Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)

SCHEME OF INSTRUCTION & SYLLABI

Programme: M. Tech Computer Science and Engineering

Scheme of Instructions: Second Year M. Tech. in Computer Science and Engineering (As Per NEP 2020)

Semester – I

SN	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs		CT/IA	CA	ESE		
1	**I**	**PCC**	CS	MCS21101	Advance in Algorithm	T	4	-	4	**4**	40	-	60	3 Hrs	100
2	**I**	**PCC**	CS	MCS21102	Artificial Intelligence & Intelligence System	T	4	-	4	**4**	40	-	60	3 Hrs	100
3	**I**	**PCC**	CS	MCS21103	High Performance Computer Architecture	T	4	-	4	**4**	40	-	60	3 Hrs	100
4	**I**	**PEC**	CS	MCS21105-07	Professional Elective - I	T	4	-	4	**4**	40	-	60	3 Hrs	100
5	**I**	**PEC**	CS	MCS21108-10	Professional Elective - II	T	4	-	4	**4**	40	-	60	3 Hrs	100
6	**I**	**PCC**	CS	MCS21104	Computer Programing – I Lab	P	-	4	4	**2**	-	50	50	2 Hrs	100
Total							**20**	**04**	**24**	**22**	**200**	**50**	**350**	**17 Hrs**	**600**

HOD Deptt. (CSE) Tulsiramji Gaikwad-Patil College of Engineering & Technology Mohagaon, Wardha Road, Nagpur	Dean Academics Tulsiramji Gaikwad-Patil College Of Engineering and Technology, Nagpur	Vice Principal Tulsiramji Gajkwad-Patil College Of Engineering &	Principal Tulsiramji Gaikwad-Patil College Of Engineering &	**June, 2024**	**1.00**	**Applicable for AY 2024-25 Onwards**
Chairperson	**Dean Academics**	**Vice Principal**	**Principal**	**Date of Release**	**Version**	

Programme: M.Tech. Computer Science and Engineering

List of **Program Electives** offered By Computer Science and Engineering Department

Program Elective- I	Program Elective-II	Program Elective- III	Program Elective- IV
Semester I	**Semester I**	**Semester II**	**Semester II**
MCS21105 Digital Image Processing	**MCS21108** Advanced Operating Systems	**MCS21204** Computer Vision	**MCS21207** Cloud Computing
MCS21106 Advanced Data Mining	**MCS21109** Data Science	**MCS21205** Big Data Analytics	**MCS21208** Data Preparation and Analysis
MCS21107 Embedded System	**MCS21110** Cryptography &Information Security	**MCS21206** Internet of Things	**MCS21209** Digital Forensics

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First Year (Semester-I) M.Tech. (CSE)

Course Code: MCS21101 (Advances in Algorithms)

Teaching Scheme	
Lectures	4Hrs/week
Tutorial	-
Total Credit	4

Examination Scheme	
CT-1	20 Marks
CT-2	20 Marks
TA	-
ESE	60 Marks
Total	100 Marks
Duration of ESE :03Hrs 00Min.	

Course Objective:

1	Analyze worst-case running times of algorithms using asymptotic analysis.
2	Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
3	Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
4	Analyze worst-case running times of algorithms using asymptotic analysis.
5	Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.

Course Contents

Unit I	**Algorithm Fundamentals**: Basic Concept, Analysis of Algorithm Fundamental Techniques: The Greedy Method, Divide and Conquer, Dynamic Programming, Branch and bound, Back Tracking
Unit II	**Hash Tables and Search Trees**: Direct address tables, hash tables, hash functions, open addressing, perfect hashing and Randomly built binary Search Trees, Red-Black Trees **Advanced data structures**- Fibonacci heaps, augmented data structures, van Emdc Boas tree **Graphs:** The Graph abstract data Type, Data Structures for Graphs, Graph Traversal, Directed Graphs. Graph algorithms: all-pairs shortest paths.
Unit III	**Network Flow and Matching**: Flows and Cuts, Maximum Flow, Maximum Bipartite Matching, Minimum Cost Flow **Strings and Pattern Matching algorithms** The Rabin Karp Algorithm, Knuth-Morris-Pratt algorithm
Unit IV	**Number Theory and Cryptography**: Fundamental Algorithms involving numbers, Cryptographic Computations, Information Security Algorithms and Protocols. **Linear programming:** Standard and slack forms, The simplex algorithm **Parallel Algorithm**: Performance Measures of Parallel Algorithms, Parallel Merging/Sorting Algorithms on CREW/EREW, Parallel searching algorithms.
Unit V	**Dealing with intractability**: NP-Completeness, **Approximation algorithms :-**Vertex cover problem, The travelling Salesman problem, Set covering problem **Randomized algorithms** Las Vegas and Monte Carlo

Text Books	
1	Cormen, Lieserson, Rivest, “Introduction to Algorithms”, 2nd Edition, PHI, 2003
2	E Horrowitz, S salmi, S Rajasekaran, “Fundamentals of Computer Algorithms”, Second Edition, University Press, 2007
Reference Books	
1	Aho, A V Hopcraft Ullman JD, “The Design and analysis of computer Algorithms”, Pearson Education, 2007
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_cs68/preview
2	https://nptel.ac.in/courses/106/104/106104019/

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First Year (Semester-I) M.Tech. (CSE)

Course Code: MCS21102 (Artificial Intelligence & Intelligent Systems)

Teaching Scheme	
Lectures	4Hrs/week
Tutorial	-
Total Credit	4

Examination Scheme	
CT-1	20 Marks
CT-2	20 Marks
TA	-
ESE	60 Marks
Total	100 Marks
Duration of ESE :03Hrs 00Min.	

Course Objective:

1	To impart knowledge about Artificial Intelligence
2	Become familiar with basic principles of AI towards problem solving, inference, perception, Knowledge representation and reasoning.
3	Demonstrate good knowledge of basic theoretical foundations of various types of AI Learning Models.
4	Apply AI techniques to real-world problems to develop intelligent systems .
5	To impart knowledge about Artificial Intelligence

Course Contents

Unit I	**Introduction to Artificial Intelligence:** Overview of AI problems, AI problems as NP, NP-Complete and NP Hard problems. Strong and weak, neat and scruffy, symbolic and sub-symbolic, knowledge-based and data-driven AI.
Unit II	**Search Strategies:** Problem spaces: states, goals and operators, problem solving by search, Heuristics and informed search, Single Candidate Optimization Algorithm, Minmax Search, Alpha-beta pruning. Constraint satisfaction (backtracking and local search methods).
Unit III	**Knowledge representation and reasoning:** Propositional and predicate logic, Resolution and theorem proving, Temporal and spatial reasoning, Totally-ordered and partially-ordered Planning. Goal stack planning, Nonlinear planning and Hierarchical planning, Uncertainity in AI
Unit IV	**AI Learning Models:** Single Agent Learning, Multi Agent Learning, Knowledge-Based Classification, Feedback-Based Classification. **Natural Language Processing:** Language models, n-grams, Vector space models, Bag of words, Text classification. Information retrieval.
Unit V	**Intelligent Systems:** Representing and Using Domain Knowledge, Expert System Shells, Rule-based Expert System, Knowledge Acquisition, Case-Based Reasoning(CBR), Future of Intelligent Systems **Key Application Areas:** Expert system, decision support systems, Speech and vision, Natural language processing, Information Retrieval, Semantic Web.

Text Books

1	Artificial Intelligence by Elaine Rich, Kevin Knight and Shivashankar B Nair, Tata McGraw Hill.
2	Artificial Intelligence: A Modern Approach by S. Russell and P. Norvig, Prentice Hall
3	Artificial Intelligence and Intelligent Systems by N.P. Padhy, Oxford University Press

Reference Books

1	Introduction to Artificial Intelligence and Expert Systems by Dan W. Patterson, Pearson Education.
2	Intelligent Systems for Engineers and Scientists, 3rd Edition by Adrian A. Hopgood CRC Press

Useful Links	
1	https://nptel.ac.in/courses/106/105/106105077/
2	https://nptel.ac.in/courses/106/102/106102220/
3	https://nptel.ac.in/courses/106/106/106106202/

	Course Outcomes	CL	Class Session
1	**Apply** AI techniques to solve different problems.	3	9
2	**Choose** problem solving methods to solve a specific problem and provide the best result.	5	9
3	**Estimate** formal methods of knowledge representation, logic and reasoning	5	9
4	**Analyze** various AI Learning Models	4	9
5	**Develop** intelligent systems to solve practical problems.	6	9

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First Year (Semester-I) M. Tech. (CSE)

Course Code: MCS21103 (High Performance Computer Architecture)

Teaching Scheme	
Lectures	4Hrs/week
Tutorial	-
Total Credit	4

Examination Scheme	
CT-1	20 Marks
CT-2	20 Marks
TA	-
ESE	60 Marks
Total	100 Marks
Duration of ESE :03Hrs 00Min.	

Course Objective:

1	Provide systematic and comprehensive treatment of the hardware and the software high performance techniques involved in current day computing.
2	Introduce the fundamentals of high-performance computing with the graphics processing units and many integrated cores using their architectures and corresponding programming environments.
3	Introduce the learner to fundamental and advanced parallel algorithms through the GPU and MIC programming environments.
4	Provide systematic and comprehensive treatment of the components in the pipeline that extract instruction level parallelism.
5	Provide a strong foundation on memory hierarchy design and tradeoffs in both uniprocessor and multiprocessors.

Course Contents

Unit I	**Theory of Parallelism:** Parallel Computer Models, The State of Computing, Multiprocessors and Multicomputer, Multivector and SIMD Computers, PRAM and VLSI Models, Architectural Development Tracks, Principles of Scalable Performance: Performance Metrics and Measures, Speedup and Performance Laws.
Unit II	**Pipelining:** Basic concepts, instruction and arithmetic pipelines, and hazards in a pipeline: structural, data and control hazards, overview of hazard resolution technique, Dynamic instruction scheduling, branch prediction techniques, Exception handling, Pipeline optimization techniques, Compiler techniques for improving performance.
Unit III	**Instruction Level Parallelism:** Concepts and Challenges, Basic Compiler Techniques for Exposing ILP, Reducing Branch Costs with Prediction , Overcoming Data Hazards with Dynamic Scheduling ,Dynamic Scheduling: Algorithm, Data level and Thread Level Parallelism.
Unit IV	**Memory Hierarchies:** Basic concept of hierarchical memory organization, Hierarchical memory technology, main memory, Inclusion, Coherence and locality properties, Cache memory design and implementation, Techniques for reducing cache misses, Virtual memory organization, mapping and management techniques, memory replacement policies, RAID.
Unit V	**Parallel and Scalable Architecture:** Multiprocessors and Multicomputer: Multiprocessor System Interconnect, Cache Coherence and Synchronization Mechanism, Multivector and SIMD Computers: Vector Processing Principles, Multivector-Multiprocessor, Compound Vector Processing.

Text Books

1	John. Hennessy & David A . Patterson, “Computer Architecture A quantitative approach”, 5 th Edition, Morgan Kaufmann Publications.
2	Kai Hwang and A. Briggs , “Computer Architecture and parallel Processing ” , International Edition McGraw-Hill.

Reference Books

1	Kai Hwang and Naresh Jotwani, “Advanced Computer Architecture: Parallelism, Scalability and Programmability” 2 nd Edition, TMH Publications
2	David A. Kular and Jasvinder Pal Singh,“ Parallel Computer Architecture”, Morgan Kaufmann Publications.

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc20_me61/preview
2	https://nptel.ac.in/courses/106/105/106105033/

	Course Outcomes	CL	Class Session
1	**Design**, formulate, solve and implement high performance versions of standard single threaded algorithms	6	9
2	**Demonstrate** the architectural features in the GPU and MIC hardware accelerators.	2	9
3	**Design** programs to extract maximum performance in a multicore, shared memory execution environment processor	6	9
4	**Design** and deploy large scale parallel programs on tightly coupled parallel systems using the message passing paradigm.	6	9
5	**Ability** to work with Multiprocessors and Multicomputer Architecture	3	9

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First Year (Semester-I) M.Tech. (CSE)

Course Code: MCS21105 (Elective – I Digital Image Processing)

Teaching Scheme	
Lectures	4Hrs/week
Tutorial	-
Total Credit	4

Examination Scheme	
CT-1	20 Marks
CT-2	20 Marks
TA	-
ESE	60 Marks
Total	100 Marks
Duration of ESE :03Hrs 00Min.	

Course Objective:

1	To study the development of two dimensional (2D) transforms and their properties.
2	Understand Image enhancement by using spatial domain techniques such as point processing, histogram processing and spatial filtering.
3	Deals with Image enhancement by using frequency domain techniques such as filtering and homomorphic systems.
4	To Study formulation of the image restoration problem
5	Deals with subdivides and image into its constituent parts or objects by using thresholding and region oriented segmentation methods

Course Contents

Unit I	**Digital Image Fundamentals & Image Transforms:** Digital Image fundamentals, Sampling and Quantization, Relationship between pixels, Image transforms: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine transform, Hotelling transform
Unit II	**Image Enhancement (Spatial Domain)**: Introduction, Image Enhancement in spatial domain, Enhancement through point operation, types of point operation, histogram manipulation, linear and non-linear gray level transformation, local or neighborhood operation, median filter, spatial domain high -pass filtering
Unit III	**Image Enhancement (Frequency Domain):** Filtering in frequency domain, obtaining frequency domain filters from spatial filters, generating filters directly in the frequency domain. Low pass (smoothing) and High pass (sharpening) filters in frequency domain.
Unit IV	**Image Restoration**: Degradation model, Algebrain approach to restoration, inverse filtering, least mean square filters. Constrained least square restoration, interactive restoration.
Unit V	**Image segmentation**: Detection of discontinuities, Edge linking and boundary detection, Threshold, Region oriented segmentation.

Text Books

1	Digital Image Processing , Rafael C. Gonzalez, Richard E. Woods, 3rd Edn, Pearson, 2008 T2.
2	Digital Image Processing, S. Jayaraman, S. Esakkirajan, T. Veerakumar, TMH, 2010

Reference Books

1	Digital Image Processing using MAT LAB, Rafael, C. Gonzalez, Richard E woods and Stens L Eddings, 2nd Edn, TMH, 2010
2	Fundamentals of Digital Image Processing, A.K. Jain, PHI, 1989
3	Digital Image Processing and Computer Vision, Somka, Hlavac, Boyle, Cengage Learning (India Edition) 2008

Useful Links	
1	www.imageprocessingplace.com
2	http://freevideolectures.com/Course/2316/Digital-Image- Processing-IIT-Kharagpur
3	www.stanford.edu/class/ee368/

	Course Outcomes	CL	Class Session
1	**Understanding** of digital image fundamentals	2	9
2	**Analyze** image enhancement techniques	4	9
3	**Apply** frequency domain techniques for image enhancement	3	9
4	**Understanding** of image restoration principles	2	9
5	**Demonstrate** proficiency in image segmentation techniques	3	9

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First Year (Semester-I) M.Tech. (CSE)

Course Code: MCS21106 (Advanced Data Mining)

Teaching Scheme	
Lectures	4 Hrs/week
Tutorial	-
TotalCredit	4

Examination Scheme	
CT-1	20 Marks
CT-2	20 Marks
TA	-
ESE	60 Marks
Total	100 Marks
Duration of CSE :03Hrs 00Min.	

Course Objective:

1	Explore and analyze the characteristics of advanced data mining methods beyond basic approaches.
2	Implement and evaluate different unsupervised learning algorithms such as clustering and dimensionality reduction techniques.
3	Develop an understanding of sequential pattern mining algorithms and their relevance in analyzing data streams.
4	Explore advanced techniques for analyzing and forecasting time series data.
5	Explore advanced techniques for analyzing and forecasting time series data.

Course Contents

UNIT I	Data Mining: Characteristics, Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives, scalable methods;
UNIT II	Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns. Clustering graph and network data, advanced cluster analysis.
UNIT III	Mining Data Streams, Methodologies for stream data processing and stream data systems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis;
UNIT IV	Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis
UNIT V	Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining

Text Books

1	Jiawei Han and M Kamber, Data Mining Concepts and Techniques,, Second Edition, Elsevier Publication, 2011.
2	Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2006
3	G Dong and J Pei, Sequence Data Mining, Springer, 2007

Reference Books

1	Advanced Data Mining and Applications" edited by Yong Shi, Shuliang Wang, and Xue Li
2	Data Mining: Concepts and Techniques" by Jiawei Han, Micheline Kamber, and Jian Pei
3	Mining of Massive Datasets" by Jure Leskovec, Anand Rajaraman, and Jeffrey D. Ullman

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_cs06/preview
2	www.coursera.org/learn/mining-massive-datasets
3	https://extendedstudies.ucsd.edu/courses-and-programs/data-mining-for-advanced-analytics

	CourseOutcomes	CL	Class Session
CO1	Understand the characteristics of advanced data mining techniques	3	9
CO2	Apply various unsupervised learning methods to real life problems	3	9
CO3	Apply sequential mining to data streams	3	9
CO4	Apply advanced data mining to time series data	3	9
CO5	Study different web mining techniques	5	9

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First Year (Semester-I) M.Tech. (CSE)

Course Code (MCS21107) Embedded System

Teaching Scheme	
Lectures	4Hrs/week
Tutorial	-
TotalCredit	4

Examination Scheme	
CT-1	20 Marks
CT-2	20 Marks
TA	-
ESE	60 Marks
Total	100 Marks
Duration of ESE :03Hrs 00Min.	

Course Objective:

1	To give sufficient background for understanding embedded systems design.
2	To understand connections of various peripherals with microcontroller-based systems.
3	To Analyze embedded system based on RTOS and communication protocols.

Course Contents

Unit I	**Introduction to an embedded systems design:** Microcontroller, Memory Devices, Embedded System Project Management, ESD and Co-design issues in System development Process, Use of software tools for development of an ES, embedding software on target machine.
Unit II	**Introduction to real time operating systems:** Real Time Operating Systems: OS Services, I/O Subsystems, Interrupt Routines in RTOS Environment, RTOS Task Scheduling model, Interrupt Latency and Response times of the tasks.
Unit III	**Overview of Microcontroller:** Microcontroller and Embedded Processors, Overview of 8051 Microcontroller Architecture, basic assembly language programming concepts, The program Counter and ROM Spaces in the 8051, 8051 Register Banks and Addressing Modes, accessing memory, Arithmetic instructions and programs, Logical instructions, Single-bit instruction programming.
Unit IV	**Communication with 8051:** Basics of Communication, Overview of RS-232, I2C Bus, UART, USB, 8051 connections to RS-232, 8051 serial communication programming, 8051 interrupts, Programming of timer interrupts, Interrupt priority in the 8051.
Unit V	**Interfacing with 8051:** Interfacing an LCD to the 8051, 8051 interfacing to ADC, Sensors, Interfacing a Stepper Motor, 8051 interfacing to the keyboard.

Text Books

1	Raj Kamal, "Embedded Systems", TMH, 2004.
2	M.A. Mazidi and J. G. Mazidi, "The 8051 Microcontroller and Embedded Systems", PHI, 2004..

Reference Books

1	Dr. Rajiv Kapadia, "8051 Microcontroller & Embedded Systems", Jaico Press Society, 2015
2	K.J. Ayala, "The 8051 Microcontroller", Penram International, 1991.

Useful Links

1	https://nptel.ac.in/courses/106/105/106105193/
2	https://onlinecourses.nptel.ac.in/noc20_ee98/preview

	Course Outcomes	CL	Class Session
1	**Understand** the concepts of Embedded System design.	2	9
2	**Analyze** real time operating systems used to design embedded systems.	4	9
3	**Make Use of** a microcontroller for embedded system design.	4	9
4	**Analyze** communication technique and protocol used in embedded.	4	9
5	**Design** and interface various devices to the microcontroller.	6	9

						1.0	Applicable from 2023-24
Chairperson	Dean OBE	Dean Academics	Vice Principal	Principal	Date of Release	Version	

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First Year (Semester-I) M.Tech. (CSE)

Course Code: MCS21108 (Elective -II Advanced Operating Systems)

Teaching Scheme	
Lectures	4Hrs/week
Tutorial	-
Total Credit	4

Examination Scheme	
CT-1	20 Marks
CT-2	20 Marks
TA	-
ESE	60 Marks
Total	100 Marks
Duration of CSE :03Hrs 00Min.	

Course Objective:

1	Introduction to Distributed Computing Systems
2	Understand the features of message passing systems, synchronization, and buffering techniques
3	Introduction, Design and implementation of DSM system
4	Learn task assignment, load balancing, load sharing approaches, process migration, and threads in distributed systems
5	Comprehensive understanding of file management and security mechanisms.

Course Contents

Unit I	**Introduction:** Introduction to Distributed Computing Systems, System Models, and Issues in Designing a Distributed Operating System, Examples of distributed systems
Unit II	Features of Message Passing System, Synchronization and Buffering, Introduction to RPC and its models, Transparency of RPC, Implementation Mechanism, Stub Generation and RPC Messages, Server Management, Call Semantics, Communication Protocols and Client Server Binding
Unit III	Introduction, Design and implementation of DSM system. Granularity and Consistency Model, Advantages of DSM, Clock Synchronization, Event Ordering, Mutual exclusion, Deadlock, Election Algorithms
Unit IV	Task Assignment Approach, Load Balancing Approach, Load Sharing Approach, Process Migration and Threads
Unit V	File Models, File Accessing Models, File Sharing Semantics, File Caching Schemes, File Replication, Atomic Transactions, Cryptography, Authentication, Access control and Digital Signatures.

Text Books

1	Pradeep. K. Sinha: “Distributed Operating Systems: Concepts and Design”, PHI, 2007.
2	George Coulouris, Jean Dollimore, Tim Kindberg: “Distributed Systems”, Concept and Design, 3rd Edition, Pearson Education, 2005
3	. A.D. Kshem kalyani, M. Singhal, “Distributed Computing: Principles, Algorithms, and Systems

Reference Books

1	"Distributed Systems: Principles and Paradigms" by Andrew S. Tanenbaum and Maarten Van Steen
2	"Distributed Systems: Concepts and Design" by George Coulouris, Jean Dollimore, Tim Kindberg, and Gordon Blair
3	"Distributed Algorithms" by Nancy Lynch

Useful Links

1	https://archive.nptel.ac.in/courses/106/106/106106168/
2	https://onlinecourses.nptel.ac.in/noc21_cs15/preview
3	https://freevideolectures.com/course/4596/nptel-distributed-systems

	Course Outcomes	CL	Class Session
1	Understand the basics of Computing Systems and its functionalities	2	9
2	Study distributed Computing system concepts agreement protocols and Create models for distributed Computing systems	1	9
3	Understand basics of agreement problem along with its solution	2	9
4	Understand concurrency control and properties of transaction in Distributed Computing systems	2	9
5	Apply different techniques learned in the distributed Computing system	3	9

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First Year (Semester-I) M.Tech. (CSE)

Course Code: MCS21109 (Elective -II Data Science)

Teaching Scheme	
Lectures	4Hrs/week
Tutorial	-
Total Credit	4

Examination Scheme	
CT-1	20 Marks
CT-2	20 Marks
TA	-
ESE	60 Marks
Total	100 Marks
Duration of CSE :03Hrs 00Min.	

Course Objective:

1	Understanding of core concepts and terminology in the field of data and technology.
2	Analysis of data collection and management
3	Understand and exploration, integrating diverse data sources
4	Equip learners with the skills to create a variety of data visualizations
5	Utilize regression and classification techniques through case studies using diverse datasets

Course Contents

Unit I	Introduction to core concepts and technologies: Introduction, Terminology, data
Unit II	Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources
Unit III	Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes
Unit IV	Data Visualisation Using Matoplotlib & Seaborn libraries : Scatter plot, line plot, bar plot, histogram, box plot, pie chart, pair plot
Unit V	Case Study Regression and Classification (use of any case study using a dataset) Regression datasets - Crime_in_india, Salary_Classification, Income_Data, Classification Datasets - Shopping_Mall,Social_Network_Ads

Text Books

1	Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly.
2	Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press
3	Mastering Python for data science, Samir Madhavan

Reference Books

1	Human-Computer Interaction, Alan Dix ,Janet E. Finlay, Gregory D. Abowd, Russell Beale Pearson Education.
2	.Brian Fling, "Mobile Design and Development", First Edition , OReilly Media Inc., 2009
3	. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, OReilly, 2009.

Useful Links

1	http://www.digimat.in/nptel/courses/video/106106212/L01.html
2	https://nptel.ac.in/courses/106106179
3	https://onlinecourses.nptel.ac.in/noc21_cs69/preview

	Course Outcomes	CL	Class Session
1	Explain how data is collected, managed and stored for data science	2	9
2	Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists	2	9
3	Analyze data collection and management scripts using MongoDB	4	9
4	Understand the mathematical foundations required	2	9
5	Evaluate data science frameworks with a practical case study.	5	9

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First Year (Semester-I) M.Tech. (CSE)

Course Code: MCS21110 (Cryptography &Information Security)

Teaching Scheme	
Lectures	4Hrs/week
Tutorial	-
TotalCredit	4

Examination Scheme	
CT-1	20 Marks
CT-2	20 Marks
TA	-
ESE	60 Marks
Total	100 Marks
Duration of ESE :03Hrs 00Min.	

Course Objective:

1	**Understand** the various types of security threats and vulnerabilities affecting computer systems.
2	**Understand** the principles of symmetric and asymmetric cryptography and their applications in secure communication.
3	**Evaluate** the security of cryptosystems against various cryptographic attacks and vulnerabilities.
4	**Evaluate** the security of cryptosystems against various cryptographic attacks and vulnerabilities.
5	**Understand** common network attacks and intrusion detection/prevention techniques.

Course Contents

Unit I	Overview: Computer Security Concepts, The OSI Security Architecture, A Model for Network Security, Block Ciphers and the Data Encryption Standard.
Unit II	Advanced Encryption Standard: The Origins AES, AES Structure, AES Round Functions, AES Key Expansion, An AES Example, AES Implementation.
Unit III	Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems, The RSA Algorithm, Other Public-Key Cryptosystems: Diffie-Hellman Key Exchange, Elliptic Curve Cryptography. Cryptographic hash function(SHA),Digital signature standard(DSS)
Unit IV	Information Security Overview, Risk Analysis, Compliance with Standards, Regulations, and Laws, Secure Design Principles, Security Policies, Standards, Procedures, and Guidelines, Data Security: Securing Unstructured Data, Information Rights Management, Storage Security, Database Security.
Unit V	Overview: Computer Security Concepts, The OSI Security Architecture, A Model for Network Security, Block Ciphers and the Data Encryption Standard.

Text Books

1	William Stallings “Cryptography And Network Security Principles And Practice Fifth Edition” (Fifth Edition) Pearson Education.
2	Mark Rhodes-Ousley "The Complete Reference Information Security Second Edition" Second Edition, Tata McGraw Hill
3	N. Olifer V. Olifer, “Computer Networks:Principles, Technologies and Protocols for Network design”, Wiley India Edition (1st Edition).

Reference Books

1	Marc Farley, Building Storage Networks , Tata McGraw Hill
2	S. Tanenbaum , “Computer Networks”, Pearson Education, Fourth Edition.

Useful Links

1	https://onlinecourses.nptel.ac.in/noc21_cs06/preview
2	https://www.cs.umd.edu/~jkatz/crypto/f02/readings.html
3	https://onlinecourses.nptel.ac.in/noc22_cs90/preview

	CourseOutcomes	CL	Class Session
CO1	**Analyze** security issues in computer system.	3	9
CO2	**Study** Advance algorithms for information interchange	3	9
CO3	**Design** and **evaluate** the Cryptosystems.	3	9
CO4	**Study** policies, standards and regulations related to information security.	3	9
CO5	**Identify** and resolve issues in computer networking environment.	5	9

						1.0	Applicable from 2023-24
Chairperson	Dean OBE	Dean Academics	Vice Principal	Principal	Date of Release	Version	