

IFTM University Moradabad

Course Structure & Evaluation Scheme

M.Tech. Computer Science & Engineering
(Effective from Session 2022-23)



आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

Sanjeev Kumar
REGISTRAR
IFTM UNIVERSITY
MORADABAD.

YEAR: I**SEMESTER: I**

S.NO	COURSE CODE	COURSE NAME	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
			L	T	P	TA	AT	CT	Total			
1.	MCS101	Advanced Distributed Systems	3	1	0	5	5	10+10	30	70	100	4
2.	MCS102	Elective –I	3	1	0	5	5	10+10	30	70	100	4
3.	MCS103	Advanced Computer Architecture	3	1	0	5	5	10+10	30	70	100	4
4.	MCS104N	Soft Computing	3	1	0	5	5	10+10	30	70	100	4
PRACTICALS/Seminar/Projects												
5.	MCS155	Computer System Lab-1	0	0	2	10	10	30	50	50	100	2
											500	18

Year: II**Semester-III**

S.NO	COURSE CODE	COURSE NAME	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
			L	T	P	TA	AT	CT	Total			
1.	MCS301	Elective III	3	1	0	5	5	10+10	30	70	100	4
2.	MCS302	Elective IV	3	1	0	5	5	10+10	30	70	100	4
3.	MCS303	Independent Study and Seminar	0	0	2	10	10	80	100	--	100	2
PRACTICALS/Seminar/Projects												
4.	MCS354	Pre-Dissertation	0	0	2	10	10	30	50	150	200	4
											500	14

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YEAR: I

SEMESTER: II

S.NO	COURSE CODE	COURSE NAME	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
			L	T	P	TA	AT	CT	Total			
1.	MCS201	Advanced Computer Networks	3	1	0	5	5	10+10	30	70	100	4
2.	MCS202	Computer Vision and Image Processing	3	1	0	5	5	10+10	30	70	100	4
3.	MCS203	Cloud Computing	3	1	0	5	5	10+10	30	70	100	4
4.	MCS204	Elective-II	3	1	0	5	5	10+10	30	70	100	4
PRACTICALS/Seminar/Projects												
5.	MCS255	Computer System Lab-2	0	0	2	10	10	30	50	50	100	2
											500	18

Year: II

Semester: IV

S.NO	COURSE CODE	SUBJECT	PERIODS			SESSIONAL				ESE	TOTAL	CREDITS
			L	T	P	TA	AT	CT	Total			
PRACTICALS/Seminar/Projects												
1.	MCS451	Dissertation	0	0	30	150	50	150	350	150	500	15


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List of Electives (CSE)

Elective-I

COURSE CODE	NAME OF THE ELECTIVE
MCS102(1)	Advanced Algorithms
MCS102(2)	Advanced Graph Theory
MCS102(3)	Embedded Systems

Elective III

COURSE CODE	NAME OF THE ELECTIVE
MCS301(1)	Data Mining & Warehousing
MCS301(2)	Research methodology
MCS301(3)	AI & neural network

Elective IV

COURSE CODE	NAME OF THE ELECTIVE
MCS302(1)	Human resource management
MCS302(2)	Digital Forensic
MCS302(3)	Bio-informatics


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List of Electives (CSE)

Elective II

COURSE CODE	NAME OF THE ELECTIVE
MCS204(1)	Cluster and Grid Computing
MCS204(2)	Sensor networks
MCS204(3)	System Security



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Department of Computer Science & Engineering

Programme	Mater of Technology(M.Tech)			Branch	Computer Science & Engineering (CSE)		
Semester	1			Version			
Effective from Academic Year				2021-2022	Effective for the Batch Admitted in		2021
Subject Code		MCS 101		Subject Name	ADVANCED DISTRIBUTED SYSTEMS		
Teaching Scheme				Examination Scheme(Marks)			
Per Week	Lecture		Practical(Lab)				Total
	L	T	P	TW		TS/PS	TE/PE
Credit	3	1	0	-	4	Theory	30
Hours	3	1	0	-	4	Practical	70
						-	--
							100
							-

COURSE OBJECTIVE

1. To teach fundamentals and various types of distributed systems.
2. To educate Distributed Deadlock Detection for skill development.
3. To teach Distributed Objects and Remote Invocation.
4. To introduce the Transactions and Concurrency Control for skill improvement.
5. To implements various Distributed Algorithms.

Syllabus

Unit-I

Characterization of Distributed Systems: Introduction. Examples of distributed Systems. Resource sharing and the Web Challenges. System Models- Architectural models, Fundamental Models Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination detection. Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem. Token based and non-token based algorithms for skill development, performance metric for distributed mutual exclusion algorithms.

Unit-II

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms. Agreement Protocols- Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem helps in skill development. Application of Agreement problem, Atomic Commit in Distributed Database system.

Unit-III

Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications. Security: Overview of security techniques, Cryptographic algorithms, Digital signatures Cryptography pragmatics, Case studies: Needham Schroeder, Kerberos, SSL & Millicent. Distributed File Systems: File service architecture, Sun Network File System, The Andrew File System and recent advances.

Unit-IV

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication for skill development, Fault - tolerant services, highly available services. Transactions with replicated data.

Unit-V

Distributed Algorithms: Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching, Introduction to Wave & traversal algorithms, Election algorithm. Case Studies: CORBA and RMI helping in employability.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	To learn fundamentals of distributed systems for skill development.

Note: Adhere to the latest editions of the Suggested Readings

CO2	Understand the concepts and issues related to Distributed Deadlock Detection for skill development.
CO3	Studied about security of distributed systems for employability
CO4	Studied the Transactions and Concurrency Control for skill development.
CO5	Design and develop the programs that are globally accepted for distributed environment helpful for employability.

PO-CO Mapping (Please write 3, 2,1 wherever required)
 (Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	3	1	1	1	1	1	1
CO2	3	3	1	2	1	1	1	1	2	1
CO3	3	3	1	1	1	1	1	1	1	1
CO4	2	3	2	3	1	1	1	1	1	1
CO5	2	1	3	3	3	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)
 (Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	3	1	1
CO3	1	2	1
CO4	3	1	1
CO5	2	3	1

SUGGESTED READINGS:

- Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
- Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design" Pearson Ed.
- Gerald Tel, "Distributed Algorithms", Cambridge University Press

SUGGESTED WEBSITES:

- swayam.gov.in
- <https://particular.net/adsc>
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>

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Note: Adhere to the latest editions of the Suggested Readings

Elective-I
Department of Computer Science & Engineering

Programme	Mater of Technology(M.Tech)	Branch	Computer Science & Engineering (CSE)						
Semester	1	Version							
Effective from Academic Year	2021-2022	Effective for the Batch Admitted in	2021						
Subject Code	MCS 102 (1)	Subject Name	ADVANCED ALGORITHMS						
Teaching Scheme			Examination Scheme(Marks)						
Per Week	Le ctu re	Practical(Lab)	Total	TS/PS	TE/PE	Total			
	L	T	P	TW					
Credit	3	1	0	-	4	Theory	30	70	100
Hours	3	1	0	-	4	Practical	-	--	-

COURSE OBJECTIVE

- Analyze the asymptotic performance of algorithms for skill development.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis for skill development.
- Synthesize efficient algorithms in common engineering design situations.

Syllabus

UNIT I

Recurrences - Master Method, Probability, AVL Trees, Red-Black Trees, Augmenting Data Structures for skill development

UNIT II

Amortized Analysis, Optimal Binary Search Trees, Priority Queues, Binomial Heaps, Fibonacci Heaps. Medians/Selection for skill development.

UNIT III I

Graph Algorithms Minimum Spanning Trees, Brief review of Prim, Kruskal's Algorithm. Max-Flow/Bipartite Matching. Preflow-push methods. Vertex and edge connectivity, Depth-First Search, Biconnected Components for skill development.

UNIT IV

String Matching, Knuth-Morris-Pratt Algorithm, Rabin-Karp Algorithm, Suffix Trees. Matrices: Strassen's Matrix Multiplication for skill development.

UNIT V

Computational Geometry, Intractability, Sample Intractable Problems, Complexity Classes, Reductions, Polynomial-Time Approximation, Parallel Algorithms/P-Completeness* for skill development.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	Describe analysis techniques for algorithms for skill development.
CO2	Identify appropriate data structure and design techniques for different problems skill development.
CO3	Identify appropriate algorithm to be applied for the various global application like geometric modeling, robotics, networking, etc.. for employability.
CO4	Appreciate the role of probability for skill development.
CO5	Learn and Analyze Computational Geometry, Complexity Classes, Reductions and Polynomial-Time Approximation for skill development and employability.

PO-CO Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
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Note: Adhere to the latest editions of the Suggested Readings

CO1	3	3	1	3	2	2	1	1	1	1
CO2	1	3	3	3	1	1	1	1	1	1
CO3	1	1	2	3	1	1	1	1	1	1
CO4	3	3	1	1	1	1	1	1	1	1
CO5	3	3	1	3	1	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)
 (Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	3	1	1
CO3	2	1	1
CO4	3	1	1
CO5	3	2	1

SUGGESTED READINGS:

- S. Baase, Computer Algorithms, Introduction to Design and Analysis, 2nd edition, Addison-Wesley, 1988
- R.L. Graham, D.E. Knuth, and O. Patashnik, Concrete Mathematics, Addison-Wesley, 1989.
- D. Gusfield, Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology, Cambridge University Press, 1997.
- D. Gusfield and R. Irving, The Stable Marriage Problem: Structure and Algorithms, MIT Press, 1989.
- E. Horowitz and S. Sahni, Fundamentals of Computer Algorithms, Computer Science Press, 1978.
- D.E. Knuth, The Art of Computer Programming, Vols. 1 and 3, Addison-Wesley
- Cormen, Leiserson, Rivest, Introduction to Algorithms, MIT Press, 1990.

SUGGESTED WEBSITES:

- <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-854j-advanced-algorithms-fall-2008/lecture-notes/>
- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm

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Note: Adhere to the latest editions of the Suggested Readings

Department of Computer Science & Engineering

Programme		Mater of Technology(M.Tech)			Branch		Computer Science & Engineering (CSE)		
Semester		1			Version				
Effective from Academic Year				2021-2022		Effective for the Batch Admitted in			2021
Subject Code			MCS 102 (2)			Subject Name		ADVANCED GRAPH THEORY	
Teaching Scheme					Examination Scheme(Marks)				
Per Week	Lecture		Practical(Lab)		Total		TS/PS	TE/PE	Total
	L	T	P	TW					
Credit	3	1	0	-	4	Theory	30	70	100
Hours	3	1	0	-	4	Practical	-	--	-

COURSE OBJECTIVE

Networks are ubiquitous and fundamental in the modern world, whether they are computer networks, transport networks, food webs, polymer chains, social networks and so on. Graph theory is the mathematics of networks helps in skill development.

Syllabus

UNIT I

Automorphism group of graphs, Group of composite graph, Graphs with a given group, Frucht's theorem, Symmetric graphs, An edge transitive graph without isolated vertices is either vertex transitive or bipartite. Ring sum of two cycles in a graph is either a cycle or an edge disjoint union of cycles, Vector spaces associated with a graph for skill development, Basic vectors of a graph. Subspaces in WG.

UNIT II

Cycle subspace W_r and cut-set subspace W_s , Bases of W_r and W_s , orthogonal vectors and spaces, Intersection of join of W_r and W_s , Matchings- Basic concepts, Matchings and 1-factors, Berg's theorem, Hall's theorem for skill development, 1- factor theorem of Tutte, Every k-regular and k-1 edge connected graph with even order has a 1- factor, Anti factor sets, Number of 1- factors.

UNIT III

F- factor theorem, f- factor theorem implies 1- factor theorem, Erdo's-Galli theorem on degree sequences follows from the 1-factor theorem, [a, b] factor theorem, [a, b] factors, Degree factors, k- factor theorem, General concepts and results on factorization, Factorization of K_n Graph theory in operation Research- Transport networks, Maximal flow cut and its capacity, Max-Flow Min-cut theorem, Multiple sources and sinks, Vertices with specified capacity for employability.

UNIT IV

Networks containing undirected edges, lower bound on edge flows, Minimal cost flows, Multi commodity flow, topological sorting, Critical path, Graphs in game theory, Kernel of a digraph, Every acyclic digraph has a unique kernel for skill development.

UNIT V

Connectedness and components algorithm, Optimization algorithms-Kruskal's algorithm, Prim's algorithm, Dijkstra's algorithm, Floyd's algorithm, Set of fundamental cycles algorithm, Cut vertices and separability algorithm, Directed cycles algorithm, shortest path algorithm, Planarity testing algorithm, and Isomorphism algorithm for skill development.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	Formulate complex problems using appropriate graph-theoretic terminology for skill development.
CO2	Appreciate the role of graph theory in other areas of mathematics for skill development.
CO3	Apply sophisticated mathematical methods in the setting of graph theory for skill development and employability.
CO4	Apply topological sorting for finding the path in game theory for skill development.
CO5	Formulate the optimization algorithm and isomorphism algorithm that can be used for national/ international interest for skill development.

Note: Adhere to the latest editions of the Suggested Readings

PO-CO Mapping (Please write 3, 2,1 wherever required)
 (Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	1	3	1	1	1	1	1	1
CO2	3	1	3	3	1	1	1	1	1	1
CO3	3	3	1	2	2	1	1	1	1	1
CO4	3	1	1	3	1	1	1	1	1	1
CO5	3	1	2	1	2	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)
 (Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	1	1	1
CO3	3	2	1
CO4	2	1	1
CO5	3	1	1

SUGGESTED READINGS:

- Frank Harary : Graph Theory, Addison- Wisley.
- K.R Parthasarty: Basic Graph Theory, Tata Mc-Graw Hill
- Foulds, Graph Theory with Applications
- Narsingh Deo : Graph Theory with Applications to Engineering and Computer Sciences, P-III.
- C.Berge : The theory of Graphs and Its applications, Methuen and Co., London

SUGGESTED WEBSITES:

- <https://ocw.mit.edu/courses/mechanical-engineering/2-158j-computational-geometry-spring-2003/lecture-notes/>
- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm


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Department of Computer Science & Engineering

Programme		Mater of Technology(M.Tech)			Branch		Computer Science & Engineering (CSE)		
Semester		1			Version				
Effective from Academic Year				2021-2022		Effective for the Batch Admitted in			2021
Subject Code		MCS 102 (3)			Subject Name		EMBEDDED SYSTEM		
Teaching Scheme					Examination Scheme(Marks)				
Per Week	Lecture		Practical(Lab)		Total		TS/PS	TE/PE	Total
	L	T	P	TW					
Credit	3	1	0	-	4	Theory	30	70	100
Hours	3	1	0	-	4	Practical	-	--	-

COURSE OBJECTIVE

- To Know the characteristics of embedded systems dependent on application domain
- To Know the mechanisms behind the state-of-the-art architectures for embedded systems skill development
- To Evaluate the features of the various architectures
- To Select the embedded architecture which is most suitable for different applications
- To Study performance evaluation and optimization methods.

Syllabus

UNIT-1

Definition of embedded system - Constraints on embedded vs. standalone systems - Concept of real-time design - Time scales for real-time systems - Embedded system design processes Applications for skill development - Embedded Systems design process – Formalisms for System Design - Design example

UNIT-2

Overview of computer architecture – Embedded Processors - Case studies of INTEL, MOTOROLA, RISC and DSP – Embedded Computing Platform – CPU Bus – Memory systems: Bus Snooping – Basic Peripherals: PC Bus, UART – Interrupts and exceptions - Component interfacing Designing with microprocessors – Development and Debugging for employability.

UNIT-3

Program design and Analysis – Introduction to Program design – Models of programs – Assembly and Linking – Basic compilation techniques Optimization: Time, Energy, Power, and Size for skill development.

UNIT-4

Processes and Operating systems – Multiple tasks and multiple processes – Context switching – Scheduling Policies – Interprocess communication Device drivers – Embedded Operating systems – POSIX standard for skill development.

UNIT-5

Evaluating system performance: Correctness - Speed - Profiling system performance - Performance optimization: Hand-optimization - Optimizing compilers -Pareto principle skill development.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	Compare embedded system design models using different processor technologies for skill development.
CO2	Describe and compare the various types of peripherals used in global embedded systems for employability
CO3	Analyze a given embedded system design and identify its performance critical points for skill development.
CO4	Understand processes and operating system for skill development.
CO5	Evaluating system performance by Optimizing compilers for skill development

PO-CO Mapping (Please write 3, 2,1 wherever required)

Note: Adhere to the latest editions of the Suggested Readings

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	1	1	1	1	1	1
CO2	3	3	1	1	1	1	1	1	1	1
CO3	1	1	3	3	3	1	1	1	1	1
CO4	2	3	3	3	3	1	1	1	1	1
CO5	2	2	1	3	3	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	3	2	1
CO3	2	1	1
CO4	3	1	1
CO5	3	1	1

SUGGESTED READINGS:

- Wayne Wolf "Computers as Components: Principles of Embedded Computer Systems Design" Morgan Kaufmann, 1st edition (September 2000) ISBN-13: 978-1558605411
- Steve Heath "Embedded Systems Design" Newnes (2002) ISBN-13: 978-0750655460
- Tammy Noergaard "Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers" Newnes (February 24, 2005) ISBN-13: 978-0750677929
- Raj Kamal "Embedded Systems: Architecture, Programming and Design" McGraw-Hill Education (India): 2nd Edition edition (March 9, 2009) ISBN-13: 978-0070151253
- K V K K Prasad "Embedded/Realtime Systems: Concepts, Design and Programming"

SUGGESTED WEBSITES:

- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm


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Department of Computer Science & Engineering

Programme	Mater of Technology(M.Tech)			Branch	Computer Science & Engineering (CSE)		
Semester	1			Version			
Effective from Academic Year				2021-2022	Effective for the Batch Admitted in		2021
Subject Code		MCS 103		Subject Name	ADVANCED COMPUTER ARCHITECTURE		
Teaching Scheme				Examination Scheme(Marks)			
Per Week	Lecture		Practical(Lab)		Total		
	L	T	P	TW		TS/PS	TE/PE
Credit	3	1	0	-	4	Theory	30
Hours	3	1	0	-	4	Practical	70
						-	--
							100
							-

COURSE OBJECTIVE

1. To describe basic structure of the computer system.
2. To demonstrate the arithmetic algorithms for solving ALU operations.
3. To describe instruction level parallelism and hazards in typical processor pipeline
4. To describe superscalar architectures, multi-core architecture and their advantages
5. To demonstrate the memory mapping techniques

Syllabus

Unit-I

Parallel computer models: The state of computing, Classification of parallel computers, Multiprocessors and multicomputer, Multifactor and SIMD computers.

Program and network properties: Conditions of parallelism, Data and resource Dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain Size and latency, Program flow mechanisms, Control flow versus data flow, Data flow Architecture for skill development, Demand driven mechanisms, Comparisons of flow mechanisms

UNIT II

Pipelining: Linear pipeline processor, nonlinear pipeline processor, Instruction pipeline Design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch Handling techniques, branch prediction, Arithmetic Pipeline Design, Computer arithmetic principles, Static Arithmetic pipeline, Multifunctional arithmetic pipelines helping in for skill development.

UNIT III

Arithmetic for computers: Signed and unsigned Numbers, Addition and Subtraction, Multiplication, Division, Floating Point, CPU Performance and Its factors, evaluating performance of CPU useful for employability.

UNIT IV

Memory Hierarchy: Introduction, The basics of Cache, Measuring and Improving of Cache Performance, Virtual Memory, Common framework for memory hierarchies for skill development

UNIT V

Enterprise Memory subsystem Architecture: Enterprise RAS Feature set: Machine check, hot add/remove, domain partitioning, memory mirroring/migration, patrol scrubbing, fault tolerant system for skill development.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	To learn computer structures for skill development.
CO2	Understand the concepts of arithmetic algorithms for solving ALU operations for skill development.
CO3	Studied about instruction level parallelism and hazards in typical processor pipeline helps in employability.



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CO4	For skill improvement be aware of the superscalar architectures, multi-core architecture and their advantages over other global architectures.
CO5	Studied the memory mapping techniques for skill development.

PO-CO Mapping (Please write 3, 2,1 wherever required)
 (Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	2	1	1	2	1	1	1	1
CO2	1	3	1	3	1	1	1	1	1	1
CO3	1	3	1	3	1	1	1	1	1	1
CO4	2	1	3	2	1	1	1	2	1	1
CO5	2	1	1	3	3	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)
 (Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	3	1	1
CO3	1	3	1
CO4	2	1	1
CO5	3	1	1

SUGGESTED READINGS:

- Kai Hwang, "Advanced computer architecture"; TMH. 2000
- D. A. Patterson and J. L. Hennessey, "Computer organization and design", Morgan Kaufmann, 2nd Ed. 2002
- M. Morris Mano, "Computer System Architecture", PHI 3rd Ed. 2004

SUGGESTED WEBSITES:

- <http://cs.baylor.edu/~maurer/aida/courses/archintro.pdf>.
- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm


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Department of Computer Science & Engineering

Programme		Mater of Technology(M.Tech)			Branch		Computer Science & Engineering (CSE)		
Semester		1			Version				
Effective from Academic Year				2021-2022		Effective for the Batch Admitted in 2021			
Subject Code			MCS 104N			Subject Name		SOFT COMPUTING	
Teaching Scheme					Examination Scheme(Marks)				
Per Week	Lecture		Practical(Lab)		Total		TS/PS	TE/PE	Total
	L	T	P	TW					
Credit	3	1	0	-	4	Theory	30	70	100
Hours	3	1	0	-	4	Practical	-	--	-

COURSE OBJECTIVE

1. To explain the Neural Networks.
2. To teach Fuzzy Logic for skill development.
3. To describe the Fuzzy Arithmetic.
4. To describe the Neuro-Fuzzy Systems for skill development.
5. To be aware of the Genetic Algorithm

Syllabus

UNIT I

Neural Networks: History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks for skill development.

UNIT II

Fuzzy Logic: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation, Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations for skill development

UNIT III

Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations, Fuzzy Logic: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Uncertainty based Information, Information & Uncertainty, No specificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets are helping in skill development.

UNIT IV

Introduction of Neuro-Fuzzy Systems: Architecture of Neuro Fuzzy Networks for skill development. Application of Fuzzy Logic: Medicine, Economics etc.

UNIT V

Genetic Algorithm: An Overview, GA in problem solving, and Implementation of GA for employability.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	Ability to analyze and appreciate the Neural Networks for skill development.
CO2	Ability to design Fuzzy Logic for skill development.
CO3	Ability to understand Fuzzy Arithmetic for skill development.
CO4	Ability to appreciate the importance of the Neuro-Fuzzy Systems for skill development.
CO5	Students would understand the efficiency of the Genetic Algorithm and its various applications in solving some Global issues for employability.

PO-CO Mapping (Please write 3, 2,1 wherever required)
 (Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

Note: Adhere to the latest editions of the Suggested Readings

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3	2	2	1	1	1	1	1	1
CO2	2	2	3	1	1	1	1	1	2	1
CO3	3	3	2	2	1	1	1	1	1	1
CO4	1	3	2	3	1	1	1	1	1	2
CO5	3	3	3	1	3	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)
 (Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	3	1	1
CO3	2	1	1
CO4	3	1	1
CO5	1	3	1

SUGGESTED READINGS:

- "Introduction to the Theory of Neural Computation", Hertz J. Krogh, R.G. Palmer, Addison-Wesley, California, 1991.
- "Fuzzy Sets & Fuzzy Logic", G.J. Klir & B. Yuan, PHI, 1995.
- "An Introduction to Genetic Algorithm", Melanie Mitchell, PHI, 1998.
- "Soft computing and Intelligent System Design", F. O. Karray and C. de Silva, Pearson, 2009.
- "Neural Networks-A Comprehensive Foundation", Prentice-Hall International, New Jersey, 1999.
- "Neural Networks: Algorithms, Applications and Programming Techniques", Freeman J.A. & D.M. Skapura, Addison Wesley, Reading, Mass, (1992).

SUGGESTED WEBSITES:

- <https://lecturenotes.in/subject/124/soft-computing-sc>
- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm



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Department of Computer Science & Engineering

Programme	Mater of Technology(M.Tech)			Branch	Computer Science & Engineering (CSE)				
Semester	2			Version					
Effective from Academic Year				2021-2022	Effective for the Batch Admitted in		2021		
Subject Code		MCS 201		Subject Name	ADVANCED COMPUTER NETWORK				
Teaching Scheme				Examination Scheme(Marks)					
Per Week	Lecture		Practical(Lab)	Total		TS/PS	TE/PE	Total	
	L	T	P	TW					
Credit	3	1	0	-	4	Theory	30	70	100
Hours	3	1	0	-	4	Practical	-	--	-

COURSE OBJECTIVE

1. To understand the fundamental concepts of computer networking and provide the knowledge of different protocols at different layers of models for skill development.
2. To understand the techniques used to share network bandwidth among the multiple users and provide the depth knowledge of DLL fundamentals.
3. Learn how the data is transferred between the computers over the network.
4. Studied internet routing protocols and also QoS based protocols.
5. Study of various network simulators.

Syllabus

UNIT I

Review of Physical Layer, Data link layer, LAN Technologies, ISDN, Frame-relay & ATM. Data link Protocol helps in skill development

UNIT I

Network Layer: ARP, RARP, ICMP, Routing Algorithms and Protocols. Router Operation, Router Configuration helping in employability. Internetworking, IPv4 Protocol, IPv6 (an overview).

UNIT III

User Datagram Protocol: Header, Checksum and Port Numbers. Transmission Control Protocol: Services and Headers, Connection establishment and Termination, Timeout of Connection Establishment and TCP timeout and retransmission. Maximum Segment Size. Reset Segments, TCP options for skill development.

UNIT IV

Application Layer: DNS, SNMP, RMON, Electronic Mail, WWW, Network Security: Firewalls (Application and Packet Filtering) for employability, Virtual Private Network, And Cryptography.

UNIT V

Case study: Study of various network simulators, Network performance analysis using NS2 for skill development.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	Demonstrate the understanding of advance data communication technologies for skill development.
CO2	Demonstrate the understanding of WAN Technology typically ATM helping in employability.
CO3	Demonstrate the understanding of packet switching protocols such as X.25, X.75 for skill development.
CO4	Explore the issues of advance internet routing protocols and also QoS based

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	protocols helping in employment.
CO5	Analyze and use various network simulators available in global market for skill development.

PO-CO Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	1	2	1	1	1	1	1
CO2	3	2	1	1	3	1	1	1	1	1
CO3	1	3	2	1	3	1	1	1	1	1
CO4	3	1	1	3	1	1	1	1	1	1
CO5	1	3	1	1	1	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	1	3	1
CO3	2	1	1
CO4	3	1	1
CO5	2	3	1

SUGGESTED READINGS:

- Black U, "Computer Networks-Protocols, Standards and Interfaces". PHI, 1996.
- Stallings W., "Data and Computer Communications", 6th Ed., PHI, 2002.
- Stallings W., "SNMP, SNMPv2, SNMPv3, RMON 1 & 2", 3rd Ed., Addison Wesley, 1999.
- Laurra Chappell (Ed), "Introduction to Cisco Router Configuration", Techmedia, 1999.
- Behrouz A. Forouzan, "TCP/IP Protocol Suit", TMH, 2000.
- Tananbaum A. S., "Computer Networks", 3rd Ed., PHI, 1999.

SUGGESTED WEBSITES:

- <https://lecturenotes.in/subject/955/advanced-computer-network-acn/note>
- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm



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Programme		Mater of Technology(M.Tech)			Branch		Computer Science & Engineering (CSE)		
Semester		2			Version				
Effective from Academic Year				2021-2022		Effective for the Batch Admitted in			2021
Subject Code			MCS 202N			Subject Name		COMPUTER VISION AND IMAGE PROCESSING	
Teaching Scheme					Examination Scheme(Marks)				
Per Week	Lecture		Practical(Lab)		Total		TS/PS	TE/PE	Total
	L	T	P	TW					
Credit	3	1	0	-	4	Theory	30	70	100
Hours	3	1	0	-	4	Practical	-	--	-
COURSE OBJECTIVE									
<ol style="list-style-type: none"> 1. To understand the fundamental of digital Image processing and image transformation. 2. To understand the techniques of Image Enhancement for skill development. 3. Learn and implements various techniques of Colour Image Processing, morphology and segmentation. 4. Be aware of the Registration techniques. 5. Study and implements the various Pattern Recognition approach. 									
Syllabus									
UNIT-I									
Fundamentals: Need for DIP- Fundamental steps in DIP – Elements of visual perception -Image sensing and Acquisition – Image Sampling and Quantization – Imaging geometry, discrete image mathematical characterization. Image Transforms: Two dimensional Fourier Transform- Properties – Fast Fourier Transform – Inverse FFT, Discrete cosine transform and KL transform.-Discrete Short time Fourier Transform- Wavelet Transform- Discrete wavelet Transform- and its application in Compression useful for skill development.									
UNIT-II									
Image Enhancement: Spatial Domain: Basic relationship between pixels- Basic Gray level Transformations – Histogram Processing – Smoothing spatial filters- Sharpening spatial filters. Frequency Domain: Smoothing frequency domain filters- sharpening frequency domain filters Homomorphic filtering, Image Restoration: Overview of Degradation models –Unconstrained and constrained restorations-Inverse Filtering, Wiener Filter helping in skill development.									
UNIT-III									
Color Image Processing: Color Fundamentals, Color Models, and Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation. Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms helping in skill development – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening.									
UNIT-IV									
Registration: Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth Segmentation Introduction, Region Extraction, Pixel-Based Approach for skill development. Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner									
UNIT-V									
Pattern Recognition: Introduction to Features, Feature Vectors, Classifiers, Supervised, Unsupervised and Semi Supervised Learning for skill development.									
COURSE OUTCOME (CO)									
					DESCRIPTION				
CO1					Demonstrate the understanding of digital Image processing and image transformation for skill development.				
CO2					To learn the Image Enhancement for skill development.				

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CO3	Studied the Color Image Processing, morphology and segmentation for skill development.
CO4	Explore the Registration techniques for skill development.
CO5	Learn and Analyze and use various Pattern Recognition approach and its applications in solving some national/ international problems for skill development.

PO-CO Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	1	1	1	1	2	1	1
CO2	3	3	1	2	2	1	1	1	1	1
CO3	2	2	1	3	1	1	1	1	1	1
CO4	2	1	1	3	3	1	1	1	1	1
CO5	3	3	2	1	1	2	1	1	2	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	3	1	1
CO3	3	1	1
CO4	2	1	1
CO5	3	1	1

SUGGESTED READINGS:

- Image Processing and machine vision-Milan Sonka,Vaclav Hlavac
- Pattern Recognition Principles-J.T. Tou and R.C.Gonzalez
- Syntactic Pattern Recognition and applications.-King Sun Fun
- Computer vision-Fairhurst (PHI).
- Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", 2nd Ed, Pearson Edu, 2004
- A.K. Jain, "Fundamental of Digital Image Processing", PHI. 2003

SUGGESTED WEBSITES:

- <https://staff.fnwi.uva.nl/r.vandenboomgaard/IPC20172018/LectureNotes/index.html>
- swayam.gov.in
- onlinecourses.nptel.ac.in

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Department of Computer Science & Engineering

Programme		Mater of Technology (M.Tech)			Branch		Computer Science & Engineering (CSE)						
Semester		2			Version								
Effective from Academic Year				2021-2022		Effective for the Batch Admitted in				2021			
Subject Code		MCS 203N			Subject Name		CLOUD COMPUTING						
Teaching Scheme					Examination Scheme(Marks)								
Per Week		Lecture		Practical(Lab)		Total		TS/PS		TE/PE		Total	
	L	T	P	TW									
Credit	3	1	0	-	4	Theory	30	70			100		
Hours	3	1	0	-	4	Practical	-	--			-		

COURSE OBJECTIVE

1. To provide students with the fundamentals and essentials of Cloud Computing.
2. To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
3. To enable students exploring some important cloud computing driven commercial systems and applications for skill development.
4. To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.
5. To explain about cloud security for skill development.

Syllabus

UNIT-I:

Overview of Computing Paradigm Recent trends in Computing Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing Evolution of cloud computing Business driver for adopting cloud computing Introduction to Cloud Computing Cloud Computing (NIST Model) Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers Properties, Characteristics & Disadvantages Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing Role of Open Standards for skill development.

UNIT-II:

Cloud Computing Architecture Cloud computing stack Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used for skill development, Role of Web services Service Models (XaaS) Infrastructure as a Service(IaaS) , Platform as a Service(PaaS), Software as a Service(SaaS) Deployment Models Public cloud, Private cloud, Hybrid cloud, Community cloud.

UNIT-III:

Infrastructure as a Service(IaaS) Introduction to IaaS IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM) Resource Virtualization Server, Storage, Network Virtual Machine (resource) provisioning and manageability, storage as a service, Data storage in cloud computing(storage as a service) Examples Amazon EC2 Renting, EC2 Compute Unit, Platform and Storage, pricing, customers Eucalyptus, Platform as a Service(PaaS) Introduction to PaaS What is PaaS, Service Oriented Architecture (SOA) Cloud Platform and Management Computation Storage Examples Google App Engine Microsoft Azure Software as a Service (PaaS) useful for employability Introduction to SaaS.

UNIT-IV:

Service Management in Cloud Computing Service Level Agreements(SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously Managing Data Looking at Data, Scalability & Cloud Services Database & Data Stores in Cloud Large Scale Data Processing helping in skill development and employability.

UNIT-V:

Cloud Security Infrastructure Security Network level security, Host level security, Application level security Data security and Storage Data privacy

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and security Issues, Jurisdictional issues raised by Data location Identity & Access Management. Access Control, Trust, Reputation, Risk, Authentication in cloud computing, Client access in cloud, Cloud contracting Model helps in skill development, Commercial and business considerations.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing for skill development
CO2	Apply the fundamental concepts in data centers to understand the tradeoffs in power, efficiency and cost for skill development.
CO3	Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing for employability.
CO4	Analyze various cloud programming models and apply them to solve global problems on the cloud for skill development and employability.
CO5	Learn and Analyze the cloud security for skill development.

PO-CO Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	3	1	2	1	1	1	1	2
CO2	2	2	3	1	1	1	1	1	1	1
CO3	3	1	1	3	1	1	1	2	1	1
CO4	2	3	1	2	1	2	1	1	1	2
CO5	3	3	2	2	2	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	3	1	1
CO3	3	2	1
CO4	2	3	1
CO5	3	1	1

SUGGESTED READINGS:

- Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
- Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M Goscinski, Wile, 2011
- Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012
- Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

SUGGESTED WEBSITES:

- swayam.gov.in
- onlinecourses.nptel.ac.in

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Elective-II

Department of Computer Science & Engineering

Programme		Mater of Technology(M.Tech)			Branch		Computer Science & Engineering (CSE)			
Semester		2			Version					
Effective from Academic Year				2021-2022		Effective for the Batch Admitted in				2021
Subject Code			MCS 204 (1)			Subject Name		CLUSTERS AND GRID COMPUTING		
Teaching Scheme					Examination Scheme(Marks)					
Per Week	Lecture		Practical(Lab)		Total		TS/PS	TE/PE	Total	
	L	T	P	TW						
Credit	3	1	0	-	4	Theory	30	70	100	
Hours	3	1	0	-	4	Practical	-	--	-	
COURSE OBJECTIVE										
<ul style="list-style-type: none"> To understand the cluster and grid computers To understand task scheduling and resource allocation in cluster and grid environment for skill development. To understand middleware architecture in Cluster and Grid Environment for skill development. To understand the cluster and grid computing platform as an alternative to traditional supercomputer 										
Syllabus										
UNIT-1										
Introduction: High Performance Computing (HPC), Grand Challenge Problems Computational and communication intensive, Parallel Architectures Classifications SMP, MPP, NUMA, Clusters and Components of a Parallel Machine for skill development. Conventional Supercomputers and its limitations.										
UNIT-2										
Multi-processor and Multi Computer based Distributed Systems. Cluster and Grids: Cluster Components Processor/machine for skill development, High Speed Interconnections goals, topology, latency, bandwidth, Example Interconnect: Myrinet, Infiniband, QsNet.										
UNIT-3										
Fast Ethernet, Gigabit Ethernet, Light weight Messaging system/Light weight communication Protocols, Cluster Middleware Job/Resource Management System, Load balancing, Scheduling of parallel processes, Enforcing policies, GUI for skill development..										
UNIT-4										
Introduction to programming tools such as PVM, MPI, Cluster Operating Systems Examples: Linux, MOSIX, CONDOR, Characteristics of Grid, Computational services, Computational Grids, Data grids/ Storage grids, management and applications, Different components of Grid Grid fabric, Grid middleware, Grid applications and portal skill development, Globus toolkit Ver.2.4, web services, MDS,GRAM,										
UNIT-5										
Grid Security –Cryptography, Authentication, Integrity, Digital Signature, Digital Certificates, Certificate Authority, MD5, RSA, GSI, GSS, API, Directory Service, LDAP, GRID FTP, GASS Fault Tolerance: Fault detection and diagnosis of Clusters and Grids. Recent advances in cluster and grid computing helps in employability.										
COURSE OUTCOME (CO)										
					DESCRIPTION					
CO1					Understand Conventional Supercomputers and its limitations for skill development.					


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CO2	Understand the fundamental principles of distributed computing for skill development.
CO3	Understand how the distributed computing environments known as Grids can be built from lower level services for skill improvements.
CO4	To know about programming tools and cluster operating system for skill development.
CO5	Understand about global security services and directory services for employability.

PO-CO Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	3	3	1	1	1	1	1	1
CO2	2	2	3	1	1	1	1	1	1	1
CO3	1	1	3	3	3	1	1	1	1	1
CO4	1	3	3	1	1	1	1	1	1	1
CO5	2	1	3	1	2	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	2	1	1
CO3	3	1	1
CO4	3	1	1
CO5	1	3	1

SUGGESTED READINGS:

- R. K. Buyya, High Performance Cluster Computing: Programming and Applications, PHI , 1999
- D. Janakiram, Grid Computing, Tata Megraw Hill , 2005.
- J. Jos & R. K. Buyya, High Performance Cluster Computing: Architecture and Systems, PHI , 1999
- P. Jalote, Fault Tolerance in Distributed Systems, Prentice Hall, 1994, P. Jalote, Fault Tolerance in Distributed Systems, Prentice Hall, 1994, Prentice Hall , 1994

SUGGESTED WEBSITES:

- <https://lecturenotes.in/subject/807>
- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm


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Department of Computer Science & Engineering

Programme		Mater of Technology(M.Tech)			Branch		Computer Science & Engineering (CSE)			
Semester		2			Version					
Effective from Academic Year				2021-2022		Effective for the Batch Admitted in				2021
Subject Code			MCS 204 (2)			Subject Name		SENSOR NETWORK		
Teaching Scheme					Examination Scheme(Marks)					
Per Week	Lecture		Practical(Lab)		Total		TS/PS	TE/PE	Total	
	L	T	P	TW						
Credit	3	1	0	-	4	Theory	30	70	100	
Hours	3	1	0	-	4	Practical	-	--	-	

COURSE OBJECTIVE

1. To study the concept of different wireless networks for skill development.
2. To introduce basic tools used for simulation of wireless network
3. To introduce basic concept of security in WSM for employability.
4. To study the hardware of various wireless networks with brief over new of protocols for sensor networks.

Syllabus

UNIT 1

Introduction and overview of sensor network architecture and its applications, sensor network comparison with Ad Hoc Networks, Sensor node architecture with hardware and software details for skill development.

UNIT 2

Hardware, Examples like mica2, micaZ, telosB, cricket, Imote2, tmote, btnode, and Sun SPOT, Software (Operating Systems): tiny OS, MANTIS, Contiki, and RetOS helps in employability.

UNIT 3

Programming tools, C, nesC. Performance comparison of wireless sensor networks simulation and experimental platforms like open source (ns-2) and commercial (QualNet, Opnet) for employability

UNIT 4

Overview of sensor network protocols (details of atleast 2 important protocol per layer). Physical, MAC and routing/ Network layer protocols, node discovery protocols, multi hop and cluster based protocols for skill development. Fundamentals of 802.15.4, Bluetooth, BLE (Bluetooth low energy), UWB.

UNIT 5

Data dissemination and processing, differences compared with other database management systems, data storage: query processing for employability.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	Design wireless sensor network system for different national and international applications under consideration for skill development.
CO2	Understand the hardware details of different types of sensors and select right type of sensor for various applications for employability.
CO3	Understand radio standards and communication protocols to be used for wireless sensor network based systems and application for employability.
CO4	Use operating systems and programming languages for wireless sensor nodes, performance of wireless sensor networks systems and platforms for skill development.
CO5	Design and develop security architecture for an organization. Design operational and strategic cyber security strategies and policies helps in employment.

PO-CO Mapping

(Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	1	1	1	1	1	1
CO2	3	2	3	1	2	1	1	1	1	1
CO3	3	1	3	3	1	1	1	1	1	1
CO4	3	3	3	1	1	1	1	1	1	1
CO5	1	1	3	3	1	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)
 (Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	1	2	1
CO3	3	1	1
CO4	3	1	1
CO5	2	3	1

SUGGESTED READINGS:

- H. Karl and A. Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, India, 2012.
- C. S. Raghavendra, K. M. Sivalingam, and T. Znati, Editors, "Wireless Sensor Networks", Springer Verlag, 1st Indian reprint, 2010
- F. Zhao and L. Guibas, "Wireless Sensor Networks: An Information Processing Approach", Morgan Kaufmann, 1st Indian reprint, 2013.
- YingshuLi, MyT. Thai, Weili Wu, "Wireless sensor Network and Applications", Springer series on signals and communication technology, 2008.

SUGGESTED WEBSITES:

- http://home.ku.edu.tr/~lkockesen/teaching/econ333/uggame_lect.htm
- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm

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Department of Computer Science & Engineering

Programme		Mater of Technology(M.Tech)			Branch		Computer Science & Engineering (CSE)			
Semester		2			Version					
Effective from Academic Year				2021-2022		Effective for the Batch Admitted in				2021
Subject Code		MCS 204 (3)			Subject Name		SYSTEM SECURITY			
Teaching Scheme					Examination Scheme(Marks)					
Per Week	Lecture		Practical(Lab)		Total		TS/PS	TE/PE	Total	
	L	T	P	TW						
Credit	3	1	0	-	4	Theory	30	70	100	
Hours	3	1	0	-	4	Practical	-	--	-	

COURSE OBJECTIVE

- To understand the Security Techniques for skill development.
- To understand the Secure Networking Threats and implement on Secure Networks.
- To understand the Network Security Platform Options.
- To understand the Network Security Management for employability.

Syllabus

UNIT I

Introduction: Classical security Techniques and Computer Network Security Concepts. Confidentiality and Security, Security Policy and Operations Life Cycle, Security System Development and Operations for skill development

UNIT I I

Secure Networking Threats: The Attack Process, Attacker Types, Vulnerability Types, Attack Results, Attack Taxonomy, Threats to Security: Physical security, Biometric systems, monitoring controls, and Data security and intrusion and detection systems.

Encryption Techniques: Conventional techniques, Modern techniques, DES, DES chaining, Triple DES, RSA algorithm, Key management, Message Authentication and Hash Algorithm, Authentication requirements and functions secure Hash Algorithm, Message digest algorithm, digital signatures, AES Algorithms for skill development

UNIT I II

Designing Secure Networks: Components of a Hardening Strategy, Network Devices, Host Operating Systems, Applications, Appliance-Based Network Services, Rogue Device Detection, Network Security Technologies The Difficulties of Secure Networking, Security Technologies, Emerging Security Technologies General Design Considerations, Layer 2 Security Considerations, IP Addressing Design Considerations, ICMP Design Considerations, Routing Considerations, Transport Protocol Design Considerations for employability.

UNIT I V

Network Security Platform Options: Network Security Platform Options, Network Security Device Best Practices, Common Application Design Considerations, E-Mail, DNS, HTTP/HTTPS, FTP, Instant Messaging.

IPsec VPN Design Considerations: VPN Basics, Types of IPsec VPNs, IPsec Modes of Operation and Security Options, Topology Considerations, Design Considerations for skill development, Site-to-Site Deployment Examples.

UNIT V

Secure Network Management and Network Security Management: Organizational Realities, Protocol Capabilities, Tool Capabilities, Secure Management Design Options, Network Security Management, Firewalls, Trusted systems and IT act and cyber laws for employability.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	Ability to apply the knowledge of the Security Techniques for skill development.
CO2	Studied Global Networking Threats for skill development.
CO3	Ability to Designing the Secure Networks for employability.
CO4	Apply the Options of Network Security Platform for skill development.
CO5	Ability to know Network Security Management for employability.

PO-CO Mapping (Please write 3, 2,1 wherever required)

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(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	3	1	1	1	1	1
CO2	3	1	1	2	1	1	1	1	1	1
CO3	1	2	3	1	1	1	1	3	1	1
CO4	2	1	3	2	3	1	1	1	1	1
CO5	1	3	3	1	1	1	1	3	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	2	1	1
CO3	1	2	1
CO4	3	1	1
CO5	1	3	1

SUGGESTED READINGS:

- Sean Convery, "Network Security Architectures, Published by Cisco Press, First Ed. 2004
- William Stallings "Cryptography and Network Security" Fourth Ed., Prentice Hall, 2006
- Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing" 3rd Edition, Prentice Hall, 2003
- Jeff Crume "Inside Internet Security" Addison Wesley, 2003

SUGGESTED WEBSITES:

- <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-858-computer-systems-security-fall-2014/lecture-notes/>
- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm



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Master of Technology (M.Tech) Computer Science & Engineering
M.Tech 2nd Year (III Semester)

Elective –III
Department of Computer Science & Engineering

Programme	Mater of Technology(M.Tech)				Branch	Computer Science & Engineering (CSE)			
Semester	3				Version				
Effective from Academic Year					2021-2022	Effective for the Batch Admitted in			2021
Subject Code			MCS 301 (1)		Subject Name	DATA MINING AND WAREHOUSING			
Teaching Scheme					Examination Scheme(Marks)				
Per Week	Lecture		Practical(Lab)		Total		TS/PS	TE/PE	Total
	L	T	P	TW					
Credit	3	1	0	-	4	Theory	30	70	100
Hours	3	1	0	-	4	Practical	-	--	-

COURSE OBJECTIVE

1. To understand the basic principles, concepts and applications of data are warehousing and data mining for skill development.
2. Ability to do Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment.
3. Have a good knowledge of the fundamental concepts that provide the foundation of data mining.

Syllabus

UNIT I

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse. Multi Dimensional Data Model- Skill development, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture. 3 Tier Architecture. Data Marting.

UNIT II

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface. Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse-Employability.

UNIT III

Overview, Motivation (for Data Mining).Data Mining-Definition & Functionalities. Data Processing. Form of Data Preprocessing: Data Cleaning Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection). Inconsistent Data. Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression. Numerosity Reduction. Clustering. Discretization and Concept hierarchy generation- Skill development.

UNIT IV

Concept Description: Definition, Data Generalization, Analytical Characterization. Analysis of attribute relevance. Mining Class comparisons. Statistical measures in large Databases. Measuring Central Tendency. Measuring Dispersion of Data. Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases. Association rule mining. mining Single-Dimensional Boolean Association rule from Transactional Databases– Apriori Algorithm- Skill development. Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases

UNIT V

Classification and Predictions: What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm- Skill development. Cluster Analysis: Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS. Grid Based Methods-STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network approach. Outlier Analysis

COURSE OUTCOME (CO)

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	DESCRIPTION
CO1	Understand the functionality of the various data mining and data warehousing component Knowledge. Understand for skill development.
CO2	Appreciate the strengths and limitations of various data mining and data warehousing models Apply, Create for employability
CO3	Explain the analyzing techniques of various data Analyze for skill development.
CO4	Describe different methodologies used in data mining and data ware housing for skill development.
CO5	Compare different approaches of data ware housing and data mining with various applications in global scenario for skill development.

PO-CO Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	1	3	1	1	1	1	1
CO2	3	1	1	2	1	1	1	1	1	1
CO3	1	2	3	1	1	1	1	3	1	1
CO4	2	1	3	2	3	1	1	1	1	1
CO5	1	3	3	1	1	1	1	3	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	2	2	1
CO3	3	1	1
CO4	3	1	1
CO5	2	1	1

SUGGESTED READINGS:

- M.H.Dunham, "Data Mining: Introductory and Advanced Topics" Pearson Education
- Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier
- Sam Anahory, Dennis Murray, "Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems, Pearson Education
- Mallach, "Data Warehousing System". McGraw -Hill

SUGGESTED WEBSITES:

- <https://lecturenotes.in/subject/1058/process-engineering-pe>
- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm


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Department of Computer Science & Engineering

Programme		Mater of Technology(M.Tech)			Branch		Computer Science & Engineering (CSE)			
Semester		3			Version					
Effective from Academic Year				2021-2022		Effective for the Batch Admitted in				2021
Subject Code		MCS 301 (2)			Subject Name		RESEARCH METHODOLOGY			
Teaching Scheme					Examination Scheme(Marks)					
Per Week	Lecture		Practical(Lab)		Total		TS/PS	TE/PE	Total	
	L	T	P	TW						
Credit	3	1	0	-	4	Theory	30	70	100	
Hours	3	1	0	-	4	Practical	-	--	-	

COURSE OBJECTIVE

1. Understand some basic concepts of research and its methodologies
2. Identify appropriate research topics for skill development.
3. Select and define appropriate research problem and parameters
4. Prepare a project proposal (to undertake a project)
5. Organize and conduct research (advanced project) in a more appropriate manner

Syllabus

UNIT 1

Introduction to Research and Problem Definition Meaning, Objective and importance of research, Types of research, steps involved in research for skill development, defining research problem.

UNIT-2

Research Design Research design, Methods of research design, research process and steps involved, Literature Survey for skill development

UNIT 3

Data Collection Classification of Data, Methods of Data Collection, Sampling, Sampling techniques procedure and methods for skill development. Ethical considerations in research.

UNIT 4

Data Analysis and interpretation Data analysis, Statistical techniques and choosing an appropriate statistical technique, Hypothesis, Hypothesis testing, Data processing software (e.g. SPSS etc.), statistical inference, Interpretation of results for improving skill.

UNIT 5

Technical Writing and reporting of research Types of research report: Dissertation and Thesis, research paper, review article, short communication, conference presentation etc., Referencing and referencing styles, Research Journals, Indexing and citation of Journals, Intellectual property, Plagiarism helps in employability.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	Develop the ability to apply the methods while working on a research project work for skill development.
CO2	Describe the appropriate statistical methods required for a particular research design for skill development.
CO3	Choose the appropriate research design and develop appropriate research hypothesis for a research project for skill development.
CO4	Develop appropriate globally accepted framework for research studies for skill development.
CO5	Ability to write research report and check plagiarism for employability.

PO-CO Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
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CO1	2	2	1	1	2	1	1	2	1	1
CO2	3	3	1	2	1	1	1	1	1	2
CO3	3	2	3	1	1	1	1	2	1	1
CO4	2	1	3	3	2	1	1	1	1	1
CO5	1	3	3	3	1	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	2	1	1
CO3	2	1	1
CO4	3	1	1
CO5	1	2	1

SUGGESTED READINGS:

- C. R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques , New Age International publishers, Third Edition
- Ranjit Kumar, Research Methodology: A Step-by-Step Guide for Beginners, 2nd Edition, SAGE, 2005
- Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
- Creswell, John W. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications, 2013

SUGGESTED WEBSITES:

- <https://lecturenotes.in/subject/371/natural-language-processing-nlp>
- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm



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Department of Computer Science & Engineering

Programme	Mater of Technology(M.Tech)			Branch	Computer Science & Engineering (CSE)				
Semester	3			Version					
Effective from Academic Year				2021-2022		Effective for the Batch Admitted in		2021	
Subject Code		MCS 301 (3)			Subject Name		ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS		
Teaching Scheme				Examination Scheme(Marks)					
Per Week	Lecture		Practical(Lab)		Total	TS/PS	TE/PE	Total	
	L	T	P	TW					
Credit	3	1	0	-	4	Theory	30	70	100
Hours	3	1	0	-	4	Practical	-	--	-

COURSE OBJECTIVE

1. To cover modern paradigms of AI that goes beyond traditional learning for skill development.
2. Understand the context of neural networks.
3. Know how to use a neural network.

Syllabus

UNIT I

Introduction: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation for skill development.

UNIT II

Searching: Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Greedy best first search, A* search Game Playing: Adversial search, Games, minimax, algorithm, optimal decisions in multiplayer games. Alpha-Beta pruning, Evaluation functions for employability, cutting of search.

UNIT III

Knowledge Representation & Reasons logical Agents, Knowledge – Based Agents, the Wumpus world, logic, propositional logic, Resolution patterns in propos ional logic, Resolution, Forward & Backward, Chaining, First order logic, Inference in first order logic, propositional A* first order inference, unification & lifts forward chaining, Backward chaining for employability, Resolution.

UNIT IV

Characteristics of Neural Networks, Historical Development of Neural Networks Principles, Artificial Neural Networks: Terminology, Models of Neuron, Topology, Basic Learning Laws, Pattern Recognition Problem, Basic Functional Units, Pattern Recognition Tasks by the Functional Units, Feed forward Neural Networks: Introduction, Analysis of pattern Association Networks, Analysis of Pattern Classification Networks, Analysis of pattern storage Networks; Analysis of Pattern Mapping Networks for skill development

UNIT V

Feedback Neural Networks: Introduction, Analysis of Linear Auto associative FF Networks, Analysis of Pattern Storage Networks, Competitive Learning Neural Networks & Complex pattern Recognition: Introduction, Analysis of Pattern Clustering Networks, Analysis of Feature Mapping Networks, and Associative Memory for skill development.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	Develop an understanding of global concepts in AI and where they can be used for skill development.
CO2	Design, implement and apply novel AI techniques based on emerging real-world requirements helps in employability.
CO3	Ability to knowledge representation technique for employability.
CO4	Design neural Networks and perform operation on it for skill development.
CO5	Ability to extract feature from a sample data mapping with existing data which is

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helpful in employability.

PO-CO Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	1	3	2	3	1	1	1	1	1
CO2	3	1	1	2	1	1	1	1	1	1
CO3	1	2	3	1	1	1	1	2	1	1
CO4	2	1	3	3	3	1	1	1	1	2
CO5	1	3	3	1	1	1	1	3	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	2	2	1
CO3	1	3	1
CO4	3	1	1
CO5	2	1	1

SUGGESTED READINGS:

- Artificial Intelligence – A Modern Approach. Second Edition, Stuart Russel, Peter Norvig, PHI/ Pearson Education
- Artificial Neural Networks B. Yagna Narayana, PHI
- Artificial Intelligence, 2nd Edition, E.Rich and K.Knight (TMH).
- Artificial Intelligence and Expert Systems – Patterson PHI.
- Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson.
- PROLOG Programming for Artificial Intelligence. Ivan Bratka- Third Edition – Pearson Education.
- Neural Networks Simon Haykin PHI 8. Artificial Intelligence, 3rd Edition, Patrick Henry Winston., Pearson Edition

SUGGESTED WEBSITES:

- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm


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Elective-IV
Department of Computer Science & Engineering

Programme		Mater of Technology(M.Tech)			Branch		Computer Science & Engineering (CSE)			
Semester		3			Version					
Effective from Academic Year				2021-2022		Effective for the Batch Admitted in				2021
Subject Code			MCS 302 (1)			Subject Name		HUMAN RESOURCE MANAGEMENT		
Teaching Scheme						Examination Scheme(Marks)				
Per Week	Lecture		Practical(Lab)		Total		TS/PS	TE/PE	Total	
	L	T	P	TW						
Credit	3	1	0	-	4	Theory	30	70	100	
Hours	3	1	0	-	4	Practical	-	--	-	

COURSE OBJECTIVE

- To enable the students to understand the HR Management and system at various levels in general and in certain specific industries or organizations for skill development.
- To help the students focus on and analyze the issues and strategies required to select and develop manpower resources.
- To develop relevant skills necessary for application in HR related issues.
- To Enable the students to integrate the understanding of various HR concepts along with the domain concept in order to take correct business decisions.

Syllabus

UNIT-1

Introduction: Introduction to Human Resource Management and its definition, functions of Human Resource Management & its relation to other managerial functions. Nature, Scope and Importance of Human Resource Management in Industry, Role & position of Personnel function in the organization for skill development.

UNIT-2

Procurement and Placement: Need for Human Resource Planning; Process of Human Resource Planning; Methods of Recruitment; Psychological tests and interviewing; Meaning and Importance of Placement and Induction. Employment Exchanges (Compulsory Notification of vacancies) Act 1959 for entrepreneurship, The Contract Labour (Regulation & Abolition) Act 1970.

UNIT-3

Training & Development: Difference between training and Development; Principles of Training; Employee Development; Promotion-Merit v/s seniority Performance Appraisal, Career Development & Planning. Job analysis & Design: Job Analysis: Job Description & Job Description, Job Specification for employability.

UNIT-4

Job Satisfaction: Job satisfaction and its importance; Motivation, Factors affecting motivation, introduction to Motivation Theory: Workers' Participation, Quality of work life. The Compensation Function: Basic concepts in wage administration, company's wage policy for employability. Job Evaluation, Issues in wage administration, Bonus & Incentives, Payment of Wages Act-1936, Minimum Wages Act-1961

UNIT-5

Integration: Human Relations and Industrial Relations; Difference between Human Relations and Industrial Relations, Factors required for good Human Relation Policy in Industry; Employee Employer relationship Causes and Effects of Industrial disputes; Employees Grievances & their Redressal, Administration of Discipline, Communication in organization, Absenteeism, Labour Turnover, Changing face of the Indian work force and their environment for employability, Importance of collective Bargaining; Role of trader unions in maintaining cordial Industrial Relations.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	To develop the understanding of the concept of human resource management and to understand its relevance in organizations.

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CO2	To develop necessary skill set for application of various HR issues.
CO3	To analyze the strategic issues and strategies required to select and develop manpower resources for national and international industry.
CO4	To Enable the students to integrate the understanding of various HR concepts along with the domain concept in order to take correct business decisions.
CO5	Understand Changing face of the Indian work force and their environment for employability.

PO-CO Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	1	2	3	1	1	1	2	1
CO2	2	1	1	2	1	1	1	1	1	1
CO3	1	2	3	1	2	1	1	2	1	1
CO4	2	1	3	2	2	1	1	1	1	1
CO5	1	3	3	1	1	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	2	1	1
CO3	3	1	1
CO4	3	1	1
CO5	1	2	1

SUGGESTED READINGS:

- Lowin B. Flippo - Principles of personnel Management (Mc Graw-Hill)
- R.C. Saxena - Labour Problems and social welfare (K.Math & Co.)
- A Minappa and M. S. Saiyada - Personnel Management (Tata Mc. Graw-Hill)
- C.B. Mamoria - Personnel Management (Himalaya Publishing House, Bombay)
- T.N. Bhagotiwai - Economics of Labour and Industrial Relations (Sahitya Bhawan Agra)

SUGGESTED WEBSITES:

- <https://lecturenotes.in/subject/1058/process-engineering-pe>
- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm


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Note: Adhere to the latest editions of the Suggested Readings

Department of Computer Science & Engineering

Programme		Mater of Technology(M.Tech)			Branch		Computer Science & Engineering (CSE)			
Semester		3			Version					
Effective from Academic Year				2021-2022		Effective for the Batch Admitted in				2021
Subject Code		MCS 302 (2)			Subject Name		DIGITAL FORENSIC			
Teaching Scheme					Examination Scheme(Marks)					
Per Week	Lecture		Practical(Lab)		Total		TS/PS	TE/PE	Total	
	L	T	P	TW						
Credit	3	1	0	-	4	Theory	30	70	100	
Hours	3	1	0	-	4	Practical	-	--	-	

COURSE OBJECTIVE

To provide students with a comprehensive overview of collecting, investigating, preserving, and presenting evidence of cyber crime left in digital storage devices. To introduce topics of forensic data examination of computers and digital storage media for skill development. Investigation of computers used for wrong-doing. Understand file system basics and where hidden files may lie on the disk, as well as how to extract the data and preserve it for analysis. Understand some of the tools of e-discovery. Legal aspects must form a constant background for these types of investigations.

Syllabus

UNIT I

Transform Methods: Fourier transformation, Fast Fourier Transformation, Discrete cosign Transformation, Mellin Fourier transformation, Wavelets, Split image in perceptual bands, Application of transformation in Steganography- Skill development..

UNIT II

Biometrics: Overview of Biometrics, Biometric identification, Biometric Verification, Biometric Enrollment, Biometric system security. Authentication and Biometrics: Secure Authentication protocols, Access Control Security Services, Authentication Method's, Authentication Protocols, Matching Biometric samples, Verification By Humans---Employability. Common Biometrics: Finger Print Recognition, Face recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification, Positive and Negative of Biometrics. Matching: Two kinds of errors. Score distribution, Estimating Errors from Data. Error rate of match Engines, Definition of FAR and FRR.

UNIT III

Introduction to information hiding--Employability: Technical Steganography, Linguistic Steganography, Copy Right Enforcement, Wisdom From cryptography. Principals of Steganography: Framework for secret Communication, Security of Steganography System, Information Hiding in Noisy Data, Adaptive VS non Adaptive Algorithms, Active and malicious Attackers, Information Hiding in Written Text.

UNIT IV

Survey of Steganographic Techniques- Skill development.: Substitution System and Plane tools. Transform Domain Techniques: Spread spectrum and information hiding, Statistical Steganography. Distortion Techniques. Cover Generation Techniques. Steganalysis: Looking for signatures: - Extracting hidden information. disabling hidden information.

UNIT V

Watermarking and Copyright Protection--Employability: Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design issues, Evaluation and Benchmarking of Watermarking system.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	Understand the importance of a systematic procedure for investigation of data found on digital storage media that might provide evidence of wrong-doing for skill development.
CO2	Understand the file system storage mechanisms of two common desktop operating systems for employability.
CO3	Use tools for faithful preservation of data on disks for analysis for employability.
CO4	Find data that may be clear or hidden on a computer disk for skill development.

Note: Adhere to the latest editions of the Suggested Readings

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CO5	Learn the use of global computer forensics tools used in data analysis, such as searching, absolute disk sector viewing and editing, recovery of files, password cracking, etc. helps in employability.
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PO-CO Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	2	2	3	1	1	2	1	1
CO2	1	2	1	2	1	1	1	1	1	2
CO3	2	2	3	3	1	1	1	1	1	1
CO4	3	1	2	2	3	1	1	1	1	1
CO5	3	3	1	1	1	1	1	1	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)

(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	2	2	1
CO3	1	3	1
CO4	3	1	1
CO5	2	3	1

SUGGESTED READINGS:

- Katzendbisser, Petitcolas, "Information hiding Techniques for Steganography and digital watermarking". Artech House
- Peter Wayner, "Disappearing Cryptography: Information Hiding, Steganography and Watermarking 2e". Elsevier.
- Bolle, Connell et. al. , "Guide to Bioinformatics", Springer.

SUGGESTED WEBSITES:

- <https://lecturenotes.in/subject/993/digital-forensics-df>
- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm



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Department of Computer Science & Engineering

Programme	Mater of Technology(M.Tech)			Branch	Computer Science & Engineering (CSE)				
Semester	3			Version					
Effective from Academic Year				2021-2022		Effective for the Batch Admitted in		2021	
Subject Code		MCS 302 (3)		Subject Name	BIOINFORMATICS				
Teaching Scheme				Examination Scheme(Marks)					
Per Week	Lecture		Practical(Lab)		Total	TS/PS	TE/PE	Total	
	L	T	P	TW					
Credit	3	1	0	-	4	Theory	30	70	100
Hours	3	1	0	-	4	Practical	-	--	-

COURSE OBJECTIVE

The objective of this course is to

1. Impart knowledge on basic techniques of Bioinformatics and on analysis of biological data using computational methods skill development.
2. Investigating problems in molecular and biology from a computational perspective.

Syllabus

UNIT I :

Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: reference systems, finding new type of data online. Molecular Biology and Bioinformatics: Systems approach in biology. Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, overview of the bioinformatics applications for improving skill.

UNIT II :

Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, -Transcription, -Translation, Genes- the functional elements in DNA, Analysing DNA, DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, knowledge of Nucleic acid-Protein interaction for enhancing skill.

UNIT III:

Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, mounting/ unmounting files, tar, gzip / gunzip, telnet, ftp, developing applications on Linux OS, Understanding and Using Biological Databases, Overview of Java, CORBA, XML, Web deployment concepts for improving skill.

UNIT IV:

Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses for employability.

UNIT V:

Macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: sequence alignment algorithms for skill development, regular expressions, hierarchies and graphical models, Phylogenetic BLAST.

COURSE OUTCOME (CO)

	DESCRIPTION
CO1	Extract information from different types of bioinformatics data (gene, protein, disease, etc.), including their biological characteristics and relationships for skill development.
CO2	Employ different data representation models and formats used for bioinformatics data representation, including markup languages such as SBML and CellML, and ontologies such as GO ontology for skill development.
CO3	Apply the different global approaches used for data integration and data management, including data warehouse and wrapper approaches for skill development.

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CO4	Analyze processed data with the support of analytical and visualization tool useful for employability.
CO5	Interact with non-bioinformatics professionals, such as biologists and biomedical researchers, to better understand their bioinformatics needs for improved support and service delivery for skill development.

PO-CO Mapping (Please write 3, 2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	2	2	3	1	1	1	1	1
CO2	2	1	1	2	2	1	1	2	1	1
CO3	1	2	2	1	1	1	1	1	1	2
CO4	2	1	1	2	2	1	1	1	1	1
CO5	1	3	3	1	1	1	1	2	1	1

CO-Curriculum Enrichment Mapping (Please write 3, 2,1 wherever required)
(Note: 3 for highly mapped, 2 for medium mapping and 1 for low mapped).

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	3	1	1
CO3	3	1	1
CO4	1	2	1
CO5	2	1	1

SUGGESTED READINGS:

- Fundamental concepts of Bioinformatics – D E Krane and M L Raymer, Pearson Education.
- Bioinformatics Methods & applications, Genomics, Proteomics & Drug Discovery – Rastogi, Mendiratta and Rastogi, PHI, New Delhi.
- Bioinformatics: with fundamentals of genomics and proteomics – Shubha Gopal, et.al., Mc Graw Hill.
- Developing Bio informatics computer skills – O'Reilly, CBS.
- Evolutionary Bioinformatics – Forsdyke, Springer.

SUGGESTED WEBSITES:

- <https://people.eecs.berkeley.edu/~luca/notes/complexitynotes02.pdf>
- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/dip/image_processing_introduction.htm


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