and Future Work**
  - Major findings, limitations, future scope of research.

**End Pages**

- References (APA/IEEE/ASME format/as per department instructions)
- Appendices (if any)
- List of Publications based on the research work

This page is left blank intentionally

**Master Copy**