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M.Tech-COMPUTER SCIENCE & ENGINEERING
Course Structure –R21

I Semester

S.No	Class	Course Code	Course Title	Int. marks	Ext. marks	L	T	P	C
1	PC	C581PC1	Data Structures and Algorithms	30	70	3	0	0	3
2	PC	C581PC2	Advanced Databases	30	70	3	0	0	3
3	PC	C581PC3	Digital Image Processing	30	70	3	0	0	3
4	PE1	C581PE1A	Information Security	30	70	3	0	0	3
5		C581PE1B	Mobile Applications and Services						
6		C581PE1C	Big Data Analytics						
7		C581PE1D	Game Theory						
8	PE2	C581PE2A	Optimization Techniques	30	70	3	0	0	3
9		C581PE2B	Natural Language Processing						
10		C581PE2C	Advanced Computer Architecture						
11		C581PE2D	Computer Forensics						
12	PC	C581PC4	Data Structures and Algorithms Lab	30	70	0	0	3	1.5
13	PC	C581PC5	Digital Image Processing Lab	30	70	0	0	3	1.5
						15	**0**	**6**	**18**

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech I Semester **L/T/P/C**
3/0/0/3

DATA STRUCTURES AND ALGORITHMS (C581PC1)

Course Objectives:

- The fundamental design, analysis, and implementation of basic data structures. Basic concepts in the specification and analysis of programs.
- Principles for good program design, especially the uses of data abstraction. Significance of algorithms in the computer field
- Various aspects of algorithm development Qualities of a good solution

Course Outcomes:

- Introduce the classic algorithms in various domains, and techniques for designing efficient algorithms.
- Gain the ability to analyze worst-case running time of algorithms and understand fundamental algorithmic problems.
- Familiarize with basic paradigms and data structures used to solve algorithmic problems.
- Understanding of different classes of problems with reference to their computation difficulties
- Enrich the students with the recent developments in the area of algorithm design

Unit - I :

Introduction - Role of algorithms in computing, Analyzing algorithms, Designing Algorithms, Growth of Functions, Divide and Conquer- The maximum-subarray problem, Stassen's algorithms for matrix multiplication, The substitution method for solving recurrences, The recurrence-tree method for solving recurrence, The master method for solving recursions, Probabilistic analysis and random analysis.

Unit - II:

Review of Data Structures- Elementary Data Structures, Hash Tables, Binary Search Trees, Red-Black Trees.

Unit - III:

Dynamic Programming - Matrix-chain multiplication, Elements of dynamic programming, Longest common subsequence, Greedy Algorithms - Elements of the greedy strategy, Huffman codes, Amortized Analysis-Aggregate analysis, The accounting method, The potential method, Dynamic tables.

Unit - IV:

Graph Algorithms - Elementary Graph Algorithms, Minimal spanning trees, Single-Source Shortest Paths, Maximum flow.

Unit - V:

NP-Complete & Approximate Algorithms-Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-complete & approximation problems - Clique problem, Vertex cover problem, formula satisfiability, 3 CNF Satisfiability. The vertex-cover problem, The traveling salesman problem, The subset-sum problem.

Text books:

1. "Introduction to Algorithms", Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest,
2. Clifford Stein, Third Edition, PHI Publication.
3. "Data Structures and Algorithms in C++", M.T. Goodrich, R. Tamassia and D.Mount, Wiley India.

References:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Second Edition, Galgotia Publication.
2. Data structures with C++, J. Hubbard, Schaum's outlines, TMH.
3. Data structures and Algorithm Analysis in C++, 3rd edition, M. A. Weiss, Pearson.
4. Classic Data Structures, D. Samanta, 2nd edition, PHI.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech I Semester **L/T/P/C**
3/0/0/3

ADVANCED DATABASES (C581PC2)

Course Objective:

Design and implement relational databases, distributed databases, XML databases and multimedia databases. Implement the concept of database connectivity with the applications.

Course Outcomes:

On successful completion of this course, the student will be able to

- Understand the underlying principles of Relational Database Management System.
- Understand and implement the advanced features of DBMS.
- Develop database models using distributed databases.
- Implement and maintain an efficient database system using emerging trends.

Unit I:
RELATIONAL MODEL
Data Model – Types of Data Models: – Entity Relationship Model – Relational Data Model – Mapping Entity Relationship Model to Relational Model – Structured Query Language – Database Normalization – Transaction Management.

Unit II:
PARALLEL AND DISTRIBUTED DATABASES
Centralized and Client-Server Architectures – Parallel Systems – Distributed Systems – Parallel Databases – I/O Parallelism – Inter- and Intra-Query Parallelism – Inter- and Intra- operation Parallelism – Distributed Database Concepts: – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing.

Unit III:
XML DATABASES
XML Databases: XML Data Model – DTD – XML Schema – XML Querying – Web Databases – Open Database Connectivity.

Unit IV:
MULTIMEDIA DATABASES
Multidimensional Data Structures – Image Databases – Text / Document Databases – Video Databases – Audio Databases – Multimedia Database Design.

Unit V:

CURRENT ISSUES

Active Databases – Deductive Databases – Data Warehousing – Data Mining – Database Tuning – Database Security.

Text Books

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Addison-Wesley, 2011.2.
2. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education,2007.
3. Henry F Korth, Abraham Silber schatz, S. Sudharshan, "Database System Concepts", Fifth Edition, McGraw Hill,2006.
4. C.J. Date, A .Kannan and S.Swamynathan,"An Introduction to Database Systems", Eighth Edition, Pearson Education,2006.
5. V.S.Subramanian, "Principles of Multimedia Database Systems", Harcourt IndiaPvt. Ltd.,2001.

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3/0/0/3

DIGITAL IMAGE PROCESSING (C581PC3)

Course Objective:

- To study the concepts of Digital Image Processing focuses on various image processing methods.
- To study the image enhancement and compression techniques.
- To study image restoration and segmentation procedures.
- To study an advanced Digital Image Processing investigates algorithms and techniques for a variety of imaging applications.

Course Outcomes:

Review the basic concepts of a digital image processing.
Analyze images in the spatial domain using various transformation techniques.
Apply the image processing techniques in various domain of image processing.
Analyses the techniques real world applications.

Unit-I

DIGITAL IMAGE FUNDAMENTALS

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color models.

Unit-II

IMAGE ENHANCEMENT

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

Unit-III

IMAGE RESTORATION AND SEGMENTATION

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation-Morphological processing- erosion and dilation.

Unit-IV

MAGE COMPRESSION

Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding –LZW Coding Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

Unit-V

COLOR IMAGE PROCESSING

Color Fundamentals, Color Models, Pseudocolor image Processing, Basics of Full Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation

Text Books and References

1. R. C.Gonzalez and R. EWoods, "Digital Image Processing", Pearson Prentice Hall.
2. A. K.Jain, "Fundamentals of Digital Image Processing", PHI.
3. B. Chandra andD.D.Majumder "Digital Image Processing and Analysis", PHI.
4. S.Jayaraman, S.Esakkirajan and T.Veerakumar, "Digital Image Processing", Tata McGraw Hill.
5. E.Gose, R. Johnsonbaugh and S.Jost, "Pattern Recognition and Image Analysis", PHI

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INFORMATION SECURITY (C581PE1A)

Course Objectives

Demonstrate the knowledge of cryptography, network security concepts and applications. Ability to apply security principles in system design.

Course Outcomes

- To understand the fundamentals of Cryptography.
- To understand various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks.
- To apply algorithms used for secure transactions in real world applications.

Unit I

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security.
Classical Encryption Techniques, DES, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operation, Blowfish, Placement of Encryption Function, Traffic Confidentiality, key Distribution, Random Number Generation.

Unit II

Public key Cryptography Principles, RSA algorithm, Key Management, Diffie - Hellman Key Exchange, Elliptic Curve Cryptography.
Message authentication and Hash Functions, Authentication Requirements and Functions, Message Authentication, Hash Functions and MACs Hash and MAC Algorithms SHA-512, HMAC.

Unit III

Digital Signatures, Authentication Protocols, Digital signature Standard, Authentication Applications, Kerberos, X.509 Directory Authentication Service. Email Security: Pretty Good Privacy (PGP) and S/MIME.

Unit IV

IP Security - Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.
Web Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer

Security (TLS), Secure Electronic Transaction (SET).

Unit V

Intruders, Viruses and Worms Intruders, Viruses and related threats Firewalls: Firewall Design Principles, Trusted Systems, Intrusion Detection Systems.

Textbooks:

1. Cryptography and Network Security (principles and approaches) by William Stallings Pearson Education, 4th Edition.

Reference books:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Principles of Information Security, Whitman, Thomson

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MOBILE APPLICATIONS AND SERVICES (C581PE1B)

Course Objective

- This course presents the three main mobile platforms and their ecosystems, namely Android, iOS, and PhoneGap/WebOS. It explores emerging technologies and tools used to design and implement feature-rich mobile applications for smartphones and tablets It also take into account both the technical constraints relative to storage capacity, processing capacity, display screen, communication interfaces, and the user interface, context and profile

Course Outcomes

- On completion of the course the student should be able to identify the target platform and users and be able to define and sketch a mobile application
- understand the fundamentals, frameworks, and development lifecycle of mobile application platforms including iOS, Android, and PhoneGap
- Design and develop a mobile application prototype in one of the platform (challenge project)

Unit I:

Introduction: Introduction to Mobile Computing, Introduction to Android Development Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development Android User.

Unit II:

More on Uis: VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal Uis, . Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider

Unit III:

Communications via Network and the Web:State Machine, Correct Communications Model, Android Networking and Web, Telephony Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony Notifications and Alarms:Performance,

Performance and Memory anagement, Android Notifications and Alarms, Graphics, Performance and Multithreading, Graphics and UI Performance, Android Graphics.

Unit IV:

Putting It All Together : Packaging and Deploying, Performance Best Practices, Android Field Service App, Location Mobility and Location Based Services Android Multimedia: Mobile Agents and Peer-to-Peer Architecture, Android Multimedia

Unit V:

Platforms and Additional Issues : Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing, Security and Hacking , Active Transactions, More on Security, Hacking Android

References:

1. Wei-Meng Lee, Beginning Android™ 4 Application Development, 2012 by John Wiley & Sons

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BIG DATA ANALYTICS (C581PE1C)

Course Objective

- Understand big data for business intelligence. Learn business case studies for big data analytics. Understand nosql big data management. Perform map-reduce analytics using Hadoop and related tools

Course Outcomes

- Describe big data and use cases from selected business domains
- Explain NoSQL big data management
- Install, configure, and run Hadoop and HDFS
- Perform map-reduce analytics using Hadoop
- Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

Unit I:

What is big data, why big data, convergence of key trends, unstructured data,industry examples of big data, web analytics, big data and marketing, fraud andbig data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data,big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

Unit II:

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.

Unit III:

Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures.

Unit IV:

MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats.

Unit V:

Hbase, data model and implementations, Hbase clients, Hbase examples, praxis.Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration. Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.

Text Books and References:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging
2. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
3. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
4. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
5. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
6. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
7. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
8. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.

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M.Tech I Semester **L/T/P/C**
3/0/0/3

GAME THEORY (C581PE1D)

Course Objectives:

- To teach students some strategic considerations to take into account making their choices.
- To learn basic concepts of game theory.
- To apply game theoretic models to real world problems.

Course Outcomes

- Solve strategic games between two and more agents in non-cooperative scenario.
- Analyze and solve both simultaneous-moves and sequential-moves games.
- Learn different methods to solve games.

Unit I

Introduction to Game Theory What is game theory? Theory of rational choice Interacting decision makers. Strategic Games and Nash Equilibrium Strategic games: examples Nash equilibrium: concept and examples Best response functions Dominated Actions Symmetric games and symmetric equilibria

Unit II

Illustrations of Nash Equilibrium Cournot's model of duopoly market Bertrand's model of duopoly market Electoral Competition War of Attrition Auctions Accident Laws.

Unit III

Mixed Strategy Nash Equilibrium Introduction Strategic games with randomisation Mixed strategy Nash equilibrium: concept and examples Dominated Actions Formation of Players' beliefs .

Unit IV

Extensive Games and Nash Equilibrium Introduction to extensive games Strategies and outcomes Nash equilibrium Subgame perfect Nash equilibrium Backward induction .

Unit V

Illustrations of Extensive Games and Nash Equilibrium Stackelberg model of duopoly markets Ultimatum game

References:

1. Osborne, M.J.An Introduction to Game Theory, Oxford University Press, 2004
2. Mas-Colell,A., M.D. Whinston and J.R. Green Microeconomic Theory, Oxford University Press, 1995 3. Gibbons, R.A Primer in Game Theory,Pearson Education, 1992

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OPTIMIZATION TECHNIQUES (C581PE2A)

Course Objective

- The objective of this course is to provide insight to the mathematical formulation of real world problems.
- To optimize these mathematical problems using nature based algorithms. And the solution is useful specially for NP-Hard problems.

Course Outcomes

- Formulate optimization problems.
- Understand and apply the concept of optimality criteria for various types of optimization problems.
- Solve various constrained and unconstrained problems in Single variable as well as multivariable.
- Apply the methods of optimization in real life situation.

Unit I:

Engineering application of Optimization, Formulation of design problems as mathematical programming problems.

Unit II:

General Structure of Optimization Algorithms, Constraints, The Feasible Region.

Unit III:

Branches of Mathematical Programming: Optimization using calculus, Graphical Optimization, Linear Programming, Quadratic Programming, Integer Programming, Semi Definite Programming.

Unit IV:

Optimization Algorithms like Genetic Optimization, Particle Swarm Optimization, Ant Colony optimization etc. Real life Problems and their mathematical formulation as standard programming problems.

Unit V:

Recent trends: Applications of ant colony optimization, genetics and linear and quadratic programming in real world applications.

References:

1. Laurence A. Wolsey (1998). Integer programming. Wiley. ISBN 978-0-471-28366-9.
2. Practical Optimization Algorithms and Engineering Applications Andreas Antoniou.
3. An Introduction to Optimization Edwin K., P. Chong & Stanislaw h. Zak.
4. Dimitris Bertsimas; Robert Weismantel (2005). Optimization over integers. Dynamic Ideas.ISBN 978-0-9759146-2-5.

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NATURAL LANGUAGE PROCESSING (C581PE2B)

Course Objectives :

- To learn about the concepts and principles of natural language processing.
- To explore both theoretical and practical issues of natural language processing.
- To develop skills of finding solutions and building software using natural language processing techniques.

Course Outcomes

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms
- Able to design different language modeling Techniques.

Unit I

Introduction and Overview What is Natural Language Processing, hands-on demonstrations. Ambiguity and uncertainty in language. The Turing test. Regular Expressions Chomsky hierarchy, regular languages, and their limitations. Finite-state automata. Practical regular expressions for finding and counting language phenomena. A little morphology. Exploring a large corpus with regex tools.

Programming in Python An introduction to programming in Python. Variables, numbers, strings, arrays, dictionaries, conditionals, iteration.

The NLTK (Natural Language Toolkit) String Edit Distance and Alignment Key algorithmic tool: dynamic programming, a simple example, use in optimal alignment of sequences. String edit operations, edit distance, and examples of use in spelling correction, and machine translation.

Unit II

Context Free Grammars Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing, bottom-up parsing, and the problems with each. The desirability of combining evidence from both directions Non-probabilistic Parsing Efficient CFG parsing with

CYK, another dynamic programming algorithms. Early parser. Designing a little grammar, and parsing with it on some test data.

Unit III

Language modeling and Naive Bayes Probabilistic language modeling and its applications. Markov models. N-grams. Estimating the probability of a word, and smoothing. Generative models of language. Part of Speech Tagging and Hidden Markov Models, Viterbi Algorithm for Finding Most Likely HMM Path Dynamic programming with Hidden Markov Models, and its use for part-of speech tagging, Chinese word segmentation, prosody, information extraction, etc.

Unit IV

Probabilistic Context Free Grammars Weighted context free grammars. Weighted CYK. Pruning and beam search. Parsing with PCFGs A tree bank and what it takes to create one. The probabilistic version of CYK. Also: How do humans parse? Experiments with eye-tracking. Modern parsers.

Unit V

Maximum Entropy Classifiers The maximum entropy principle and its relation to maximum likelihood. Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks .Maximum Entropy Markov Models & Conditional Random Fields Part-of-speech tagging, nounphrase segmentation and information extraction models that combine maximum entropy and finitestate machines. State-of-the-art models for NLP

Text books:

1. "Speech and Language Processing": Jurafsky and Martin, Prentice Hall
2. "Statistical Natural Language Processing"- Manning and Schutze, MIT Press
3. "Natural Language Understanding". James Allen. The Benajmins/Cummings Publishing Company

References Books:

1. Cover, T. M. and J. A. Thomas: Elements of Information Theory. Wiley.
2. Charniak, E.: Statistical Language Learning. The MIT Press.
3. Jelinek, F.: Statistical Methods for Speech Recognition. The MIT Press.
4. Lutz and Ascher - "Learning Python", O'Reilly

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3/0/0/3

ADVANCED COMPUTER ARCHITECTURE(C581PE2C)

Course Objective:
An appreciation of the historical developments in computer architecture and an acquaintance with many of the current innovative designs, providing a basis for understanding the new computer architectures that are on the horizon.

Course Outcomes:
- Understand the Concept of Parallel Processing and its applications.
- Implement the Hardware for Arithmetic Operations.
- Analyze the performance of different scalar Computers.
- Develop the Pipelining Concept for a given set of Instructions.
- Distinguish the performance of pipelining and non pipelining environment in a processor.

Unit I
Fundamentals of Computer design- Technology trends- cost- measuring and reporting performance quantitative principles of computer design.
Instruction set principles and examples- classifying instruction set- memory addressing- type and size of operands- addressing modes for signal processing-operations in the instruction set- instructions for control flow- encoding an instruction set.-the role of compiler.

Unit II
Instruction level parallelism (ILP)- over coming data hazards- reducing branch costs –high performance instruction delivery- hardware based speculation- limitation of ILP
ILP software approach- compiler techniques- static branch protection – VLIW approach – H.W support for more ILP at compile time- H.W verses S.W Solutions

Unit III
Memory hierarchy design- cache performance- reducing cache misses penalty and miss rate – virtual memory- protection and examples of VM.

Unit IV
Multiprocessors and thread level parallelism- symmetric shared memory architectures- distributed shared memory- Synchronization- multi threading.
Storage systems- Types – Buses – RAID- errors and failures- bench marking a storage device- designing a I/O system.

Unit V
Inter connection networks and clusters- interconnection network media – practical issues in interconnecting networks- examples – clusters- designing a cluster.

Text book:

1. Computer Architecture A quantitative approach 3rd edition John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elsevier)

References:

1. "Computer Architecture and parallel Processing" Kai Hwang and A. Briggs International Edition McGraw-Hill.
2. Advanced Computer Architectures, Dezso Sima, Terence Fountain, Peter Kacsuk, Pearson.
3. Parallel Computer Architecture, A Hardware / Software Approach, David E. Culler, Jaswinder Pal singh with Anoop Gupta, Elsevier

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COMPUTER FORENSICS (C581PE2D)

Course Objective

- Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
- Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
- Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools

Course Outcomes

- Understand relevant legislation and codes of ethics
- Computer forensics and digital detective and various processes, policies and procedures
- E-discovery, guidelines and standards, E-evidence, tools and environment.
- Email and web forensics and network forensics

Unit I:

Digital Forensics Science: Forensics science, computer forensics, and digital forensics. **Computer Crime:** Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics

Unit II:

Cyber Crime Scene Analysis: Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

Unit III:

Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

Unit IV:

Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a

case, **Network Forensics:** open-source security tools for network forensic analysis, requirements for preservation of network data.

Unit V:

Mobile Forensics: mobile forensics techniques, mobile forensics tools. **Legal Aspects of Digital Forensics:** IT Act 2000, amendment of IT Act 2008.

References:

1. John Sammons, The Basics of Digital Forensics, Elsevier

2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech I Semester **L/T/P/C**
0/0/3/1.5

DATA STRUCTURES AND ALGORITHMS LAB (C581PC4)

Course Objectives:

The course is designed to develop skills to design and analyze simple linear and non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures .

Course Outcomes:

- At the end of this lab session, the student will · Be able to design and analyze the time and space efficiency of the data structure
- Be capable to identity the appropriate data structure for given problem
- Have practical knowledge on the applications of data structures

List of Experiments:

1. Write Java programs that use both recursive and non-recursive functions for implementing a) Linear search b) Binary search c) Merge sort d) Quick sort e) Radix sort f) Heap sort
2. Write Java programs to implement the following using arrays and linked lists
   a) List ADT b)Stack ADT c) Queue ADT d) Priority queue ADT
   e) Circular Queue ADT f) Dequeue
3. Write a Java programs to perform the following operations:
   a)Construct a binary search tree of elements b) Search for a key element in the above
   b) Binary search tree. c) Delete an element from the above binary search tree.
   d) Preorder, Inorder and Postorder traversals.
4. Write a Java program to implement all the functions of a dictionary (ADT) using hashing.
5. Write Java programs for the implementation of BFS and DFS for a given graph and implement Dijkstra's algorithm for Single source shortest path problem and implement Kruskal's algorithm to generate minimum cost spanning tree.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech I Semester **L/T/P/C**
0/0/3/1.5

DIGITAL IMAGE PROCESSING LAB(C581PC5)

Course Objective

- Be familiar with both the theoretical and practical aspects of computing with images.
- Have described the foundation of image formation, measurement, and analysis.

Course Outcomes

- Developed the practical skills necessary to build image processing applications.
- To have gained exposure to object and scene recognition and categorization from images.

List of Experiments:

1. Install and use different Image Processing Modules in Python
2. Read an Image and Display using PIL and CV2 modules
3. Implement and understand image resizing, image type conversion.
4. Implement of image addition, image complement, logical operations (like NOT, OR, AND, XOR) on images, geometric operations.
5. Understand histogram operations, contrast stretching, gamma correction on images.
6. Observe various type of noise effect on images.
7. Implement different spatial filtering (smoothing & sharpening) techniques.
8. Understand and implement Fast Fourier Transformation (FFT) and frequency domain filtering on images.
9. Understand image restoration and implement the Weiner filter on images.
10. Understand image segmentation using different edge detection, thresholding techniques.
11. Understand and implement different morphological operation and their applications.
12. Understand color model s and manipulate color images.

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M.Tech-COMPUTER SCIENCE & ENGINEERING
Course Structure –R21

II Semester

S.NO	Class	Course Code	Course Title	Int. marks	Ext. marks	L	T	P	C
1	PC	C582PC6	Machine Learning Techniques	30	70	3	0	0	3
2	PC	C582PC7	Distributed Computing	30	70	3	0	0	3
3	PC	C582PC8	Wireless Sensor Networks	30	70	3	0	0	3
4	PE3	C582PE3A	Deep Learning with Computer Vision	30	70	3	0	0	3
5		C582PE3B	Internet of Things						
6		C582PE3C	Blockchain						
7		C582PE3D	Cyber Security						
8	PE4	C582PE4A	Mobile Computing	30	70	3	0	0	3
9		C582PE4B	Soft Computing						
10		C582PE4C	Service Oriented Computing						
11		C582PE4D	Cloud Computing						
12	PC	C582PC9	Machine Learning Techniques Lab	30	70	0	0	3	1.5
13	PC	C582PC10	Wireless Sensor Networks Lab	30	70	0	0	3	1.5
14	AC	C583AC1	Audit Course-I			2	0	0	0
			Total Credits			**17**	**0**	**6**	**18**

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
3/0/0/3

MACHINE LEARNING TECHNIQUES(C582PC6)

COURSE OBJECTIVE

- To learn the concept of how to learn patterns and concepts from data without being explicitly
- Programmed in various IOT nodes.
- To design and analyse various machine learning algorithms and techniques with a modern
- Outlook focusing on recent advances.
- Explore supervised and unsupervised learning paradigms of machine learning.
- To explore Deep learning technique and various feature extraction strategies.

COURSE OUTCOMES

After completion of course, students would be able to:

- Extract features that can be used for a particular machine learning approach in various IOT applications.
- To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.
- To mathematically analyse various machine learning approaches and paradigms.

Unit I:
Supervised Learning (Regression/Classification)
Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes, Linear models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

Unit II:
Unsupervised Learning
Clustering: K-means/Kernel K-means, Dimensionality Reduction: PCA and kernel PCA
Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models)

Unit III
Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

Unit IV

Sparse Modelling and Estimation, Modelling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

Unit V

Scalable Machine Learning (Online and Distributed Learning),A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference Recent trends in various learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

Text Books:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, the Elements of Statistical Learning, Springer 2009 (freely available online).
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
3/0/0/3

DISTRIBUTED COMPUTING (C582PC7)

Course Objective:

Understand distributed Systems, distributed computing environment, RMI, DCOM architecture and CORBA architecture.

Course Outcomes:

1. Foundation of cooperative distributed systems engineering
2. Supporting technologies with a special attention to agent-oriented paradigm
3. Service-oriented computing and grid computing
4. The implementation component includes a term-project

Unit I

Introduction: The different forms of computing, the strengths and weaknesses of Distributed computing, Operating system concepts relevant to distributed computing, the architecture of distributed applications. Paradigms for Distributed Applications, choosing a Paradigm for an application (trade-offs).

Unit II

Cluster Computing: Parallel computing overview, cluster computing – Introduction, Cluster Architecture, parallel programming models and Paradigms, Applications of Clusters.

Unit III

Grid Computing: Introduction, Grid Computing Anatomy – Architecture, Architecture and relationship to other Distributed Technologies, Grid computing road map. Merging the Grid services Architecture with the Web Services Architecture.

Unit IV

Open Grid Service Architecture – Introduction, Architecture and Goal, Sample Use cases: Commercial Data Center, National Fusion Collaboratory, Online Media and Entertainment. OGSA platform Components, Open Grid Services Infrastructure.

UNIT V

Globus GT 3 Toolkit – Architecture, Programming Model, A sample implementation, High Level services, OGSI.NET Middleware Solutions.

Text Books:

1. Grid Computing, Joshy Joseph & Craig Fellenstein, Pearson education,2004
2. Distributed Computing, Principles and Applications, M.L.Liu, Pearson Education, 2004
3. High Performance Cluster Computing, Rajkumar Buyya, Pearson education.

Reference Books:

1. Grid Computing – Making the global infrastructure a reality, Fran Berman, Geoffrey C Fox, Anthony J G Hey, Wiley India, 2010.
2. A Networking Approach to Grid Computing, D.Minoli, Wiley & sons, 2006.
3. Grid Computing: A Practical Guide to Technology and Applications, A. Abbas, Firewall Media, 2008.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
3/0/0/3

WIRELESS SENSOR NETWORKS (C582PC8)

Course Objective:

Analyze the various design issues and challenges in the layered architecture of Adhoc wireless networks.

Course Outcomes:

1. To understand the concepts of sensor networks.
2. To understand the MAC and transport protocols for adhoc networks.
3. To understand the security of sensor networks.
4. To understand the applications of adhoc and sensor networks.

Unit I

Introduction to Adhoc Wireless Networks: Characteristics of MANETs, Applications of MANETs, Challenges.

Routing in MANETs: Topology-based versus Position-based approaches, Topology based routing protocols, Position based routing, Other Routing Protocols.

Unit II

Data Transmission in MANETs: The Broadcast Storm, Multicasting, Geocasting TCP over AdHoc Networks: TCP Protocol overview, TOP and MANETs, Solutions for TOP over AdHoc.

Unit III

Basics of Wireless Sensors and Applications: The Mica Mote, Sensing and Communication Range, Design issues, Energy consumption, Clustering of Sensors, **Applications**

Data Retrieval In Sensor Networks: Classification of WSNs, MAC layer, Routing layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

Unit IV

Security: Security in Ad hoc Wireless Networks, Key Management, Secure Routing, Cooperation in MANETs, Intrusion Detection Systems. Sensor Network Platforms and Tools: Sensor Network Hardware, Sensor Network Programming Challenges, Node-Level Software Platforms.

Unit V

Operating System — TinyOS Imperative Language: nesC, Dataflow style language: T1nyGALS, Node- Level Simulators, ns-2 and its sensor network extension, TOSSIM.

Text Books:

1. Ad Hoc and Sensor Networks — Theory and Applications, Car/os Corderlo Dharma R Aggarwal, World Scientific Publications /Cambridge University Press, March2006
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp 2009.

Reference Books:

1. Adhoc Wireless Networks — Architectures and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education, 2004
2. Wireless Sensor Networks — Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group,2010
3. Wireless Ad hoc Mobile Wireless Networks — Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group,2008.
4. Ad hoc Networking, Charles E.Perkins, Pearson Education,2001.
5. Wireless Ad hoc Networking, Shih-Liri Wu, Yu-Chee Tseng, Auerbach Publications, Taylor & Francis Group,2007
6. Wireless Ad hoc and Sensor Networks — Protocols, Performance and Control, Jagannathan Sarangapani, CRC Press, Taylor & Francis Group, 2007,rp 2010.
7. Security in Ad hoc and Sensor Networks, Raheem Beyah, et al., World Scientific Publications / Cambridge University Press,2010
8. Ad hoc Wireless Networks — A communication-theoretic perspective, Ozan K.Tonguz, Giatuigi Ferrari, Wiley India, 2006, rp2009.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
3/0/0/3

DEEP LEARNING WITH COMPUTER VISION(C582PE3A)

Course Outcomes

- Thoroughly Understanding the fundamentals of Deep Learning.
- Gaining knowledge of the different modalities of Deep learning currently used.
- Gaining Knowlegde about State-of the art models and Other Important Works in recent years.
- Learning the skills to develop Deep Learning based AI Systems(Use of Multiple packages etc.)

Unit: I

Introduction and Overview: Course Overview and Motivation; Introduction to Image Formation, Capture and Representation; Linear Filtering, Correlation, Convolution Visual Features and Representations: Edge, Blobs, Corner Detection; Scale Space and Scale Selection; SIFT, SURF; HoG, LBP, etc.

Unit: II

Visual Matching:
Bag-of-words, VLAD; RANSAC, Hough transform; Pyramid Matching; Optical Flow Deep Learning Review**:**Review of Deep Learning, Multi-layer Perceptrons, Backpropagation

Unit:III

Convolutional Neural Networks (CNNs):Introduction to CNNs; Evolution of CNN Architectures: AlexNet, ZFNet, VGG, InceptionNets, ResNets, DenseNets Visualization and Understanding CNNs**:** Visualization of Kernels; Backprop-to-image/Deconvolution Methods; Deep Dream, Hallucination, Neural Style Transfer; CAM, Grad-CAM, Grad-CAM++; Recent Methods (IG, Segment-IG, SmoothGrad)

Unit: IV

CNNs for Recognition, Verification, Detection, Segmentation:CNNs for Recognition and Verification (Siamese Networks, Triplet Loss, Contrastive Loss, and Ranking Loss); CNNs for Detection: Background of Object Detection, R-CNN, Fast R-CNN, Faster R-CNN, YOLO, SSD, RetinaNet; CNNs for Segmentation: FCN, SegNet, U-Net, And Mask-RCNN

Recurrent Neural Networks (RNNs):

Review of RNNs; CNN + RNN Models for Video Understanding: Spatio-temporal Models, Action/Activity Recognition

Unit: V

Attention Models:

Introduction to Attention Models in Vision; Vision and Language: Image Captioning, Visual QA, Visual Dialog; Spatial Transformers; Transformer Networks

Deep Generative Models**:** Review of (Popular) Deep Generative Models: GANs, VAEs; Other Generative Models: PixelRNNs, NADE, Normalizing Flows, etc

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, 2016
2. Richard Szeliski, Computer Vision: Algorithms and Applications, 2010.

Reference Books:

1. Michael Nielsen, Neural Networks and Deep Learning, 2016
2. Yoshua Bengio, Learning Deep Architectures for AI, 2009
3. Simon Prince, Computer Vision: Models, Learning, and Inference, 2012.
4. David Forsyth, Jean Ponce, Computer Vision: A Modern Approach, 2002.
5. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY:Oxford University Press, 1995. ISBN: 9780198538646.
6. Bishop, Christopher M. Pattern Recognition and Machine Learning. Springer,2006. ISBN 978-0-387-31073-2
7. Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Interscience, 2000. ISBN: 9780471056690.
8. Mitchell, Tom. Machine Learning. New York, NY: McGraw-Hill,1997.ISBN:9780070428072.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
3/0/0/3

INTERNET OF THINGS (C582PE3B)

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web based services on IoT devices

Course Outcomes:

- Able to understand the application areas of IOT ·
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks ·
- Able to understand building blocks of Internet of Things and characteristics.

Unit I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT– IoT Protocols, IoT communication models, Iot Communication APIs IoT enabaled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs– Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

Unit II

IoT and M2M – Software defined networks, network function virtualization, difference betweenSDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG-NETCONF,YANG, SNMP NETOPEER

Unit III

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

Unit IV

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C)Programming – Python program with Raspberry PI with focus of interfacing external gadgets,controlling output, reading input from pins.

Unit V

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web applicationframework Designing a RESTful web API.

Text books:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
3/0/0/3

BLOCKCHAIN TECHNOLOGY (C582PE3C)

Course Objective:
1. Introduce block chain technology and Crypto currency

Course Outcome:
1. Learn about research advances related to one of the most popular technological areas today.

Unit- I

Introduction: Block chain or distributed trust, Protocol, Currency, Cryptocurrency, How a Cryptocurrency works, Crowdfunding

Unit- II

Extensibility of Blockchain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Blockchain Environment

Unit- III

Blockchain Science: Gridcoin, Folding coin, Blockchain Genomics, Bitcoin MOOCs

Unit - IV

Currency, Token, Tokenizing, Campuscoin, Coindrop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

Unit - V

Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations

Text Book: 1. Blockchain Blue print for Economy by Melanie Swan

Reference: 1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st ed. Edition, by Daniel

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
3/0/0/3

CYBER SECURITY(C582PE3D)

Course objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes:

- The students will be able to understand cyber-attacks, types of cybercrimes, cyber
- laws and also how to protect them self and ultimately the entire Internet community from such attacks.

Unit - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability,threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

Unit - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles ofInternational Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

Unit - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and WirelessDevices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Unit- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security

risks and perils for organizations, social computing and the associated challenges for organizations. Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

Unit - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Cybercrime: Examples and Mini-Cases Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

Text books:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

References:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
3/0/0/3

MOBILE COMPUTING (C582PE4A)

Course Objectives

- Students taking this course will develop an understanding of the ways that mobile technologies can be used for teaching and learning.
- They will also consider the impact of mobile computing on the field of education.

Course Outcomes

- To understand concepts of Mobile Communication. (Understand)
- To analyse next generation Mobile Communication System. (Analyze)
- To understand network and transport layers of Mobile Communication. (Understand)
- Analyze various protocols of all layers for mobile and ad hoc wireless communication networks. (Analyze)
- To understand IP and TCP layers of Mobile Communication. (Understand)

Unit I :

Mobile Computing: Novel Applications, Limitations of Mobile Computing, Mobile Computing Architecture: Programming languages, Functions of Operating Systems, Functions of Middleware for mobile Systems, Mobile Computing Architectural layers, Protocols, Layers.

Unit II

Mobile Devices: Handheld Mobile Smartphones with Multimedia Functionalities, Smartcards, Smart Sensors, Mobile System Networks: Cellular Network, WLAN Network and Mobile IP, Ad-hoc Networks, Mobility Management

Unit III:

Global System For Mobile Communications (Gsm): Mobile Services, System Architecture, Protocols, Localization & Calling, Handover, Security. GPRS: GPRS System Architecture, UMTS: UMTS System Architecture. LTE: Long Term Evolution

Unit IV:

Mobile Network Layer: Mobile IP: Goals, Assumptions, Entities and Terminology, IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimizations, Dynamic Host Configuration Protocol (DHCP) Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP, TCP over 2.5G/3G Wireless Networks.

Unit V:

Security Issues in Mobile Computing: Introduction, Information Security, Security Techniques and Algorithms, Security Protocols, Security Models, Security Frameworks for mobile Environment

Text books:

1. Raj Kamal, "Mobile Computing", OXFORD UNIVERSITY PRESS.
2. Asoke K Talukder, et al, "Mobile Computing", Tata McGraw Hill, 2008.

References:

1. Jochen Schiller, "Mobile Communications", Pearson Education, Second Edition, 2008.
2. Dr. Sunilkumar, et al "Wireless and Mobile Networks: Concepts and Protocols",Wiley India.
3. Matthew S.Gast, "802.11 Wireless Networks", SPD O'REILLY.
4. Ivan Stojmenovic , "Handbook of Wireless Networks and Mobile Computing",Wiley, 2007.
5. Kumkum Garg, "Mobile Computing", Pearson.
6. Handbook of Security of Networks, Yang Xiao, Frank H Li, Hui Chen, World Scientific, 2011.

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CLOUD COMPUTING(C582PE4B)

Course Objectives:

- Cloud computing has evolved as a very important computing model, which enables information, software, and shared resources to be provisioned over the network as services in an on-demand manner.
- This course provides an insight into what is cloud computing and the various services cloud is capable.

Unit I:

Computing Paradigms, High-Performance Computing, Parallel Computing.,Distributed Computing..,Cluster Computing.,Grid Computing, Cloud Computing., Biocomputing, Mobile Computing.,Quantum Computing, Optical Computing. Nano computing.

Unit II:

Cloud Computing Fundamentals: Motivation for Cloud Computing,The Need for Cloud Computing,Defining Cloud Computing, Definition of Cloud computing,Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing,Five Essential Characteristics...Four Cloud Deployment Models

Unit III:

Cloud Computing Architecture and Management: Cloud architecture, Layer,Anatomy of the Cloud,Network Connectivity in Cloud Computing, Applications, on the Cloud,Managing the Cloud,Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

Unit IV:

Cloud Service Models: Infrastructure as a Service,Characteristics of IaaS.Suitability of IaaS,Pros and Cons of IaaS,Summary of IaaS Providers,Platform as a Service,Characteristics of PaaS,Suitability of PaaS,Pros and Cons of PaaS,Summary of PaaS Providers,Software as a Service,Characteristics of SaaS,Suitability of SaaS,Pros and Cons of SaaS,Summary of SaaS Providers.Other Cloud Service Models.

Unit V:

Cloud Service Providers:EMC,EMC IT,Captiva Cloud Toolkit,Google,Cloud Platform,Cloud Storage,Google Cloud Connect,Google Cloud Print,Google App Engine,Amazon Web

Services,Amazon Elastic Compute Cloud,Amazon Simple Storage Service,Amazon Simple Queue ,ervice,Microsoft,Windows Azure,Microsoft Assessment and Planning Toolkit,SharePoint,IBM,Cloud Models,IBM SmartCloud,SAP Labs,SAP HANA Cloud Platform,Virtualization Services Provided by SAP,Salesforce,Sales Cloud,Service Cloud: Knowledge as a Service,Rackspace,VMware,Manjrasoft,Aneka Platform

Text books:

1. Essentials of cloud Computing : K.Chandrasekhran , CRC press, 2014

References:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing , Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

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3/0/0/3

SERVICE ORIENTED COMPUTING(C582PE4C)

Course Objectives:

- To Understand Web Services and implementation model for SOA
- To Understand the SOA, its Principles and Benefits
- To Understand XML concepts
- To Understand paradigms needed for testing Web Services
- To explore different Test Strategies for SOA-based applications
- To implement functional testing, compliance testing and load testing of Web Services
- To Identify bug-finding ideas in testing Web Services

Course Outcomes:

After learning the course, the student will be able:

- To understand the principles of service oriented architecture.
- To understand and describe the standards & technologies of modern web services implementations.
- To properly use market-leading development tools to create and consume web services.
- To analyze and select the appropriate framework components in the creation of web service solutions.
- To apply object-oriented programming principles to the creation of web service solutions.

Unit – I :

Evolution and Emergence of Web Services – Evolution of distributed computing. Core distributed computing technologies – client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.

Unit – II :

Web Service Architecture – Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services. Describing Web Services – WSDL introduction, non functional service description, WSDL1.1 Vs WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL port type, limitations of WSDL.

Unit – III :

Brief Over View of XML – XML Document structure, XML namespaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation. SOAP : Simple Object Access Protocol, Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP envelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging, The enterprise Service Bus, SOA Development Lifecycle, SOAP HTTP binding, SOAP communication model, Error handling in SOAP.Download iStudy App for latest syllabus, timetables and updates from JNTUH (No Ads, No Pdfs) Get it on Google Play.

Unit – IV :

Registering and Discovering Services : The role of service registries, Service discovery, Universal Description, Discovery, and Integration, UDDI Architecture, UDDI Data Model, Interfaces, UDDI Implementation, UDDI with WSDL, UDDI specification, Service Addressing and Notification, Referencing and addressing Web Services, Web Services Notification.

Unit – V :

SOA and web services security considerations, Network-level security mechanisms, Application-level security topologies, XML security standards, Semantics and Web Services, The semantic interoperability problem, The role of metadata, Service metadata, Overview of .NET and J2EE, SOA and Web Service Management, Managing Distributed System, Enterprise management Framework, Standard distributed management frameworks, Web service management, Richer schema languages, WS-Metadata Exchange.

Text books:

1. Web Services & SOA Principles and Technology, Second Edition, Michael P. Papazoglou.
2. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India.
3. Developing Enterprise Web Services, S. Chatterjee, J. Webber, Pearson Education.

Reference books:

1. XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education.
2. Building web Services with Java, 2nd Edition, S. Graham and others, Pearson Education.
3. Java Web Services, D.A. Chappell & T. Jewell, O'Reilly, SPD.
4. McGovern, et al., "Java web Services Architecture", Morgan Kaufmann Publishers, 2005.
5. J2EE Wer Services, Richard Monson-Haefel, Pearson Education.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
3/0/0/3

SOFT COMPUTING(C582PE4D)

Course Objectives:

- Familiarize with soft computing concepts
- Introduce and use the idea of fuzzy logic and use of heuristics based on human experience
- Familiarize the Neuro-Fuzzy modeling using Classification and Clustering techniques
- Learn the concepts of Genetic algorithm and its applications
- Acquire the knowledge of Rough Sets

Course Outcomes:

- On completion of this course, the students will be able to: Identify the difference between Conventional Artificial Intelligence to Computational
- Intelligence. Understand fuzzy logic and reasoning to handle and solve engineering problems
- Apply the Classification and clustering techniques on various applications.
- Understand the advanced neural networks and its applications
- Perform various operations of genetic algorithms, Rough Sets.
- Comprehend various techniques to build model for various applications

Unit - I

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing, Applications of Soft Computing Techniques.

Unit-II

Fuzzy Systems: Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems

Unit-III

Fuzzy Decision Making, Particle Swarm Optimization

Unit-IV

Genetic Algorithms: Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm.

Unit-V

Rough Sets, Rough Sets, Rule Induction, and Discernibility Matrix, Integration of Soft Computing Techniques.

Text book:

1. Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy and J. Anuradha – Cengage Learning

Reference books:

1. S. N. Sivanandam & S. N. Deepa, "Principles of Soft Computing", 2nd edition, Wiley India, 2008.
2. David E. Goldberg, "Genetic Algorithms-In Search, optimization and Machine learning", Pearson Education.
3. J. S. R. Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", Pearson Education, 2004.
4. G.J. Klir & B. Yuan, "Fuzzy Sets & Fuzzy Logic", PHI, 1995.
5. Melanie Mitchell, "An Introduction to Genetic Algorithm", PHI, 1998.
6. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw- Hill International editions, 1995

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
0/0/3/1.5

MACHINE LEARNING TECHNIQUES LAB(C582PC9)

COURSE OBJECTIVES

This course will enable students to,

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.

COURSE OUTCOMES

After studying this course, the students will be able to

- Understand the implementation procedures for the machine learning algorithms
- Design Java/Python programs for various Learning algorithms.
- Apply appropriate data sets to the Machine Learning algorithms
- Identify and apply Machine Learning algorithms to solve real world problems

LIST OF EXPERIMENTS

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program.

Calculate the accuracy, precision, and recall for your data set.

7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.

8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
0/0/3/1.5

WIRELESS SENSOR NETWORKS LAB (C582PC10)

Course outcomes:

- Simulate different topologies of Ad-hoc networks.
- Implement the physical and MAC layer protocols of Ad-hoc networks.
- Apply TCP and UDP protocols for Ad-hoc networks.

List of experiments:

1. Study of Network Simulator.
2. Implement the Star topology.
3. Implement the Bus topology.
4. Implement the Ring topology.
5. Simulation of Stop & Wait Protocol.
6. Simulation of Sliding Window Protocol.
7. Implementation of distance vector routing algorithm
8. Implementation of Link state routing algorithm
9. simulation of Congestion Control Algorithms using NS
10. Implementing a wireless sensor network.
11. Simulate a Mobile Adhoc Network.
12. Implement Transport Control Protocol in Sensor Network

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
2/0/0/0

ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I) C583AC1

Course Objective:

Improve competence in scholarly communications by deepening knowledge of the core features of the scientific writing style. It presents and analyzes the unwritten rules of scientific writing, the ones candidates most likely never learned in academic writing.

Course Outcomes:

Students will be able to:

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Unit I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

Unit II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.

Unit III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit IV

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

Unit V

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

Text Books/ Reference Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books).
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

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M.Tech II Semester **L/T/P/C**
2/0/0/0

DISASTER MANAGEMENT (Audit Course - I) C583AC1

Course Objective:

Conceptual understanding of disasters and its relationships with development. And approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction.

Course Outcomes:

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches.
5. Planning and programming in different countries, particularly their home country or the countries they work in

Unit I

Introduction:

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

Unit II

Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

Unit III

Disaster Preparedness and Management: Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

Unit IV

Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assesment. Strategies for Survival.

Unit V

Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Text Books/ Reference Books:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "NewRoyal book Company.Sahni, Pardeep Et. Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.
2. Goel S. L., Disaster Administration and Management Text and Case Studies", Deep &Deep Publication Pvt. Ltd., New Delhi.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
2/0/0/0

VALUE EDUCATION (Audit Course - I) C583AC1

Prerequisite: None
Course Objectives: Students will be able to

1. Understand value of education and self- development.
2. Imbibe good values in students.
3. Let the should know about the importance of character.

Course outcomes: Students will be able to
1. Knowledge of self-development.
2. Learn the importance of Human values.
3. Developing the overall personality.

Unit I
Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgments'

Unit II
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

Unit III
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

Unit IV
Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious
tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature.

Unit V
Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

Text Books/ Reference Books:

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
2/0/0/0

CONSTITUTION OF INDIA (Audit Course - I) C583AC1

Course Objectives: Students will be able to:

Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

1. Address the growth of Indian opinion regarding modern Indian intellectuals' Constitutional role and entitlement to civil and economic rights as well as the Emergence of nationhood in the early years of Indian nationalism.
2. Address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

Unit I

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), Philosophy of the Indian Constitution: Preamble, Salient Features.

Unit II

Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality, Right toFreedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT III

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

Unit IV

Local Administration: District's Administration head: Role and Importance,

Municipalities:Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

Unit V

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Text Books/ Reference Books:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

III Semester

S.No	Class	Course Code	Course Title	Int. marks	Ext. marks	L	T	P	C
1	OE	C223OE1	Open Elective1	30	70	3	0	0	3
2	PE	C583PE5	Research Methodology	30	70	3	0	0	3
3	PW	C583PW	Project Phase-I	100	--	--	0	20	10
4	AC	C583AC2	Audit Course-II			2	0	0	0
		Total Credits		---	---	**8**	**0**	**20**	**16**

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech III Semester **L/T/P/C**
3/0/0/3

RESEARCH METHODOLOGY (C583PE5)

Course Objectives:

1. Introduce research paper writing and induce paper publication skills.
2. Give the introduction to Intellectual Property Rights

Course Outcomes:

1. Ability to distinguish research methods
2. Ability to write and publish a technical research paper
3. Ability to review papers effectively
4. IPR and Patent filing

Unit I

Introduction: Objective of Research; Definition and Motivation; Types of Research; Research Approaches; Steps in Research Process; Criteria of Good Research; Ethics in Research. Research Formulation and Literature Review: Problem Definition and Formulation; Literature Review; Characteristics of Good Research Question; Literature Review Process.

Unit II

Data Collection: Primary and Secondary Data; Primary and Secondary Data Sources; Data Collection Methods; Data Processing; Classification of Data. Data Analysis Statistical Analysis; Multivariate Analysis; Correlation Analysis; Regression Analysis; Principle Component Analysis; Samplings.

Unit III

Research Design: Need for Research Design; Features of a Good Design; Types of Research Designs; Induction and Deduction. Hypothesis Formulation and Testing Hypothesis; Important Terms; Types of Research Hypothesis; Hypothesis Testing; Z-Test; T-Test; F-Test; Making a Decision; Types of Errors; ROC Graphics.

Unit IV

Test Procedures: Parametric and Non Parametric Tests; ANOVA; Mann-Whitney Test; Kruskal-Wallis Test; Chi-Square Test; Multi-Variate Analysis Presentation of the Research Work Business Report; Technical Report; Research Report; General Tips for Writing Report;

Presentation of Data; Oral Presentation; Bibliography and References; Intellectual Property Rights; Open-Access Initiatives; Plagiarism.

Unit V

Law of Patents, Patent Searches, Ownership, Transfer Patentability Design Patents Double Patenting – Patent Searching – Patent Application Process – Prosecuting the Application, Post-issuance Actions, Term and Maintenance of Patents. Ownership Rights – Sole and Joint Inventors – Inventions Made by Employees and Independent Contractors – Assignment of Patent Rights – Licensing of Patent Rights – Invention Developers and Promoters.
Patent Infringement, New Developments and International Patent Law Direct Infringement - Inducement to Infringe – Contributory Infringement – First Sale Doctrine – Claims Interpretation – Defenses to Infringement – Remedies for Infringement – Resolving an Infringement Dispute – Patent Infringement Litigation. New Developments in Patent Law.

Text Books:

1. Research Methodology. Methods & Technique : Kothari. C.R.
2. Research Methodology, S.S Vinod Chandra, S Anand Hareendran, Pearson.
3. Intellectual Property – Copyrights, Trademarks, and Patents by Richard Stim, Cengage Learning.

Reference Books:

1. Practical Research : planning and Design(8th Edition) – Paul D. Leedy and Jeanne E. Ormrod.
2. A Hand Book of Education Research – NCTE
3. Methodology of Education Research – K.S. Sidhu.
4. Tests, Measurements and Research methods in Behavioural Sciences- A.K. Singh.
5. Statistical Methods- Y.P. Agarwal.
6. Methods of Statistical Ananlysis- P.S Grewal.
7. Fundamentals of Statistics – S.C. Gupta, V.K. Kapoor.
8. Intellectual Property Rights by Deborah E. Bouchoux, Cengage Learning.
9. Managing Intellectual Property – The Strategic Imperative, Vinod V.Sople, 2nd Edition, PHI Learning Private Limited.
10. Research methodology – S.S. Vinod Chandra, S. Anand Hareendran.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech III Semester **L/T/P/C**
2/0/0/0

PEDAGOGICAL STUDIES (Audit Course - II) C583AC2

Course Objectives: Students will be able to:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

Course Outcomes: Students will be able to understand:

1. Practices are being used by teachers in formal and informal classrooms in developing countries?
2. Evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. Educate (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

UNIT I

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

UNIT II

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT III

Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV

Professional development: alignment with classroom practices and follow-up support, Peer

support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT V

Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Text Books/ Reference Books:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education.Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

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2/0/0/0

SOFT SKILLS (Audit Course - II) C583AC2

Course Objectives:

The objective of this course to help the students to develop as team member, leader and all round professional in the long run. This course would focus on over all personality development of the student and to improve his technical writing and documentation.

Course Outcomes:

Having successfully completed this course, the student will be able to:

1. Communicate, interact and present his ideas to the other professionals.
2. Understand and aware of importance, role and contents of soft skills through instructions, knowledge acquisition, demonstration and practice.
3. Have right attitudinal and behavioral aspects, and build the same through activities.
4. Possess right professional and social ethical values.

UNIT I

Self Awareness and Self Development : Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self appraisal, Personal Goal setting, Career Planning, Personal success factors, Handling failure, Emotional Intelligence, Lateral thinking, Depression and Habit, relating SWOT analysis & goal setting, prioritization.

UNIT II

Communication Skill: Importance of communication, Aspects of communication, communication through words,communication through body language, communication through technology, Oral communication, Listening Skills, Group Discussion and Interview Skills, Presentation skills: preparing the presentation, performing the presentation, Written communication: Reading comprehension, précis writing, Business and technical reports, Styles, Business correspondence, Memorandum writing, Notice, Agenda and Minutes, Research papers and articles, Advertising and job Description, Mechanics of Manuscript preparation.

UNIT III

Interpersonal Relationship: Team work, Team effectiveness, Group discussion, Decision making - Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development, Team Problem Solving, Building the team dynamics, Multicultural Diversity and Socialising.

UNIT IV

Leadership Skills: Leaders: their skills, roles, and responsibilities. Vision, Empowering and delegation, motivating others, organizational skills, team building, Organizing and conducting meetings, decision making,giving support, Vision, Mission, Coaching, Mentoring and counselling, Appraisals and feedback,conflict, Power and Politics, Public Speaking.

Other Skills

Managing Time, Managing Stress, Meditation. Improving personal memory, Study skills that include,Rapid Reading, Notes Taking, Self learning, Complex problem solving and creativity, listening skills and speaking skills, Corporate and Business Etiquettes.

UNIT V

Ethics in Engineering Practice and Research: Introduction to ethical reasoning and engineer ethics, Right and responsibilities regarding Intellectual property, workplace rights and responsibilities, Central Professional Responsibilities of Engineers, Responsibility for environment.

Text Books:

1. Developing Communication Skill : Krishna Mohan, MeeraBanerji,- MacMillan India Ltd.
2. B N Ghosh, : Managing Soft Skills for Persanality Development " Mc Graw Hill.
3. Ethics in Engineering Practice and Research: Caroline Whitbeck, Cambridge University press.
4. A Course In Communication Skills : Kiranmai Dutt , Cambridge University press.
5. English for Business Communication : Simon Sweeney , Cambridge University Press.
6. Basics Of Communication In English : Francis Sounderaj, MacMillan India Ltd.
7. Group Discussions and Interview Skills : Priyadarshi Patnaik , Cambridge University Press.
8. Professional Presentations : Malcolm Goodale, Cambridge University Press.
9. An Introduction to Professional English And Soft Skills : Das , Cambridge University Press.
10. A practical course in Effective English speaking skills , G.K.Gangal, PHI Publication.
11. A practical course in Effective English writing skills , G.K.Gangal, PHI Publication.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech III Semester **L/T/P/C**
2/0/0/0

STRESS MANAGEMENT BY YOGA (Audit Course - II) C583AC2

Course Objectives:

1. To achieve overall health of body and mind.
2. To overcome stress.

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also.
2. Improve efficiency.

UNIT I

Definitions of Eight parts of yog. (Ashtanga)

UNIT II

Yam and Niyam.

UNIT III

Do`s and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha.
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan.

UNIT IV

Asan and Pranayam.

UNIT V

i) Various yog poses and their benefits for mind & body.
ii) Regularization of breathing techniques and its effects-Types of pranayam.

Text Books/ References Books:

1. 'Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur.
2."Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech III Semester **L/T/P/C**
2/0/0/0

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS (Audit Course - II) C583AC2

Course Objectives:

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Course Outcomes:

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students

UNIT I

Neetisatakam-Holistic development of personality
1.Verses- 19,20,21,22 (wisdom)
2.Verses- 29,31,32 (pride & heroism)
3.Verses- 26,28,63,65 (virtue)

UNIT II

Neetisatakam-Holistic development of personality
1. Verses- 52,53,59 (dont's)
2. Verses- 71,73,75,78 (do's)

UNIT III

Approach to day to day work and duties.
1. Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
2. Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
3. Chapter 18-Verses 45, 46, 48.

UNIT IV

Statements of basic knowledge.

1. Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
2. Chapter 12 -Verses 13, 14, 15, 16,17, 18
3. Personality of Role model. Shrimad Bhagwad Geeta:

UNIT V

1. Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
2. Chapter 4-Verses 18, 38,39
3. Chapter18 – Verses 37,38,63

Text Books/ Reference Books:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department),Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

M.Tech III Semester (C583OE1)

Open Electives

1. Basic Computer Programming skills are required for all open electives. Additionally, knowledge on the specified area mentioned in prerequisites is required for opting open elective.
2. Note: A student can register for any open elective subject provided that he has not already registered for the same subject.

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M.Tech (CSE) Open Electives R21.

1. Artificial intelligence
2. Artificial intelligence & machine learning
3. Block chain technology
4. Cloud computing
5. Cyber security
6. Deep learning
7. Internet of things
8. Machine learning
9. Python programming
10. Python programming lab
11. Operating systems

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech. III-SEMESTER

ARTIFICIAL INTELLIGENCE (C583OE1)

L T P C
3 0 0 3

OBJECTIVES:

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI.

OUTCOMES:

Upon completion of the course, the students will be able to:

- Use appropriate search algorithms for any AI problem
- Represent a problem using first order and predicate logic
- Provide the apt agent strategy to solve a given problem
- Design software agents to solve a problem
- Design applications for NLP that use Artificial Intelligence.

UNIT: I INTRODUCTION

Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT II: PROBLEM SOLVING METHODS

Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games

UNIT III: KNOWLEDGE REPRESENTATION

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information

UNIT IV: SOFTWARE AGENTS

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

UNIT V: APPLICATIONS

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving

TEXT BOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.
2. I. Bratko, ―Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

REFERENCES:

1. M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J. Nilsson, ―The Quest for Artificial Intelligence‖, Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish,‖ Programming in Prolog: Using the ISO Standard‖, Fifth Edition, Springer, 2003.
4. Gerhard Weiss, ―Multi Agent Systems‖, Second Edition, MIT Press, 2013.
5. David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations of Computational Agents‖, Cambridge University Press, 2010.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (C583OE1)

M.Tech III Semester **L/T/P/C**

3/0/0/3

Course Objective: To acquire knowledge on intelligent systems and agents, formalization of knowledge, reasoning with and without uncertainty, machine learning.

Course Outcomes:

After completion of course, students would be able to:

- Understand the various characteristics of intelligent agents.
- Learn about the different search strategies in AI.
- Learn to represent knowledge in solving AI problems.
- Analyse various machine learning algorithms and techniques with a modern.
- Explore supervised and unsupervised learning paradigms of machine learning.

UNIT I: INTRODUCTION

Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT II: PROBLEM SOLVING METHODS

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing – Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games.

UNIT III: KNOWLEDGE REPRESENTATION

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories -

Reasoning with Default Information

UNIT IV: SUPERVISED LEARNING (REGRESSION/CLASSIFICATION)

Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes, Linear models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.

UNIT V: UNSUPERVISED LEARNING

Clustering: K-means/Kernel K-means, Dimensionality Reduction: PCA and kernel PCA Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models).

TEXT BOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.
2. I. Bratko, ―Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
3. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.

REFERENCES:

1. M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.; First Edition, 2008.
2. Nils J. Nilsson, ―The Quest for Artificial Intelligence‖, Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish,‖ Programming in Prolog: Using the ISO Standard‖, Fifth Edition, Springer, 2003.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, the Elements of Statistical Learning, Springer 2009 (freely available online).
5. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech III Semester **L/T/P/C**

3/0/0/3

BLOCKCHAIN TECHNOLOGY (C583OE1)

Prerequisites

1. Knowledge in security and applied cryptography;

2. Knowledge in distributed databases

Course Objective: 1. Introduce block chain technology and Crypto currency

Course Outcome: 1. Learn about research advances related to one of the most popular technological areas today.

UNIT- I Introduction: Block chain or distributed trust, Protocol, Currency, Cryptocurrency, How a Cryptocurrency works, Crowdfunding

UNIT- II Extensibility of Blockchain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Blockchain Environment

UNIT- III Blockchain Science: Gridcoin, Folding coin, Blockchain Genomics, Bitcoin MOOCs

UNIT - IV Currency, Token, Tokenizing, Campuscoin, Coindrop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

UNIT - V Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations

Text Book: 1. Blockchain Blue print for Economy by Melanie Swan

Reference: 1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st ed. Edition, by Daniel

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M.Tech-COMPUTER SCIENCE & ENGINEERING

CLOUD COMPUTING (C583OE1)

M.Tech III Semester **L/T/P/C**
3/0/0/3

Course Objectives:

- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

UNIT- I Systems Modeling, Clustering and Virtualization: Distributed System Models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualization of Clusters and Data centers.

UNIT- II Foundations: Introduction to Cloud Computing, Migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era, The Enterprise Cloud Computing Paradigm.

UNIT- III Infrastructure as a Service (IAAS) & Platform and Software as a Service(PAAS / SAAS): Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service, Secure Distributed Data Storage in Cloud Computing .Aneka, Comet Cloud, T-Systems', Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments.

UNIT- IV Monitoring, Management and Applications: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing, Performance Prediction for HPC on Clouds, Best Practices in Architecting Cloud Applications in the AW S cloud, Building Content Delivery networks using Clouds, Resource Cloud Mashups.

UNIT- V Governance and Case Studies: Organizational Readiness and Change management in the Cloud age, Data Security in the Cloud, Legal Issues in Cloud computing, Achieving Production Readiness for Cloud Services.

TEXT BOOKS:

1. Cloud Computing:Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, W iley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C.Fox, JackJ.Dongarra, Elsevier, 2012.

REFERENCE BOOKS:

1.Cloud Computing :

1. A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw Hill, 2011.
2. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
3. Cloud Computing: Implementation, Management and Security, JohnW. Rittinghouse, James F.Ransome, CRC Press, rp2012.
4. C lo ud A pp lication A rc hitectures: Bu ilding A pp lication s an dInfrastructure in the Cloud, George Reese, O'Reilly, SPD, rp2011.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks andCompliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly,SPD, rp2011

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M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech III Semester **L/T/P/C**

3/0/0/3

CYBER SECURITY (C583OE1)

Course objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes:

- The students will be able to understand cyber-attacks, types of cybercrimes, cyber
- laws and also how to protect them self and ultimately the entire Internet community from such attacks.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations. Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer

Forensics and Legal Perspectives, Wiley

2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles,

Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

DEEP LEARNING (C583OE1)

M.Tech. III Semester **L/T/P/C**
3/0/0/3

Course Objective:

To present the mathematical, statistical and computational challenges of building stable representations for high-dimensional data, such as images, text and data. We will delve into selected topics of Deep Learning, discussing recent models from both supervised and unsupervised learning. Special emphasis will be on convolutional architectures, invariance learning, unsupervised learning and non-convex optimization.

Course Outcomes:

Unit-I: Machine Learning Basics

Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning.

Unit-II: Deep Feedforward Networks

Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

Regularization for Deep Learning

Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training Tangent Distance, Tangent Prop, and Manifold Tangent Classifier.

Unit-III: Optimization for Training Deep Models

How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

.Convolutional Networks

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks.

Unit-IV: Sequence Modeling: Recurrent and Recursive Nets

Unfolding Computational Graphs, Recurrent Neural Networks and Bidirectional RNN, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory,

Applications

Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications.

Unit-V: Autoencoders

Undercomplete Autoencoders, Regularized Autoencoders, Representational Power, Layer Size and Depth, Stochastic Encoders and Decoders, Denoising Autoencoders, Learning Manifolds with Autoencoders, Contractive Autoencoders, Predictive Sparse Decomposition, Applications of Autoencoders.

Representation Learning

Greedy Layer-Wise Unsupervised Pretraining, Transfer Learning and Domain Adaptation, Semi-Supervised Disentangling of Causal Factors, Distributed Representation, Exponential Gains from Depth, Providing Clues to Discover Underlying Causes.

Structured Probabilistic Models for Deep Learning

The Challenge of Unstructured Modeling, Using Graphs to Describe Model Structure, Sampling from Graphical Models, Advantages of Structured Modeling, Learning about Dependencies,

Inference and Approximate Inference, The Deep Learning Approach to Structured Probabilistic Models.

Text Books:

1. Deep Learning, Ian Good Fellow, Yoshua Bengio and Aaron Courville.

Reference Books:

1. Neural Networks and Learning Machines, Simon Haykin, Third Edition, Pearson.
2. Michael Nielsen, "Neural Networks and Deep Learning", Determination Press, 2015. http://neuralnetworksanddeeplearning.com/
3. CharuC.Aggarwal "Neural Networks and Deep learning" Springer International Publishing, 2018
4. Satish Kumar, "Neural Networks, A Classroom Approach", Tata McGraw -Hill, 2007.
5. Simon Haykin, "Neural Networks, A Comprehensive Foundation", 2nd Edition, Addison Wesley Longman, 2001.

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M.Tech-COMPUTER SCIENCE & ENGINEERING

INTERNET OF THINGS (C583OE1)

M.Tech. III Semester **L/T/P/C**
3/0/0/3

Course Objectives:

Explore the interconnection and integration of the physical world and the cyber space and design & development steps of IoT Devices.

Course Outcomes:

Upon completion of this course stunts can able to

- Understand building blocks of Internet of Things and characteristics
- Understand the various methods used for IoT device networking
- Understand the protocols used in IoT devices communication
- Understand the architectures and usage of Aurdino & Raspberry Pi
- Understand the design methods of IoT and use of cloud offerings related to IoT

Unit I

INTRODUCTION TO INTERNET OF THINGS:

Introduction, physical design of IoT, logical design of IoT-functional blocks, communicational models, communication APIs, IoT enabling technologies, IOT levels & deployment templates, Characteristics of IoT, Applications of IoT, IoT Enablers and Connectivity Layers, Baseline Technologies,, Sensors, Actuators, IoT Components and Implementation, Challenges of IoT.

Unit II

IOT AND M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, Origin of SDN, SDN Architecture, Rule Replacement, IoT System Management with NETCONF-YANG: Need for IOT systems management, simple network management protocol, network operator requirements, NETCONF, YANG, IoT system management with NETCONF-YANG,

Unit III

IoT networking: Connectivity Terminologies, Gateway Prefix Allotment, Impact of Mobility on Addressing, Multihoming,,, Deviations from regular Web, IoT Identification and Data Protocols.

Connectivity technologies: IEEE 802.15.4, ZigBee, 6LoWPAN, RFID, HART and Wireless HART, NFC, Bluetooth, Z-Wave, ISA 100.11A

Wireless Sensor networks : Components of a Sensor Node, Modes of Detection, Challenges in WSN, Sensor Web.

Unit IV

ARDUINO: Features of Arduino, Components of Arduino Board, Arduino IDE, Program Elements, Function Libraries, Random Numbers, Interupts.

RASPBERRY : Introduction, Architecture, PIN Configuration.

Unit V

IoT Platforms Design Methodology

IoT Physical Servers & Cloud Offerings: Cloud Storage Models & Communication APIs,, WAMP-AutoBahn for IoT, Xively Cloud for IoT, Amazon Web Services for IoT.

Text Books:

1. Internet of Things by Arshadeep Bagha, Madisetty Vijay, University Press

2. Internet of Things by Jiva jose, Khanna Book Publishing Co. (P) Ltd.

Reference Books:

1. Getting Started with Raspberry Pi, 2nd Edition, Matt Richardson and Shawn Wallance, SPD

2. Internet of Things Principles and Paradigms, Rajkumar Buyya and Amir Vahid Dastjerdi, ELSEVIER

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M.Tech-COMPUTER SCIENCE & ENGINEERING

MACHINE LEARNING (C583OE1)

M.Tech. III Semester **L/T/P/C**
3/0/0/3

Course Objective

To be able to formulate machine learning problems corresponding to different applications and range of machine learning algorithms along with their strengths and weaknesses.

Course Outcomes:

On completion of this course the student should be able to
1. Understand the basic concepts such as decision trees and neural networks.
2. Develop the ability to formulate machine learning techniques to respective problems.
3. Apply machine learning algorithms to solve problems of moderate complexity

UNIT-I:

INTRODUCTION - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learningconcept learning and the general to specific ordering –

Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.

UNIT-II:

DECISION TREE LEARNING – Introduction, Decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, Hypothesis space search indecision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

ARTIFICIAL NEURAL NETWORKS – Introduction, Neural network representation, appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition Advanced topics in artificial neural networks.

EVALUATION HYPOTHESES – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses

UNIT-III:

BAYESIAN LEARNING – Overview of -Bayes theorem principle, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities , Minimum Description Principle, Bayes optimal Classifier, Gibs algorithm, NavieBaysean Classifier.

COMPUTATIONAL LEARNING THEORY – Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space,
INSTANCE-BASED LEARNING- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case Based Reasoning, Remark son Lazy and Eager Learning

UNIT-IV:

Learning Sets of Rules – Introduction, Sequential Covering Algorithms, Learning Rule.

Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL.

Analytical Learning - Introduction, Learning with Perfect Domain Theories: Prolog-EBG, Remarks on Explanation- Based Learning-Discovering new features,

UNIT V:

Combining Inductive and Analytical Learning – Motivation, Inductive- Analytical approaches to Learning, Reinforce learning task and Q Learning.

TEXT BOOKS

1. Machine Learning – Tom M. Mitchell, -MGH.

2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC).

REFERENCE BOOKS

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge University Press.

2. Richard o.Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc.,2001

3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press,1995

M.Tech-COMPUTER SCIENCE & ENGINEERING

PYTHON PROGRAMMING (C583OE1)

M.Tech III Semester **L T P C**
3 0 0 3

Course Objectives:

- To be able to introduce core programming basics and program design with functions using Python programming language.
- To understand a range of Object-Oriented Programming, as well as in-depth data and information processing techniques.
- To understand the high-performance programs designed to strengthen the practical expertise.

UNIT - I

Introduction to Python, Installing Python. How a Program Works, Using Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops. Data types and Expressions: Strings, Assignment and Comments, Numeric Data Types and Character Sets, Expressions, Functions and Modules.

UNIT - II

Control Statements: Definite Iteration, Formatting Text for Output, Selection, Conditional Iteration. File and Exceptions: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions.

Functions: Introduction, Defining and Calling a Void Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions-Generating Random Numbers, The math Module, Storing Functions in Modules.

UNIT - III

Strings and Text Files: Accessing Characters and Substrings in a String, Strings and Number System, String Methods, Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings. Text Files, Data Encryption, Lists, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples Sequences, Tuples. Dictionaries and Sets: Dictionaries, Sets, Serializing Objects. Recursion: Introduction, Problem Solving with Recursion, Examples of Recursive Algorithms.

UNIT - IV

Design with Classes: Classes and Objects, Classes and Functions, Classes and Methods, Working with Instances, Inheritance and Polymorphism. Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, techniques for Designing Classes.

UNIT - V

Graphical User Interfaces: Behavior of terminal based programs and GUI-based programs, Coding simple GUI-based programs, other useful GUI resources. GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons. Simple Graphics and Image Processing: Overview of Turtle Graphics, Two dimensional, Colors and RBG System, Image Processing.

TEXT BOOKS:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning.
2. Think Python First Edition, by Allen B. Downey, Orielly publishing

REFERENCE BOOKS:

1. Introduction to Computation and Programming Using Python. John V. Guttag, The MIT Press.
2. James Payne, Beginning Python using Python 2.6 and Python 3, Wrox publishing
3. Paul Gries, Practical Programming: An Introduction to Computer Science using Python 3,The Pragmatic Bookshelf, 2nd edition (4 Oct. 2013)
4. Charles Dierach, Introduction to Computer Science using Python

M.Tech-COMPUTER SCIENCE & ENGINEERING

PYTHON PROGRAMMING LAB (C583OE1)

M.Tech. III Semester **L/T/P/C**
0/0/2/1

COURSE OBJECTIVE:

To write and execute the programs based on operators, functions, simple data structures, basic packages using python programming constructs.

COURSE OUTCOMES:

After completion of course the student will be able to

1. Implementthefundamentalprogrammingelements:operators,statements,conditional and control flow statements.
2. Use predefined functions and build functions.
3. Use python modules and implement data structures to solve various computing problems.
4. Apply oops concepts using python.

List of programs

1. Write a python program to print "HelloWorld".
2. Running instructions in Interactive interpreter and a Python Script.
3. Write a Python Programming to demonstrate the Indentation.
4. Write a Python program to calculate number of days between two dates.
5. Write a python program that takes 2 numbers as command line arguments and prints its product.
6. Write a Python program to test whether a given letter is a vowel or not.
7. Write a Python program to create a pattern.

```
*
**
***
****
*****
```

8. Write a Python program to count the number 6 in a given list.
9. Write a python program to find the sum of the first n positive integers.
10. Write a Python program to calculate the sum of the digits in an integer
11. Write a Python program that prints all the numbers from 0 to 50 except multiples of 10 (10,20,30,40,50)
12. Write a Python program to check if a number is positive, negative or zero.
13. Write a Python program that will accept the base and height of a triangle nd compute the area.
14. Write a Python program to compute the greatest common divisor (GCD) of two positive integers.
15. Write a Python program Make a Simple Calculator

16. Write a Python program to count the number of even and odd numbers from a series of numbers.
17. Write a Python function to calculate the factorial of a number(anon-negative integer).The function should accept the number as an argument.
18. Write a Python function that accepts a string and calculate the number of upper case letters and lower case letters.
19. Write a Python function that checks whether a passed string is palindrome or not.
20. Write a Python program to get the Fibonacci series between 0 to 50usingrecursion
21. Write a Python program to calculate the value of 'a' to the power 'b' using recursion.
22. Write a Python program to get the factorial of a non-negative integer using recursion
23. Write a Python program to calculate the length of a string.
24. Write a Python program to count occurrences of a substring in a string.
25. Write a Python program to count and display the vowels of a given text.
26. Write a program to count the numbers of characters in the string and store them in a dictionary data structure
27. Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.
28. Write a program combine lists that combines these lists into a dictionary.
29. Write a Python program for binary search.
30. Write a Python program to sort a list of elements using the bubble sort algorithm
31. Write a Python program to sort a list of elements using the quick sort algorithm.
32. Write a Python program to count the frequency of words in a file.
33. Write a Python program to print last n lines of a file.
34. Write a Python program to combine each line from first file with the corresponding line in second file.
35. Write a Python program to assess if a file is closed or not.
36. Write a Python program to get the Python version you are using.
37. Write a Python program to display the current date and time.
38. Write a Python program to print the calendar of a given month and year.
39. WriteaPythonclasswhichhastwomethodsget_Stringandprint_String.get_Stringaccepta string from the user and print_String print the string in uppercase.
40. Write a Python class named Rectangle constructed by length and width and a method which will compute the area of a rectangle.
41. Solve the following linear equations using scipy library X+3y+5z=10 2x+5y+z=8 2x+3y+8z=3
42. Find the determinant for a 2 * 2 matrix using scipy library module.
43. Find the mean and variance for the following data using scipy [2,23,45,56,78,89,13,33,66,89]
44. Draw a barchart with the following data using matplot lib Men_mean=[20,35,30,35,27] Women_mean=[25,32,34,20,25] Men_std=[2,3,4,1,2] Women_std=[3,5,2,3,3]
45. Using matplot lib and scipy libraries, apply the following operations on an image.

a) Display the image crop image
b) b)flip
c) c)rotate
d) display the statistical information of the image
e) turn upside down

46. Using matplot lib package, draw histogram to show the results performance of a class in the subject C Programming. Students of first year written the exam c programming and obtained the results. Show their performance with the help of a histogram.

M.Tech-COMPUTER SCIENCE & ENGINEERING

M.Tech III Semester **L/T/P/C**
3/0/0/3

OPERATING SYSTEMS (C583OE1)

Course Objectives:

1. To understand the OS role in the overall computer system
2. To study the operations performed by OS as a resource manager
3. To understand the scheduling policies of OS
4. To understand the different memory management techniques
5. To understand process concurrency and synchronization
6. To understand the concepts of input/output, storage and file management
7. To understand the goals and principles of protection
8. Introduce system call interface for file and process management.
9. To study different OS and compare their features.

Course Outcomes:

1. Ability to design and solve synchronization problems.
2. Learn about minimization of turnaround time, waiting time and response time and also
3. Maximization of throughput by keeping CPU as busy as possible.
4. Understand the process scheduling algorithms.
5. Ability to change access controls to protect files.
6. Ability to compare the different operating systems.
7. Understands the windows vista operating system design

UNIT I

Overview Introduction-Operating system objectives, User view, System view, Operating system definition, Computer System Architecture, OS Structure, OS Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments. Operating System services, User and OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure.

UNIT II

CPU Scheduling Process concepts-The Process, Process State, Process Control Block, Threads, Process Scheduling Scheduling Queues, Schedulers, Context Switch, Operations on Processes, System callsfork(),exec(),wait(),exit(), Inter-process communication-ordinary pipes and named pipes, message queues, shared memory.

Process Scheduling Basic concepts, Scheduling Criteria, Scheduling algorithms, Multiple-Processor Scheduling, RealTime Scheduling, Thread scheduling, Linux scheduling and Windows scheduling.

Process Synchronization, Background, The Critical Section Problem, Peterson's solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization in Linux and Windows.

UNIT III

Deadlocks System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.
Memory Management and Virtual Memory Memory Management Strategies- Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.

UNIT IV

Virtual Memory Management Background, Demand Paging, Copy-on-Write, Page Replacement, Page Replacement Algorithms, Allocation of Frames, Thrashing, Virtual memory in Windows.
Storage Management File System- Concept of a File, System calls for file operations - open (), read (), write (), close (), seek (), unlink (), Access methods, Directory and Disk Structure, File System Mounting, File Sharing.

UNIT V

File System Implementation: File System Structure, File System Implementation, Directory Implementation, Allocation methods, Free-space Management, Efficiency, and Performance.
Overview of Mass Storage Structure. Protection System Protection, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection.
Case Study on Windows Vista History of windows vista, Programming windows vista, System structure, Process and threads in windows vista, memory management, Caching in windows vista, input/output in windows vista, the Windows NT file system, Security in windows vista.

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, Greg Gagne, 8th Edition, Wiley, 2016 India Edition.
2. Operating Systems – Internals and Design Principles, W. Stallings, 7th Edition, Pearson.

Reference Books:

1. Modern Operating Systems, Andrew S Tanenbaum, 3rd Edition, PHI
2. Operating Systems: A concept-based Approach, 2nd Edition, D.M. Dhamdhere, TMH.
3. Principles of Operating Systems, B. L. Stuart, Cengage learning, India Edition.
4. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
5. Principles of Operating systems, Naresh Chauhan, Oxford University Press.

IV Semester

S.No	Class	Course Title		Int. marks	Ext. marks	L	T	P	C
1	PW	C584PW	Project Phase-II	--	100	0	0	32	16
		Total Credits		**--**	--	**0**	**0**	**32**	**16**