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M.TECH - COMPUTER SCIENCE & ENGINEERING
Course Structure - R 19

I YEAR – I SEMESTER

Course Code	Course Title	Int. marks	Ext. marks	L	P	C
B251PC1	Data Structures and Algorithms	30	70	3	--	3
B251PC2	Fundamentals of Data Science	30	70	3	--	3
B251PC3	Distributed Systems	30	70	3	--	3
B251PE1	1. Information Security 2. Mobile Applications Development 3. Wireless Networks 4. Multimedia and Gaming	30	70	3	--	3
B251PE2	1. Machine Learning 2. Natural Language Processing 3. Design Patterns 4. Advanced Computer Architecture	30	70	3	--	3
B251PC4	Software Lab-1	30	70	--	4	2
Total Credits				**15**	**4**	**17**

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M.TECH - COMPUTER SCIENCE & ENGINEERING
Course Structure - R 19

I YEAR – II SEMESTER

Course Code	Course Title	Int. marks	Ext. marks	L	P	C
B252PC5	Network Programming	30	70	3	--	3
B252PE3	1. Cyber Security 2. Advanced Databases 3. Social Network Analysis 4. Cloud Computing	30	70	3	--	3
B252PE4	1. Deep Learning 2. Internet of Things 3. Service Oriented Computing 4. Distributed Computing	30	70	3	--	3
B252PE5	1. Storage Area Networks 2. Mobile Computing 3. Computer Forensics 4. Scripting Languages	30	70	3	--	3
B252PC6	Software Lab-2	30	70	--	4	2
B252PC7	Software Lab-3	30	70	--	4	2
B252PC8	Software Lab-4	30	70	--	4	2
B252AT1	Audit Course-I			2		
Total Credits				**14**	**12**	**18**

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M.TECH - COMPUTER SCIENCE & ENGINEERING
Course Structure - R 19

II YEAR - I SEMESTER

Course Code	Course Title	Int. marks	Ext. marks	L	P	C
B253OE1	Open Elective1	30	70	3	--	3
B253RM	Research Methodology	30	70	2	--	2
B253S & MPW	Seminar & Mini Project Work	100		--	6	3
B253PW	Phase-I	100	--	--	18	9
B252AT2	Audit Course-II			2		
Total Credits		---	---	**7**	**24**	**17**

II YEAR – II SEMESTER

Course Code	Course Title	Int. marks	Ext. marks	L	P	C
B254PW	Phase-II	--	100	--	32	16
Total Credits		**--**	--	--	**32**	**16**

Audit Courses - I

1) English for Research Paper Writing
2) Disaster Management
3) Value Education
4) Constitution of India

Audit Course - II

1) Pedagogical Studies
2) Soft Skills
3) Stress Management by YOGA
4) Personality Development through Life Enlightenment Skills

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COMPUTER SCIENCE & ENGINEERING

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

DATA STRUCTURES AND ALGORITHMS (B251PC1)

Course Objectives:

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

Course Outcomes:

At the conclusion of the course, students should be able to:

1. Introduce the classic algorithms in various domains, and techniques for designing efficient algorithms.
2. Gain the ability to analyze worst-case running time of algorithms and understand fundamental algorithmic problems.
3. Familiarize with basic paradigms and data structures used to solve algorithmic problems.
4. Understanding of different classes of problems with reference to their computation difficulties
5. 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, Clifford Stein, Third Edition, PHI Publication.
2. "Data Structures and Algorithms in C++", M.T. Goodrich, R. Tamassia and D.Mount, Wiley India.

Reference Books:

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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COMPUTER SCIENCE & ENGINEERING

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

FUNDAMENTALS OF DATA SCIENCE (B251PC2)

Course Objective:

Extract valuable information for use in strategic decision making, product development, trend analysis, and forecasting. The key techniques in use are data mining, big data analysis, data extraction, and data retrieval

Course Outcomes:

At the conclusion of the course, students should be able to:

1. Describe what Data Science is and the skill sets needed to be a data scientist.
2. Identify probability distributions commonly used as foundations for statistical modeling that are required to fit a model to data.
3. Identify the significance of exploratory data analysis (EDA) in data science. Apply basic tools to carry out EDA.
4. Use APIs and other tools to scrap the Web and collect data, and Use of techniques to extract meaning from data and create features to incorporate into models.
5. Apply basic machine learning algorithms for predictive modeling.

UNIT I

Introduction: What is Data Science, Big Data and Data Science hype - and getting past the hype, why now – Data fictions, Current landscape of perspectives, Skill sets needed. Statistical Inference - Populations and samples, Statistical modeling, probability distributions, fitting a model, Intro to R.
Exploratory Data Analysis and the Data Science Process- Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process;

UNIT II

Three Basic Machine Learning Algorithms- Linear Regression, k-Nearest Neighbors (k-NN), k-means, Filtering Spam and Naïve Bayes. Data Wrangling: APIs and other tools for scrapping the Web.

UNIT III

Feature Generation and Feature Selection (Extracting Meaning From Data)- Motivating application: user (customer) retention, Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms- Filters, Wrappers, Decision Trees, Random Forests.

UNIT IV

Recommendation Systems: Building a User-Facing Data Product, Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, - Principal Component Analysis.

UNIT V

Mining Social-Network Graphs- Social networks as graphs, Clustering of graphs, Direct discovery of communities in graphs, Partitioning of graphs, Neighborhood properties in graphs.
Data Visualization- Basic principles, ideas and tools for data visualization, Examples of inspiring (industry) projects, Exercise: create your own visualization of a complex dataset.
Practical exposure:
Case Study: Real Direct (online real estate firm). R to Filtering spam using linear regression, k-NN, Naïve Bayes. Tools for data wrangling, User retention and brainstorming case studies w.r.t filters, wrappers, decision trees, random forests. Building recommendation system. Creating visualization of a complex dataset.

Text Books:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline.O'Reilly. 2014.

Reference Books:

1. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
2. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
3. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN1449361323. 2013.
4. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online)
5. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science. (Note: this is a book currently being written by the three authors. The authors have made the first draft of their notes for the book available online. The material is intended for a modern theoretical course in computer science.)
6. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press.2014.
7. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790.2011.

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COMPUTER SCIENCE & ENGINEERING

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

DISTRIBUTED SYSTEMS (B251PC3)

Course Objective:

Study software components of distributed computing systems. Know about the communication and interconnection architecture of multiple computer systems.

Course Outcomes:

1. Understand the need for distributed systems and their applications.
2. Understand the concepts of remote procedure calls, remote file systems, distributed agreement, clock synchronization, and security.

UNIT I

Characterization of Distributed Systems - Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models-Introduction, Architectural and Fundamental models, Networking and Internetworking, Inter process Communication. Distributed objects and Remote Invocation - Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT II

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems Introduction, File Service architecture, case study- SUN network file systems. Name Services - Introduction, Name Services and the Domain Name System, Case study of the Global Name Service, Case study of the X.500 Directory Service.

UNIT III

Peer to Peer Systems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, Ocean Store, Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.Coordination and Agreement - Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT IV

Transactions and Concurrency Control -Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency controls. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

UNIT V

Security - Introduction, Overview of Security techniques, Cryptographic algorithms, Digital signatures, Case studies-Kerberos, TLS, 802.11 Wi-Fi. Distributed shared memory, Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, other consistency models, CORBA case study Introduction, CORBA RMI, CORBA Services

Text Books:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and TK in dberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S. Ghosh, Chapman& Hall/CRC, Taylor & Francis Group, 2010.

Reference Books:

1. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.
2. Distributed Operating Systems Concepts and Design, Pradeep K.Sinha, PHI.
3. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, TMH.
4. Reliable Distributed Systems, K.P.Birman, Springer.
5. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
6. Distributed Operating Systems and Algorithm Analysis, R.Chow, T.Johnson, Pearson.
7. Distributed Operating Systems, A.S.Tanenbaum, Pearson education.
8. Distributed Computing, Principles, Algorithms and Systems, Ajay D.Kshema kalyani and Mukesh Singhal, Cambridge, rp2010.

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COMPUTER SCIENCE & ENGINEERING

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

INFORMATION SECURITY (B251PE1A)

Course Objectives:

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

Course Outcomes:

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

UNIT I

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Service (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.

Text Books:

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

MOBILE APPLICATION DEVELOPMENT (B251PE1B)

Course Objective:

Android Application Development course is designed to quickly get you up to speed with writing apps for Android devices. The student will learn the basics of Android platform and get to understand the application lifecycle.

Course Outcomes:

1. To demonstrate their understanding of the fundamentals of Android operating systems.
2. To demonstrate their skills of using Android software development tools.
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform.
4. To demonstrate their ability to deploy software to mobile devices.
5. To demonstrate their ability to debug programs running on mobile devices.

UNIT I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools.
Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes.

UNIT II

Android User Interface: Measurements – Device and pixel density independent measuring units Layouts–Linear, Relative, Grid and Table Layouts User Interface(UI) Components– Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing, and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities.

UNIT III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

UNIT V

Advanced Topics: Alarms – Creating and using alarms Using Internet Resources – Connecting to internet resource, using download manager Location Based Services – Finding Current Location and showing location on the Map, updating location

Text Books:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning,

Reference Books:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox).

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WIRELESS NETWORKS (B251PE1C)

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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MULTIMEDIA AND GAMING (B251PE1D)

Course Objective:

Earn the concepts which are required for designing multimedia games.

Course Outcomes:

1. Explain approaches to represent multimedia data in digital format and identify their properties;
2. Derive the rational of the multimedia representation format and compression algorithms based on the human visual and auditory perception;
3. Analyze image, video and audio in the frequency domain to identify important components to been coded;
4. Explain the major steps in some of the image, video and audio compression standards;
5. Apply lossless and lossy compression techniques on multimedia data.

UNIT I

Introduction to Multimedia- components of multimedia (Text, Graphic, Animation, Video and Audio), History, Software tools for multimedia, tasks and concerns, Multimedia presentations, data compression, multimedia production, sharing and distribution. Tools for multimedia-Adobe Premier, Directory, Flash.

UNIT II

Basic Concepts for Game Design: Designer, creates an experience, experience takes a place at venue, the experience raises out of game, game elements and its theme, game idea, idea improvements, game player motivation, mechanics, interface and story.

UNIT III

Importance of text in multimedia, fonts and typefaces, text elements, editing and design tools, applications. Introduction to Graphics/Images, types, File formats, Color science, color models in image, creation of multimedia images, still images, colors and palettes in multimedia, tools for editing images.

UNIT IV

Introduction to sound, Multimedia system sound, Digital audio, MIDI audio, audio formats. Tools for creating and editing audio.
Introduction to animation, principles, techniques, file formats, tools for creating animation, Ex: Bouncing Ball.
Introduction to video, working principle, standards, analog and digital video concepts, formats of video, compression techniques and tools for making and editing video.

UNIT V

Multimedia data compression- lossless and lossy compression algorithms, image, audio, video standards, compression techniques and supported tools.
Practical exposure: Hardware for multimedia systems, Basic software tools- Authoring system, Text editing, word processing, painting and drawing tools, 2D, 3D Modeling and Animation tools, Image Editing Tools, sound editing tools, Animation, Video, and Digital move tools.

Text Books:

1. Ze-NianLi, MarkS.Drew, Jiangchuan Liu, Fundamentals of Multimedia, second edition, Springer publications,2014.
2. Jesse Schell, The Art of Game Design A Book of Lenses, Second edition CRS Press 2015.

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MACHINE LEARNING (B251PE2A)

Course Objective:

State-of-the-art methods and modern programming tools for data analysis

Course Outcomes:

1. To be able to formulate machine learning problems corresponding to different applications.
2. To understand a range of machine learning algorithms along with their strengths and weaknesses.
3. To understand the basic theory underlying machine learning.
4. To be able to apply machine learning algorithms to solve problems of moderate complexity.
5. To be able to read current research papers and understands the issues raised by current research.

UNIT I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning.
Concept 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 in decision 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, Comparing learning algorithms.

UNIT III

Bayesian Learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm.

Computational Learning Theory – Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, and The mistake bound model of learning.

Instance-Based Learning - Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning

Genetic Algorithms–Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms.

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, Induction as Inverted Deduction, Inverting Resolution.

Analytical Learning - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge.

UNIT V

Combining Inductive and Analytical Learning – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators,

Reinforcement Learning – Introduction, the Learning Task, Q Learning, Non Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

Text Books:

1. Machine Learning – Tom M. Mitchell, -MGH.
2. Ethern Alpaydin, Introduction to Machine Learning. Eastern Economy Edition, Prentice Hall of India, 2005.
3. Machine Learning: An Algorithmic Perspective, Stephen Mars land, Taylor &Francis (CRC).

Reference Books:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William WHsieh, Cambridge Univ Press.
2. Richard O. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc., 2001 Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press,1995
3. Machine Learning by Peter Flach, Cambridge.

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COMPUTER SCIENCE & ENGINEERING

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

NATURAL LANGUAGE PROCESSING (B251PE2B)

Course Objectives:

Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes:

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

UNIT I

Finding the Structure of Words - Words and Their Components, Issues and Challenges, Morphological Models.Finding the Structure of Documents - Introduction, Methods, Complexity of the Approaches, and Performance of the Approaches.

UNIT II

Syntax - Parsing Natural Language, Tree banks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues.

UNIT III

Semantic Parsing - Introduction, Semantic Interpretation, System Paradigms, Word Sense Recourse, Systems, Software.

UNIT IV

Predicate - Argument Structure, Meaning Representation Recourse, Systems, and Software.

UNIT V

Language Modeling - Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling.

Text Books:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.

Reference Books:

1. Speech and Natural Language Processing - Daniel Jurafsky &James H Martin.

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COMPUTER SCIENCE & ENGINEERING

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

DESIGN PATTERNS (B251PE2C)

Course Objective:

Apply common design patterns to incremental /iterative development and to identify appropriate patterns for design of given problem

Course Outcomes:

1. Demonstration of patterns related to object oriented design.
2. Describe the design patterns that are common in software applications.
3. Analyze a software development problem and express it.
4. Design a module structure to solve a problem, and evaluate alternatives.
5. Implement a module so that it executes efficiently and correctly.

UNIT I

Introduction: What is a Design Pattern? Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design patterns, Organizing the Catalog, How Design patterns solve Design problems, How to select a Design Pattern, How to use a Design Pattern.

UNIT II

A Case Study: Designing a Document Editor, Design Problems, Document Structure, Formatting Embellishing the User Interface, Supporting Multiple Look and Feel Standards, Supporting Multiple Window systems, User Operations Spelling Checking and Hyphenation, Summary.
Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT III

Structural Pattern Part – I: Adaptor, Bridge, and Composite. Structural Pattern Part – II : Decorator, acade, flyweight, proxy.

UNIT IV

Behaviour Patterns Part – I : Chain of Responsibility, Command, Interpreter, Iterator. Behaviour Patterns Part – II : Mediator, Memento, Observer.

UNIT V

Behaviour Patterns Part – Ii (cont'd) State, strategy, Template Method, Visitor, Discussion of Behavioural Patterns.
What to Expect from Design Patterns, A brief History, The Pattern Community An Invitation, A Parting Thought.

Text Books:

1. Design Patterns By Erich Gamma, Pearson Education.Reference Books
2. Pattern's in JAVA Vol-I By Mark Grand, Wiley DreamTech.
3. Pattern's in JAVA Vol – II BY Mark Grand, Wiley DreamTech.
4. JAVA Enterprise Design Patterns Vol – III By Mark Grand, Wiley Dream TECH.
5. Head First Design Patterns By Eric Freeman – Oreilly –spd.
6. Peeling Design Patterns, Prof Meda Srinivasa Rao, Narsimha Karumanchi,Career Monk Publication.
7. Design Patterns Explained By Alan Shallowy, Pearson Education.
8. Pattern Oriented Software Architecture, af .Buschman & others, John Wiley & Sons.

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COMPUTER SCIENCE & ENGINEERING

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

ADVANCED COMPUTER ARCHITECTURE (B251PE2D)

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:

1. Understand the Concept of Parallel Processing and its applications.
2. Implement the Hardware for Arithmetic Operations.
3. Analyze the performance of different scalar Computers.
4. Develop the Pipelining Concept for a given set of Instructions.
5. 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).

Reference Books:

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 SCIENCE & ENGINEERING

M.Tech I Semester **L/T/P/C**
0/0/4/2

SOFTWARE LAB-1 (B251PC4)

Programs on Data structures:

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) De queue
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) Pre order, In order and Post order 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.

Programs on Data Science:

1. Using any Basic tools implement plots, graphs and summary statistics.
2. Case Study: Real direct (online real estate firm).
3. Implement i) Linear Regression
   ii) k-Nearest Neighbors(k-NN)
   iii) k-means
   iv) Filtering Spam Emails using Naïve Bayesian algorithm

Programs on Distributed Systems:

1. Write a program to simulate the functioning of Lamport's logical clock in 'C'.
2. Write a program to simulate the Distributed Mutual Exclusion in'C'.
3. Write a program to implement a Distributed chat server using TCP sockets in 'C'.
4. Implement RPC mechanism for a file transfer across a network in 'C'.
5. Write a JAVA code to implement 'Java RMI' mechanism for accessing methods of remote systems.

Reference Books:

1. Data Structures and Algorithms in java, 3rd edition, A. Drozdek, Cengage Learning
2. Data Structures with Java, J.R.Hubbard, 2nd edition, Schaum's Outlines, TMH.
3. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
4. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.

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COMPUTER SCIENCE & ENGINEERING

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

NETWORK PROGRAMMING (B252PC5)

Course Objective:

Computer network programming involves writing computer programs that enable processes to communicate with each other across a computer network.

Course Outcomes:

1. Introduced to the physical and logical organization of the Internet.
2. Acquainted with major internet applications and transport protocols.
3. Know the functions of hubs, switches, bridges, routers, and firewalls.
4. Understand the functional layering of network software architectures.
5. Able to write your own socket-based network application programs.
6. Gain experience with using software tools for network troubleshooting.

Network programming is client–server programming

Inter process communication, even if it is bidirectional, cannot be implemented in a perfectly symmetric way: to establish a communication channel between two processes, one process must take the initiative, while the other is waiting for it. Therefore, network programming unavoidably assumes a client–server model: The process initiating the communication is a client, and the process waiting for the communication to be initiated is a server. The client and server processes together form a distributed system. In a peer-to-peer communication, the program can act both as a client and a server.

UNIT I

Linux Utilities- File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities. Bourne again shell(bash) - Introduction, pipes and redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples. Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

UNIT II

Files- File Concept, File types File System Structure, Inodes, File Attributes, file I/O in C using system calls, kernel support for files, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions- chmod, fchmod, file ownership-chown, lchown , fchown, linkssoft links and hard links – symlink, link, unlink. File and Directory management – Directory contents, Scanning Directories- Directory file APIs. Process- Process concept, Kernel support for process, process attributes, process control – process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process.

UNIT III

Signals- Introduction to signals, Signal generation and handling, Kernel support for signals,Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, abort, sleep functions. Inter process Communication - Introduction to IPC mechanisms, Pipes-creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions, Introduction to message queues, semaphores and shared memory. Message Queues- Kernel support for messages, UNIX system V APIs for messages, client/server example. Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores.

UNIT IV

Shared Memory- Kernel support for shared memory, UNIX system V APIs for shared memory, client/server example. Network IPC - Introduction to Unix Sockets, IPC over a network, Client-Server model ,Address formats(Unix domain and Internet domain), Socket system calls for Connection Oriented - Communication, Socket system calls for Connectionless-Communication, Example-Client/Server Programs- Single Server-Client connection, Multiple simultaneous clients, Socket options–setsockopt, getsockopt, fcntl.

UNIT V

Network Programming in Java-Network basics, TCP sockets, UDP sockets (datagram sockets), All Server programs that can handle one connection at a time and multiple connections (using Multi threaded server), Remote Method Invocation (Java RMI)-Basic RMI Process, Implementation details-Client-Server Application.

Text Books:

1. Unix System Programming using C++, T.Chan, PHI.(Units-II,III,IV)
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.(UnitI)
3. An Introduction to Network Programming with Java, Jan Graba, Springer,rp 2010.(Unit-V)
4. Unix Network Programming ,W.R. Stevens, PHI.(Units II,III,IV)
5. Java Network Programming,3rd edition, E.R. Harold, SPD, O'Reilly.(Unit-V)

Reference Books:

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.
3. UNIX for programmers and users, 3rd Edition, Graham Glass, King Ables,Pearson Education.
4. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition.
5. Unix Network Programming The Sockets Networking API, Vol.-I,W.R.Stevens, Bill Fenner, A.M.Rudoff, Pearson Education.
6. Unix Internals, U.Vahalia, Pearson Education.
7. Unix shell Programming, S.G.Kochan and P.Wood, 3rd edition, Pearson Education. CProgramming Language, Kernighan and Ritchie, PHI.

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COMPUTER SCIENCE & ENGINEERING

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

CYBER SECURITY (B252PE3A)

Course Objective:

The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks. The learner will understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.

Course Outcomes:

1. To learn about cybercrimes and how they are planned.
2. To learn the vulnerabilities of mobile and wireless devices.
3. To learn about the crimes in mobile and wireless devices.

UNIT I

Introduction to Cybercrime: Introduction, Cybercrime and Information security, who are cybercriminals, Classifications of Cybercrimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.
Cyber Offenses: How criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT II

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 an Measures in Mobile Computing Era ,Laptops.

UNIT III

Cybercrimes and Cyber security: the Legal Perspectives: Introduction: Cyber Crime and Legal Landscape around the world, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario In India, Digital signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment Cyber law, Technology and Students: Indian Scenario.

UNIT IV

Understanding Computer Forensics - 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, Chain of Custody concept, Network Forensics, Approaching a computer, Forensics Investigation, Challenges in Computer Forensics, Special Tools and Techniques Forensics Auditing.

UNIT V

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.

Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.
2. Introduction to Cyber Security , Chwan-Hwa(john) Wu, J. David Irwin.CRC Press T&F Group

Reference Book:

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

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COMPUTER SCIENCE & ENGINEERING

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

ADVANCED DATABASES (B252PE3B)

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

1. Understand the underlying principles of Relational Database Management System.
2. Understand and implement the advanced features of DBMS.
3. Develop database models using distributed databases.
4. 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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COMPUTER SCIENCE & ENGINEERING

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

SOCIAL NETWORK ANALYSIS (B252PE3C)

Course Objective:

Enable to put social network analysis projects into action in planned, informed and efficient manner.

Course Outcomes:

At the end of the course the student will be able to

1. Classify social networks
2. Analyze social media and networking data.
3. Apply Social networks Visualization tools.
4. Analyze the social data using graph theoretic computing approach.
5. Identify application driven virtual communities from social networks.
6. Apply sentiment mining.

UNIT I

Introduction to social network analysis, Vertex or node, edge, neighbors, degree, shortest path, cycle, tree, complete graph, bipartite graphs, directed graphs, weighted graphs, adjacency matrix, connected components;

UNIT II

Games on networks, game theory strategies, dominant strategies, dominated strategies, pure strategies and mixed strategies, Nash equilibrium, multiple equilibria coordination games, multiple equilibria-the Hawk-Dove game, mixed strategies, Modeling network traffic using game theory.

UNIT III

Technological networks (internet, telephone network, power grids, transportation networks), social networks (facebook, movie collaboration, paper collaboration), information networks (web), biological networks (neural networks, ecological networks);

UNIT IV

Random models of networks, Erdos-Renyi model of random graph, models of the small world, decentralized search in small-world , random graphs with general degree distributions, models of network formation, Spread of influence through a network, influence maximization in networks, spread of disease on networks, Information networks,

UNIT V

Structure of the web, link analysis and web search, page rank, spectral analysis of page rank and hubs and authorities, random walks, auctions and matching markets, sponsored search markets.

Text Books:

1. David Easley and Jon Kleinberg, Networks, Crowds, and Markets: Reasoning About a Highly Connected World., Cambridge University Press,2010.
2. Mark Newman, Networks: An Introduction., Oxford University Press,2010.
3. Hansen, Derek, Ben Sheiderman, Marc Smith., Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann,2011.
4. Avinash Kaushik., Web Analytics 2.0: The Art of Online Accountability, Sybex,2009.

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COMPUTER SCIENCE & ENGINEERING

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

CLOUD COMPUTING (B252PE3D)

Course Objective:

Identify the technical foundations of cloud systems architectures, analyze the problems and solutions to cloud application problems, apply principles of best practice in cloud application design and management, identify and define technical challenges for cloud applications and assess their importance.

Course Outcomes:

1. To explain the evolving computer model caned cloud computing.
2. To introduce the various levels of services that can be achieved by cloud.
3. 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 centres.

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', Work flow 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 Production for HPC on Clouds, Best Practices in Architecture Cloud Applications in the AWS cloud, Building Content Delivery networks 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, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski,Wiley,2011
2. Distributed and Cloud Computing. Kal Hwang. Geoffeiy C.Fox. JackJ.Dongarra. Elsevier. 2012.

Reference Books:

1. Cloud Computing: A Practical Approach. Anthony T.Velte. Toby J.VeFte,Robert Elsenpeter. Tata McGraw Hill.rp2Oll.
2. Enterprise Cloud Computing Gautam Shroif, Cambridge University Press.2010.
3. Cloud Computing: Implementation, Management and Security, John W.Rittinouse, James F Ransome. CRC Press,rp2012.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. George Reese, O'Red ISPD,rp2Oll.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Ktriaraswamy, Shahed Latif, O'Redç SPD,rp2Oll.

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COMPUTER SCIENCE & ENGINEERING

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

DEEP LEARNING (B252PE4A)

Course Objective:

Delve into selected topics of Deep Learning, discussing recent models from both supervised and unsupervised learning. Special emphasis will be on convolution architectures, invariance learning, unsupervised learning and non-convex optimization.

Course Outcomes:

1. To know the main techniques in deep learning and the main research in this field.
2. Applying knowledge and understanding.
3. Be able to design and implement deep neural network systems.
4. Be able to identify new application requirements in the field of computer vision.

UNIT I

Introduction – Feed forward neural networks. Gradient descent and the back propagation algorithm. Unit saturation, aka the vanishing gradient problem, and ways to mitigate it. Heuristics for avoiding bad local minima. Heuristics for faster training. Nestors accelerated gradient descent. Regularization. Dropout.

UNIT II

Convolution Neural Networks - Architectures, convolution / pooling layers Recurrent Neural Networks - LSTM, GRU, Encoder Decoder architectures Deep Unsupervised Learning - Autoencoders (standard, sparse, denoising, contractive, etc), Variational Autoencoders, Adversarial Generative Networks, Autoencoder and DBM Attention and memory models - Dynamic memory networks

UNIT III

Applications of Deep Learning to Computer Vision - Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, and video to text with LSTM models. Attention models for computer vision tasks.

UNIT IV

Applications of Deep Learning to NLP: Introduction to NLP and Vector Space Model of Semantics, Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag of Words model (CBOW), Glove, Evaluations and Applications in word similarity, analogy reasoning, Named Entity Recognition, Opinion Mining using Recurrent Neural Networks.

UNIT V

Applications of Deep Learning to NLP- Parsing and Sentiment Analysis using Recursive Neural Networks, Sentence Classification using Convolution Neural Networks, Dialogue Generation with LSTMs, Applications of Dynamic Memory Networks in NLP, Recent Research in NLP using Deep Learning: Factoid Question Answering, similar question detection, Dialogue topic tracking, Neural Summarization, Smart Reply.

Text Books:

1. Bengio, Yoshua, Ian J. Good fellow, and Aaron Courville. "Deep learning." An MIT Press book in preparation.(2015).
2. Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1 (2009): 1127.
3. Hochreiter, Sepp, and Jargen Schmidhuber. "Long short-term memory." Neural computation 9.8 (1997):17351780.

References (papers):

1. Oquab, Maxime, et al. "Learning and transferring midlevel image representations using convolution neural networks." Proceedings of the IEEE conference on computer vision and pattern recognition.2014.
2. Bengio, Yoshua, et al. "A neural probabilistic language model." journal of machine learning research 3.Feb(2003).
3. Collobert, Ronan, et al. "Natural language processing (almost) from scratch."Journal of Machine Learning Research 12.Aug (2011):2493-2537.
4. Mikolov, Tomas, et al. "Efficient estimation of word representations in vector space." Ar Xiv preprint arXiv:1301.3781(2013).
5. Pennington, Jeffrey, Richard Socher, and Christopher D. Manning. "Glove: Global Vectors for Word Representation." EMNLP. Vol. 14.2014.
6. Kim, Yoon. "Convolution neural networks for sentence classification." EMNLP (2014).
7. Oquab, Maxime, et al. "Learning and transferring mid-level image representations using convolution neural networks." Proceedings of the IEEE conference on computer vision and pattern recognition.2014.
8. Kumar, Ankit, et al. "Ask me anything: Dynamic memory networks for natural language processing." arXiv preprint arXiv:1506.07285(2015).
9. Sutskever, Ilya, Oriol Vinyals, and Quoc V. Le. "Sequence to sequence learning with neural networks." Advances in neural information processing systems.2014.
10. Kalchbrenner, Nal, Edward Grefenstette, and Phil Blunsom. "A convolution neural network for modeling sentences." ACL(2014).
11. Socher, Richard, et al. "Recursive deep models for semantic compositionality over a sentiment tree bank." Proceedings of the conference on empirical methods in natural language processing (EMNLP). Vol. 1631.2013.
12. Socher, Richard, et al. "Parsing with Compositional Vector Grammars." ACL.2013.
13. Abadi, Martın, et al. "Tensorflow: Large-scale machine learning on heterogeneous distributed systems." Ar Xiv preprint arXiv:1603.04467 (2016).

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COMPUTER SCIENCE & ENGINEERING

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

INTERNET OF THINGS (B252PE4B)

Course Objective:

Impart knowledge on Internet of Things (IoT), which relates to the study of sensors, actuators, and controllers, among other Things, IoT applications and examples overview (building automation, transportation, healthcare, industry, etc.) with a focus on wearable electronics

Course Outcomes:

1. Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
2. Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules
3. Market forecast for IoT devices with a focus on sensors
4. Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi.

UNIT I

Introduction: Internet of Things Promises–Definition– Scope–Sensors for IoT Applications–Structure of IoT– IoT Map Device

UNIT II

Seven Generations Of Iot Sensors To Appear: Industrial sensors – Description & Characteristics–First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics–Polytronics Systems – Description & Characteristics–Sensors' Swarm – Description & Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap

UNIT III

Technological Analysis: Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module.

UNIT IV

IoT Development Examples: ACOEM Eagle – EnOcean Push Button – NEST Sensor – Ninja Blocks -Focus on Wearable Electronics.

UNIT V

Preparing Iot Projects: Creating the sensor project - Preparing Raspberry Pi - Clayster libraries - HardwareInteracting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data - External representation of sensor values – Exporting sensor data - Creating the actuator project- Hardware - Interfacing the hardware - Creating a controller - Representing sensor values - Parsing sensor data – Calculating control states - Creating a camera - Hardware -Accessing the serial port on Raspberry Pi - Interfacing the hardware - Creating persistent default settings – Adding configurable properties - Persisting the settings - Working with the current settings - Initializing the camera

Text Books:

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024',Yole Développement Copyrights ,2014.
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015.
3. Editors OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market.
4. Deployment', River Publishers, 2014.
5. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

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COMPUTER SCIENCE & ENGINEERING

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

SERVICE ORIENTED COMPUTING (B252PE4C)

Course Objective:

Become an important paradigm for information technology architectures and applications, support interoperability and integration of enterprise applications with the help of technologies like Web Services.

Course Outcomes:

After learning the course, the student will be able:

1. To understand the principles of service oriented architecture.
2. To understand and describe the standards & technologies of modern web services implementations.
3. To properly use market-leading development tools to create and consume web services.
4. To analyze and select the appropriate framework components in the creation of web service solutions.
5. To apply object-oriented programming principles to the creation of web service solutions.
6. To identify the requirements of a medium-difficulty programming task, and create software that meets the requirements.

UNIT I

SOC Introduction - Distributed computing in the large, Motivations for composition, Challenges for composition, Web Services Architectures and Standards, Computing with Services, W3C; Roots of SOA - Fundamental of SOA, Characteristics of SOA, Comparing SOA to client- server and distributed internet architectures, Anatomy of SOA, How components in an SOA interrelate.

UNIT II

Enterprise Architectures and SOC Principles - Introduction, Integration versus interoperation, Model Driven Architecture, Concepts of Distributed Computing, XML, Use cases: Intra enterprise and Inter-enterprise Interoperation, Application, Configuration, Dynamic Selection, Software Fault Tolerance; Service Oriented Analysis - Business-centric SOA – Deriving business, Services, Service modeling, Service Oriented Design; WSDL Basics, SOAP Basics, UDDI Basics, REST Basics, Difference between SOAP v/s REST.

UNIT III

Web Service Basics - Service Description, Messaging with SOAP, Message Exchange pattern, Coordination, Transaction, Business Activities, Orchestration, Choreography. Service layer Abstraction - Application Service Layer, Business Service Layer, and Orchestration Service Layer; Service Composition - Service composition guidelines – Entity-centric business service design, Application service design, Task centric business, service design.

UNIT IV

SOA Platform Basics - SOA support in J2EE: Java API for XML based web services (JAX- WS), Java architecture for XML binding (JAXB), Java API for XML Registries (JAXR), Java API for XML based RPC (JAXRPC), Web Services Interoperability Technologies (WSIT). SOA support in .NET: Common Language Runtime, ASP.NET web forms, ASP.NET web services, Web Services Enhancements(WSE).

UNIT V

WS- Specifications and WS-BPEL - WS-Addressing, WS-Reliable Messaging, WS-Policy (including WS Policy Attachments and WS-Policy Assertions), WS-Metadata Exchange, WS- BPEL basics, WS-Coordination overview, WS-Choreography, WS-Security (including XML- Encryption, XML-Signature, and SAML).

Text Books:

1. Munindar Singh & Michael Huhns, "Service Oriented Computing: Semantics, Processes, Agents", Wiley Publication, 2004.
2. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005.
3. Thomas Erl, "SOA Principles of Service Design" (The Prentice Hall Service- Oriented Computing Series from Thomas Erl), 2005.
4. Mark D Hansen, "SOA using Java™ Web Services", Prentice Hall Publication, 2007.
5. Dan Woods and Thomas Mattern, "Enterprise SOA Designing IT for Business Innovation" O'REILLY.
6. Shankar Kambhampaty, "Service-oriented Architecture for Enterprise Applications", John Wiley & Sons, 2008.

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COMPUTER SCIENCE & ENGINEERING

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

DISTRIBUTED COMPUTING (B252PE4D)

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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COMPUTER SCIENCE & ENGINEERING

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

STORAGE AREA NETWORKS (B252PE5A)

Course Objective:

Expose the students to different Backup, Archive and Replication, Business Continuity, Local Replication, Cloud Computing, Securing Storage Infrastructure.

Course Outcomes:

1. To understand Storage Area Networks characteristics and components.
2. To become familiar with the SAN vendors and their products
3. To learn Fibre Channel protocols and how SAN components use them to communicate with each other
4. To become familiar with Cisco MDS 9000 Multilayer Directors and Fabric Switches thoroughly learn Cisco SAN-OS features.
5. To understand the use of all SAN-OS commands. Practice variations of SANOS features

UNIT I

Introduction to Storage Technology: Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities

UNIT II

Storage Systems Architecture: Hardware and software components of the host environment, Key protocols and concepts used by each component, Physical and logical components of a connectivity environment, Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components , Different RAID levels and their suitability for different application environments: RAID 0, RAID1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID6, Compare and contrast integrated and modular storage systems ,High-level architecture and working of an intelligent storage system.

UNIT III

Introduction to Networked Storage: Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, understand the need for long- term archiving solutions and describe how CAS fulfils the need, understand the appropriateness of the different networked storage options for different application environments.

UNIT IV

Information Availability & Monitoring & Managing Data Center: List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime, Differentiate between business continuity (BC) and disaster recovery (DR) ,RTO and RPO, Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures , Architecture of backup/recovery and the different backup/recovery topologies , replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a datacenter.

UNIT V

Securing Storage and Storage Virtualization: Information security, Critical security attributes for information systems, Storage security domains, List and analyses the common threats in each domain, Virtualization technologies, block-level and file-level virtualization technologies and processes.

Case Studies

The technologies described in the course are reinforced with EMC examples of actual solutions.

Realistic case studies enable the participant to design the most appropriate solution forgiven sets of criteria.

Text book:

1. EMC Corporation, Information Storage and Management, Wiley.

Reference Books:

1. Robert Spalding, “Storage Networks: The Complete Reference“, Tata McGraw Hill, Osborne,2003.
2. Marc Farley, “Building Storage Networks”, Tata McGraw Hill ,Osborne,2001.
3. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002

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COMPUTER SCIENCE & ENGINEERING

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

MOBILE COMPUTING (B252PE5B)

Course Objective:

Impart fundamental concepts in the area of mobile computing, to provide a computer systems perpective on the converging areas of wireless networking, embedded systems, software and to introduce selected topics of current research interest in the field.

Course Outcomes:

1. Understand fundamentals of wireless communications.
2. Analyze security, energy efficiency, mobility, scalability and their unique characteristics in wireless networks.
3. Demonstrate basic skills for cellular networks design.
4. Apply knowledge of TCP/IP extensions for mobile and wireless networking.

UNIT I

Introduction, Mobile Computing Architecture, mobile communication, Emerging Technologies: 3G, 4G and 5G Networks.

UNIT II

Global System for Mobile Communications (GSM), General Packet Radio Services(GPRS), Wireless Application Protocol (WAP), CDMA.

UNIT III

Wireless LAN, Wireless MAC , Mobile IP Network layer, Mobile Transport Layer.

UNIT IV

Operating Systems for Mobile Computing , Palm OS, Symbian OS, Wireless Devices with Windows CE.

UNIT V

Mobile Application Development and protocols, J2ME Introduction, J2ME Architecture, MIDLET, Mid Let Suite, J2ME Profiles, Voice over Internet Protocol and Convergence, Security issues in Mobile computing.

Text books:

1. Mobile Computing Technology, Applications and Service Creation by Ashok Talukder , Hasan Ahmed, RoopaR Yavagal.
2. Mobile Computing Principles by Raza B'Far, Cambridge.
3. Mobile Computing by Raj Kamal 2e.
4. Mobile Computing by Jochen schiller.

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COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
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COMPUTER FORENSICS (B252PE5C)

Course Objective:

Select and apply current computer forensics tools. Identify and apply current practices for processing crime and incident scenes, apply digital evidence controls, perform forensic analysis in various operating system environments.

Course Outcomes:

1. To understand the cyberspace.
2. To understand the forensics fundamentals.
3. To understand the evidence capturing process.
4. To understand the preservation of digital evidence.

UNIT I

Computer Forensics Fundamentals: Introduction to Computer Forensics, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps Taken by Computer Forensics Specialists, Who Can Use Computer Forensic Evidence?. Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement Computer Forensic Technology, Types of Business Computer Forensics Technology.

UNIT II

Computer Forensics Evidence and Capture: Data Recovery: Data Recovery Defined Data Backup and Recovery, The Role of Backup in Data Recovery, The Data-Recovery Solution, and Case Histories. Evidence Collection and Data Seizure: Why Collect Evidence?, Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collecting and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain ofCustody.

UNIT III

Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene, Computer Evidence Processing Steps, Legal Aspects of Collecting and Preserving Computer Forensic Evidence. Computer Image Verification and Authentication: Special Needs of Evidential Authentication, Practical Considerations, Practical Implementation.

UNIT IV

Computer Forensics Analysis: Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool, Identification of Data: Timekeeping, Time Matters, Forensic Identification and Analysis of Technical Surveillance Devices. Reconstructing Past Events: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files. Networks: Network Forensics Scenario, A Technical Approach, Destruction of Email, Damaging Computer Evidence, International Principles Against Damaging of Computer Evidence, Tools Needed for Intrusion Response to the Destruction of Data, Incident Reporting and ContactForms.

UNIT V

Current Computer Forensics Tools: Evaluating Computer Forensics Tool Needs, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software.

Text Books:

1. “Computer Forensics: Computer Crime Scene Investigation”, JOHN R.VACCA, FirewallMedia.
2. “Guide to Computer Forensics and Investigations”4e, Nelson, PhillipsEnfinger, Steuart, CengageLearning.

Reference Books:

1. “Computer Forensics and Cyber Crime”, Marjie T Britz, PearsonEducation.
2. “Computer Forensics”, David Cowen, Mc GrawHill.
3. Brian Carrier , "File System Forensic Analysis" , Addison Wesley,2005.
4. Dan Farmer & Wietse Venema ,"Forensic Discovery", Addison Wesley,2005.
5. Eoghan Casey , ―Digital Evidence and Computer Crime ―, Edition 3,Academic Press,2011.
6. Chris Pogue, Cory Altheide, Todd Haverkos ,Unix and Linux Forensic Analysis DVD ToolKit, Syngress Inc. ,2008.
7. Harlan Carvey ,Windows Forensic Analysis DVD Toolkit, Edition 2, Syngress Inc., 2009.
8. Harlan Carvey ,Windows Registry Forensics: Advanced Digital Forensic Analysisof the Windows Registry , Syngress Inc, Feb2011.
9. Eoghan Casey, Handbook of Digital Forensics and Investigation, Academic Press, 2009.
10. Gonzales/ Woods/ Eddins, Digital Image Processing using MATLAB, 2ndedition, Gatesmark Publishing, ISBN9780982085400.
11. N.Efford, Digital Image Processing, Addison Wesley 2000, ISBN0-201-59623-7.
12. M Sonka, V Hlavac and R Boyle, Image Processing, Analysis and MachineVision, PWS 1999, ISBN0-534-95393-
13. Pratt.W.K., Digital Image Processing, John Wiley and Sons, New York,1978.

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COMPUTER SCIENCE & ENGINEERING

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

SCRIPTING LANGUAGES (B252PE5D)

Course Objective:

The course demonstrates an in depth understanding of the tools and the scripting languages necessary for design and development of applications dealing with Bio-information/ Bio-data. The instructor is advised to discuss examples in the context of Bio-data/ Bio-information application development.

Course Outcomes:

1. Comprehend the differences between typical scripting languages and typical system and application programming languages.
2. Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
3. Acquire programming skills in scripting language.

UNIT I

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines, advance perl - finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT II

PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

UNIT III

Advanced PHP Programming Php and Web Forms, Files, PHP Authentication and Methodologies -Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package, Building Web sites for the World – Translating Websites- Updating Web sites Scripts, Creating the Localization Repository, Translating Files, text, Generate Binary Files, Set the desired language within your scripts, Localizing Dates, Numbers and Times.

UNIT IV

TCL – Tk TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures , strings, patterns, files, Advance TCL- eval, source, exec and up level commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface. Tk Visual Tool Kits, Fundamental Concepts of Tk,Tk by example, Events and Binding, Perl-Tk.

UNIT V

Python - Introduction to Python language, python-syntax, statements, functions, Built-in-functions and Methods, Modules in python, Exception Handling, Integrated Web Applications in Python – Building Small, Efficient Python Web Systems, Web Application Framework.

Text Books:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.
3. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications (Dream tech)

Reference Books:

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware (Addison Wesley) Pearson Education
2. Programming Python, M.Lutz,SPD.
3. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.
4. PHP 5.1,I.Bayross and S.Shah, The X Team,SPD.
5. Core Python Programming, Chun, Pearson Education.
6. Guide to Programming with Python, M.Dawson, Cengage Learning.
7. Perl by Example, E.Quigley, Pearson Education.
8. Programming Perl, Larry Wall, T.Christiansen and J.Orwant, O'Reilly,SPD.
9. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
10. PHP and MySQL by Example, E.Quigley, Prentice Hall(Pearson).
11. Perl Power, J.P.Flynt, Cengage Learning.
12. PHP Programming solutions, V.Vaswani, TMH.

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COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
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SOFTWARE LAB-2

Course Objectives:

1. Write syntactically correct HTTP messages and describe the semantics of common HTTP methods and header fields.
2. Discuss differences between URIs, URNs, and URLs, and demonstrate a detailed understanding of http-scheme URLs, both relative and absolute.
3. Describe the actions, including those related to the cache, performed by a browser in the process of visiting a Web address.
4. Install a web server and perform basic administrative procedures, such as tuning communication parameters, denying access to certain domains, and interpreting an access log.
5. Write a valid standards-conformant HTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms.
6. Use CSS to implement a variety of presentation effects in HTML and XML documents, including explicit positioning of elements.
7. Demonstrate techniques for improving the accessibility of an HTML document.

Internet Technologies

1. Develop static pages (using Only HTML) of an online Book store. The pages should resemble: www.amazon.com the website should consist the following pages. Home page, Registration and user Login User Profile Page, Books catalog Shopping Cart, Payment By credit card Order Conformation.

2. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.

3. Create and save an XML document at the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.

4. Install TOMCAT web server. Convert the static web pages of assignments 2 into dynamic web pages using Servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.

5. Redo the previous task using JSP by converting the static web pages of assignments 2into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database. Follow the MVC architecture while doing the website.

6. Implement the “Hello World!” program using JSP Struts Framework.

7. Write an HTML page including any required Java script that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show “out of range” and if it is not a number, it should show “not a number” message in the result box.

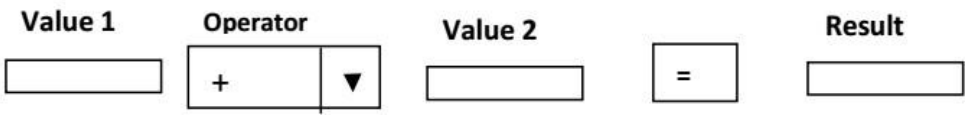
8. Write a java swing application that takes a text file name as input and counts the characters, words and lines in the file. Words are separated with white space characters and lines are separated with new line character.

9. Write a simple calculator servlet that takes two numbers and an operator (+, -, /, * and %) from an HTML page and returns the result page with the operation performed on the operands. It should check in a database if the same expression is already computed and if so, just return the value from database. Use MySQL or Post greSQL.

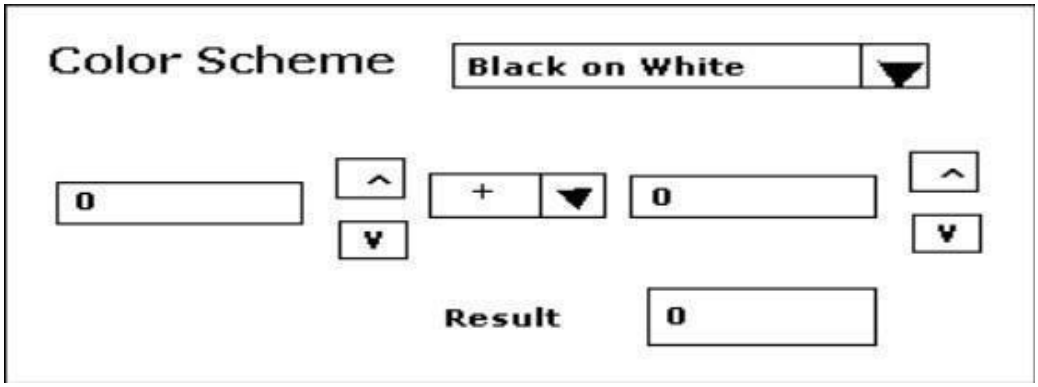
10. Write an HTML page that contains a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).

11. Write a servlet that takes name and age from an HTML page. If the age is less than 18, it should send a page with “Hello <name>, you are not authorized to visit this site” message, where <name> should be replaced with the entered name. Otherwise it should send “Welcome <name> to this site” message.

12. Write a calculator program in HTML that performs basic arithmetic operations (+, -, /, * and %). Use CSS to change the foreground and background color of the values, buttons and result display area separately. Validate the input strings using JavaScript regular expressions. Handle any special cases like division with zero reasonably. The screen may look similar to the following:



13. Write a Java program that creates a calculator GUI, as shown in figure. Extra components may be added for convenience:



The Color Scheme may be Black on White or Blue on Yellow (selectable) and accordingly all components colors must be changed. The values can be either entered or increased or decreased by a step of 10. The operators are +, -, / and * (selectable). Once any change takes place, the result must be automatically computed by the program.

14. Write a Java Application that will read an XML file that contains personal information (Name, Mobile Number, age and place). It reads the information using SAX parser. After reading the information, it shows two input Text Fields in a window, one for tag name and the other for value. Once these two values are given, it should list all the records in the XML file that match the value of the given field in a text area (result box). For example, if the two text boxes are entered with "name" and "ABCD" then it should show all the records for which name is "ABCD"? An Illustration is given below that takes a mobile number and lists all the records that have the same mobile number.

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COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C**
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SOFTWARE LAB-3 (B252PC7)

1. Consider the following web application for implementation: The user is first served a login page, which takes user's name and password. After submitting the details the server checks these values against the data from a database and takes the following decisions. If name and password matches, serves a welcome page with user's full name. If name matches and password doesn't match, then serves “password mismatch” page. If name is not found in the database, serves a registration page, where users full name, present user name (used to login) and password are collected. Implement this application in:
    1. Pure JSP
    2. Pure Servlets
    3. Struts Framework

    Implement a simple arithmetic calculator with +, -, /, *, % and = operations using Struts Framework. The number of times the calculator is used should be displayed at the bottom (use session variable).

2. Create a web Service in Java that takes two city names from the user and returns the distance between these two from data available from a table in MySql. Write a java and a C# client which use the above service.

3. Write an HTML page that has two selection menus. The first menu contains the states (“AP”, “TN” and “KN”) and depending on the selection the second menu.

4. Write an HTML page that gives 3 multiple choice (a,b,c and d) questions from a set of 5 preloaded questions randomly. After each question is answered change the color of the question to either green or blue using CSS. Finally on clicking OK button that is provided, the score should be displayed as a pop-up window. Use Java Script for dynamic content.

5. Write an HTML page that has 3 countries on the left side (“USA”, “UK” and “INDIA”) and on the on the right side of each country, there is a pull-down menu that contains the following entries: (“Select Answer”, “New Delhi”, “Washington” and “London”). The user will match the Countries with their respective capitals by selecting an item from the menu. The user chooses all the three answers (whether right or wrong). Then colors of the countries should be changed either to green or to red depending on the answer. Use CSS for changing color.

6. Write an HTML Page that can be used for registering the candidates for an entrance test. The fields are: name, age, qualifying examination (diploma or 10+2), stream in qualifying examination. If qualifying examination is “diploma”, the stream can be “Electrical”, “Mechanical” or “Civil”. If the qualifying examination is 10+2, the stream can be “MPC” or “BPC”. Validate the name to accept only characters and spaces. should show the following items: “Hyderabad”, “Vijayawada”, “Kurnool” for AP, “Chennai”, “Salem”, “Madurai” for TN and “Bangalore”, “Bellary”, “Mysore” for KN.

7. Write an HTML page that has phone buttons 0 to 9 and a text box that shows the dialed number If 00 is pressed at the beginning, it should be replaced with a + symbol in the text box. If the number is not a valid international number (+ followed by country code and 10 digit phone number) the color of the displa should be red and it should turn to green when the number is valid. Consider only “+91, +1 and +44 as valid country codes. Use CSS for defining colors.

8. Write an HTML page that has a text box for phone number or Name. If a number is entered in the box the name should be displayed next to the number. If 00 is pressed at the beginning, it should be replaced with a + symbol in the text box. If a name is entered in the text box, it should show the number next to the name. If the corresponding value is not found, show it in red and show it in green otherwise. Use CSS for colors. Store at least 5 names and numbers in the script for testing.

9. A library consists of 10 titles and each title has a given number of books initially. A student can take or return a book by entering his/her HTNo as user ID and a given password. If there are at least two books, the book is issued and the balance is modified accordingly.
   Use RDBMS and implement it with JSP.
   Use XML File for data and Implement it with JSP.
   Use RDBMS and implement it with Servlets.
   Use XML File for data and Implement it with Servlets.

10. A Bus Reservation System contains the details of a bus seat plan for 40 seats in 2x2 per row arrangement, where the seats are numbered from 1 to 40 from first row to last row. The customer can visit the website and can reserve a ticket of his choice if available by entering his details (Name, Address, Gender and Age). The customer can cancel the ticket by entering the seat number and his name as entered for reservation.
    Use RDBMS and implement it with JSP.
    Use XML File for data and Implement it with JSP.
    Use RDBMS and implement it with Servlets.
    Use XML File for data and Implement it with Servlets.

11. Implement a simple messaging system with the following details:
    When a student logs in with his/her HTNO and a given password, they should get all the messages posted to him/her giving the ID of sender and the actual message.

Each message may be separated with a ruler. There should be a provision for the user to send a message to any number of users by giving the IDs separated with commas in the "To" text box. Use RDBMS and implement it with JSP.
Use XML File for data and Implement it with JSP.
Use RDBMS and implement it with Servlets.
Use XML File for data and Implement it with Servlets.

12. There is an image of 600x100 size which can be logically divided into 12 button areas with labels (0-9, +, =). Write a java script calculator program that uses this image as input virtual keyboard and three text areas for two input numbers and result of sum of these numbers. Add a CSS that can be used to change the colors of text and background of text areas and the page. The input numbers can be up to 4 digits each.

13. Develop a web application that takes user name and password as input and compares them with those available in an xml user database. If they match, it should display the welcome page that contains the user's full name and last used date and time retrieved from a client cookie. On logout it stores new time to the cookie and displays a goodbye page. If authentication fails, it should store the attempt number to the client cookie and displays an error page. Add necessary CSS that takes care of the font, color of foreground and background.

14. A web application has the following specifications: The first page (Login page) should have a login screen where the user gives the login name and password. Both fields must be validated on client side for a minimum length of 4 characters, name should be lower case a to z characters only and password should contain at least one digit. On submitting these values, the server should validate them with a MySQL database and if failed, show the login page along with a message saying "Login Name or Password Mismatch" in Red color below the main heading and above the form. If successful, show a welcome page with the user's full name (taken from database) and a link to Logout. On logout, a good bye age is displayed with the total time of usage (Logout time – login time). Specify the Schema details of table and web.xml file contents. Implement it using (a) JSP Pages (b) Servlets (c) Struts

15. Design a struts based web portal for an international conference with following specifications: The welcome page should give the details of the conference and a link to login. If login fails, direct them back for re-login and also provide a link for registration. On successful registration/login, the user will be directed to a page where s/he can see the status (accepted/rejected) of their already submitted papers followed by a form for submitting a doc file to the conference. Provide a logout button on all pages including the home page, once the user logs in Implement validation framework to check that the user name is in the form of CCDDCC and password is in the form of (CCSDDD) (C for character, S for special character (one of @, #, $, %, ^, & and!) and D for digit)., Database should be accessed through Connection Pool for MySql for user information.
Provide scope for internationalization in future. Assume any missing information and mention it first.

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COMPUTER SCIENCE & ENGINEERING

M.Tech II Semester **L/T/P/C 0/0/4/2**

SOFTWARE LAB – 4 (B252PC8)

Cloud Computing

1. Introduction to cloud computing.
2. Creating a Warehouse Application in SalesForce.com.
3. Creating an Application in Sales Force.com using Apex programming Language.
4. Implementation of SOAP Web services in C#/JAVA Applications.
5. Implementation of Para-Virtualization using VM Ware's Workstation/ Oracle's Virtual
6. Box and Guest O.S.
7. Installation and Configuration of Hadoop.
8. Create an application (Ex: Word Count) using Hadoop Map/Reduce.
9. Case Study: PAAS (Facebook, Google App Engine).
10. Case Study: Amazon Web Services.

Information Security

1. Write a Java program that takes a file as input and encrypts it using DES encryption. The program should check if the file exists and its size is not zero.
2. Write a Java program that generates a key pair and encrypts a given file using RSA algorithm.
3. Write a Java program that finds digest value of a given string.
4. Consider the following xml file for encryption

   <? xml version="1.0"><transaction><from>12345</from><to>54321</to>
   <amount>10000</amount><secret code>abc123</secret code>
   <checksum></checksum></transaction> Replace <from> and <to>

   values with the RSA encrypted values represented with base64 encoding assuming that the public key is available in a file in local directory "pubkey.dat". Encrypt <secret code> with AES algorithm with a password 'secret'. Encrypt <secret code> with AES algorithm with a password 'secret'. The checksum of all the field values concatenated with a delimiter character '+' will be inserted in the checksum and the xml file is written to encrypted.xml file.
5. Assume that a file 'config.xml', which has the following information:

   <users>
   <user><name>abc</name><pwd>pwd123</pwd><role>admin</role>
   <md5>xxx</md5></user>
   <user><name>def</name><pwd>pwd123</pwd><role>guest</role>
   <md5>xxx</md5></user>
   </users>

   Replace name and role with DES encrypted values and pwd with RSA encrypted values (represent) with base64 encoding). The public key is available in "public.key" file incurrent directory. Replace respective MD5 values of all the fields for each user. Write the resulting file back to config.xml.

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COMPUTER SCIENCE & ENGINEERING

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

RESEARCH METHODOLOGY (B253RM)

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.

Open Electives (Computer Science & Engineering-R19)

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.

S.No	Open Electives	Prerequisites
1.	"R" Programming	Mathematics, Statistics
2.	Android Application Development	Java
3.	Algorithmics	----
4.	Big Data Analytics	Data Bases , Mathematics
5.	Bioinformatics	Data Structures
6.	Biometrics	----
7.	E-Commerce	Internet Technologies
8.	Information Security & Audit	Information Security, Mathematics
9.	Embedded Systems	Digital logic
10.	Intellectual Property Rights	---
11.	Java Programming	---
12.	Linux Programming	---
13.	Mobile Application Security	Mobile Application
14.	OpenStack cloud computing	Linux Programming
15.	Operations Research	Mathematics, Data Structures
16.	Principles of Information Security	Information Security
17.	Social Media Intelligence	----
18.	Software Engineering	----
19.	Web Usability	Web Technology
20.	Operating Systems	----

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COMPUTER SCIENCE & ENGINEERING

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

R-PROGRAMMING (B253OE1)

Course Objective:

Covers practical issues in statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, profiling R code, and organizing and commenting R code.

Course Outcomes:

1. To learn the fundamentals of R.
2. To understand performing operations on complex data types.
3. To understanding how to use the four object systems in R.
4. To create functions that use non-standard evaluation in a principled way.
5. To use profiling to pinpoint performance bottlenecks.
6. To convert slow R functions to fast C++ equivalents.

UNIT I

Introduction to R programming, Introduction to Functions, Preview of Important R Data Structures, Vectors, Recycling, Common Vector Operations, Vectorized Operations, Filtering Matrices and Arrays

UNIT II

Lists, Creating Lists, General List Operations Accessing List Components and Values, Applying Functions to Lists, Recursive Lists, Data Frames, Creating Data Frames, Other Matrix-Like Operations, Merging Data Frames, Applying Functions to Data Frames, Factors and Tables, Factors and Levels, Common Functions Used with Factors, Working with Table, Table-Related Functions

UNIT III

R Programming Structures, Control Statements, Arithmetic and Boolean Operators and Values, Default Values for Arguments, Environment and Scope Issues, Recursion Replacement Functions, Anonymous Functions Data Frames, Creating Data Frames, Other Matrix-Like Operations, Merging Data Frames, Applying Functions to Data Frames, Factors

and Tables Factors and Levels, Common Functions Used with Factors, Working with Table, Table Related Functions, R Programming Structures, Control Statements Arithmetic and Boolean Operators and Values, Default Values for Arguments, Environment and Scope Issues, Recursion Replacement Functions, Anonymous Functions Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses.

UNIT IV

Math and Simulations in R, Math Functions, Functions for Statistical Distributions, Sorting, Linear Algebra Operations on Vectors and Matrices, Set Operations, Simulation Programming in R, Object-Oriented Programming, S3 Classes, S4 Classes, S3 Versus S4, Managing Your Objects

UNIT V

Input/output, Accessing the Keyboard and Monitor, Reading and Writing Files, Accessing the Internet, String Manipulation, String-Manipulation Functions, Regular Expressions, Use of String Utilities in the edtdbg Debugging Tool, Creating Graphs, Customizing Graphs, Saving Graphs to Files Creating Three-Dimensional Plots.

Text Book:

1. Art of R programming by Norman Matloff, safari books online Publisher: No Starch Press.

Reference Books:

1. Beginning R: The Statistical Programming Language by mark garden erwrox publication.
2. Beginning R by lary pace Publishers ap press publishing.
3. R Programming for Dummies by Andrie De Vries and Joris Meys, Wiley India Private Limited.

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

ANDROID APPLICATION DEVELOPMENT (B253OE1)

Course Objective:

It is designed to quickly get up to speed with writing apps for Android devices, learn the basics of Android platform and get to understand the application lifecycle

Course Outcomes:

1. To demonstrate their understanding of the fundamentals of Android operating systems.
2. To demonstrate their skills of using Android software development tools.
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform.
4. To demonstrate their ability to deploy software to mobile devices.
5. To demonstrate their ability to debug programs running on mobile devices.

UNIT I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools. Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes.

UNIT II

Android User Interface: Measurements – Device and pixel density independent measuring units Layouts – Linear, Relative, Grid and Table Layouts User Interface (UI) Components – Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi screen Activities

UNIT III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to sends MS Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts.

UNIT IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update).

UNIT V

Advanced Topics: Alarms – Creating and using alarms Using Internet Resources – Connecting to internet resource, using download manager Location Based Services – Finding Current Location and showing location on the Map, updating location

Text Books:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi,Cengage Learning,2013

Reference Books:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox),

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COMPUTER SCIENCE & ENGINEERING

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

ALGORITHMICS (B253OE1)

Course Objective:

Teach techniques for effective problem solving in computing. The use of different paradigms of problem solving will be used to illustrate clever and efficient ways to solve a given problem. In each case emphasis will be placed on rigorously proving correctness of the algorithm.

Course Outcomes:

Upon completion of this course, students will be able to

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

UNIT I

Relevant Mathematics: Existential and Universal Quantifiers, Logarithms and Exponentials, The Time(and Space) Complexity of an Algorithm, Asymptotic Notations and Their Properties, Adding Mode easy Approximations, Recurrence Relations,
Abstractions: Different representations of Algorithms, Abstract Data Types (ADTs),

UNIT II

Iterative Algorithms and Loop Invariants: Iterative algorithms: Measures of Progress and Loop Invariants, Examples Using More –Of- the – Input Loop Invariants,

UNIT III

Narrowing the Search Space: Binary Search, Iterative Searching Algorithm Euclid's GCD Algorithm, The Loop Invariant for Lower Bound,

UNIT IV

Recursion: Abstractions, Techniques and theory, Some Sample Algorithms of Recursive Algorithms, Recursion on trees, Recursive Images, Parsing with Context-free Grammars.

UNIT V

Optimization Problems: Definition, Graph Search Algorithms, Network Flow and Linear programming, Greedy Algorithms, Recursive backtracking, Dynamic Programming Algorithms, Examples of Dynamic Programs, Reduction and NP-Completeness, Randomized Algorithms.

Text Books:

1. How to think about Algorithms by Jeff Edmonds Cambridge 2003.

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COMPUTER SCIENCE & ENGINEERING

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

BIG DATA ANALYTICS (B253OE1)

Course Objective:

Conceptualization and summarization of big data and machine learning, trivial data versus big data, big data computing technologies, data analytics and types.

Course Outcomes:

1. Understand the Big Data Platform and its Use cases
2. Provide an overview of Apache Hadoop
3. Provide HDFS Concepts and Interfacing with HDFS
4. Understand Map Reduce Jobs
5. Provide hands on Hodoop Eco System
6. Apply analytics on Structured, Unstructured Data..

UNIT I

Big Data Analytics: What is big data, History of Data Management; Structuring Big Data ; Elements of Big Data ; Big Data Analytics; Distributed and Parallel Computing for Big Data; Big Data Analytics: What is Big Data Analytics, What Big Data Analytics Isn't, Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data; Top Challenges Facing Big Data; Why Big Data Analytics Important; Data Science; Data Scientist; Terminologies used in Big Data Environments; Basically Available Soft State Eventual Consistency (BASE); Open source Analytics Tools.

UNIT II

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics; Points to Consider during Analysis; Developing an Analytic Team; Understanding Text Analytics; Analytical Approach and Tools to Analyze Data: Analytical Approaches; History of Analytical Tools; Introducing Popular Analytical Tools; Comparing Various Analytical Tools.

UNIT III

Understanding Map Reduce Fundamentals and HBase : The MapReduce Framework; Techniques to Optimize MapReduce Jobs; Uses of MapReduce; Role of HBase in Big Data Processing; Storing Data in Hadoop : Introduction of HDFS, Architecture, HDFC Files, File system types, commands, org.apache.hadoop.io package, HDF, HDFS High Availability; Introducing HBase, Architecture, Storing Big Data with HBase , Interacting with the Hadoop Ecosystem; HBase in Operations-Programming with HBase; Installation, Combining HBase and HDFS.

UNIT IV

Big Data Technology Landscape and Hadoop : NoSQL, Hadoop; RDBMS versus Hadoop; Distributed Computing Challenges; History of Hadoop; Hadoop Overview; Use Case of Hadoop; Hadoop Distributors; HDFC (Hadoop Distributed File System), HDFC Daemons, read, write, Replica Processing of Data with Hadoop; Managing Resources and Applications with Hadoop YARN.

UNIT V

Social Media Analytics and Text Mining: Introducing Social Media; Key elements of Social Media; Text mining; Understanding Text Mining Process; Sentiment Analysis, Performing Social Media Analytics and Opinion Mining on Tweets;
Mobile Analytics: Introducing Mobile Analytics; Define Mobile Analytics; Mobile Analytics and Web Analytics; Types of Results from Mobile Analytics; Types of Applications for Mobile Analytics; Introducing Mobile Analytics Tools.

Text Books:

1. BIG DATA and ANALYTICS, Seema Acharya, Subhasinin Chellappan, Wiley publications.
2. BIG DATA, Black BookTM , DreamTech Press, 2015Edition.

Reference Books:

1. Rajiv Sabherwal, Irma Becerra- Fernandez," Business Intelligence –Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss,ShakuAtre, " Business Intelligence Roadmap", Addison-Wesley It Service.
3. Yuli Vasiliev, " Oracle Business Intelligence : The Condensed Guide to Analysisand Reporting", SPD Shroff, 2012.

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COMPUTER SCIENCE & ENGINEERING

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

BIOINFORMATICS (B253OE1)

Course Objective:

Knowledge and awareness of the basic principles and concepts of biology, computer science & mathematics, existing software effectively to extract information from large databases and to use this information in computer modeling.

Course Outcomes:

1. Describe principles and algorithms of pairwise and multiple alignments, and sequence database searching
2. Perform pattern matching in biomolecular sequences
3. Describe how evolutionary relationships can be inferred from sequences (phylogenetics)
4. Describe the most important principles in gene prediction methods
5. Describe basic principles of hidden Markov models and their application in sequence analysis

UNIT I

Introduction to Bioinformatics and Biological Databases, Sequence alignment, Pair wise Sequence alignment, multiple sequence alignment, database Similarities.

UNIT II

Molecular Phylogenetics: Basics, gene phylogene Vs Systems Phylogene, Tree construction methods and programs, advanced Statistical approaches, profiles and Hidden markow models.

UNIT III

Gene and Promoter Prediction: Gene Prediction, promoter and regulatory element prediction, RNA structure prediction, protein motives and domain prediction

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UNIT IV

Structural Bioinformatics: Basics, Protein structure Visualization, comparison, classification, protein secondary structure prediction, protein tertiary structure prediction.

UNIT V

Genomics and Proteomics: Genome Mapping, Assembly, comparison, functional genomics, proteomics.

Text Books:

1. Essential Bioinformatics: Jin Xiong 2006, Cambridge University Press and Reporting", SPD Shroff, 2012.

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COMPUTER SCIENCE & ENGINEERING

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

BIOMETRICS (B253OE1)

Course Objective:

Quantitatively and qualitatively evaluate the strength and weaknesses of several biometric modalities from measures, such as error metrics, usability, and public perception, and apply these skills to emerging biometric technologies.

Course Outcomes:

1. Apply biometric matching for identification
2. Identify algorithms for finger, retina, iris biometric technology
3. Apply privacy enhancement using biometrics, biometrics cryptography and multimodal biometrics.
4. Understand and applications of different watermarking techniques with biometrics.
5. Understand current image enhancing techniques with biometrics

UNIT I

Introduction & Handwritten Character Recognition: Introduction – history – type of Biometrics – General Architecture of Biometric Systems – Basic Working of biometric Matching – Biometric System Error and performance Measures – Design of Biometric Systems – Applications of Biometrics – Benefits of Biometrics Versus Traditional Authentication Methods – character Recognition – System Overview – Gesture Extraction for character Recognition – Neural Network for handwritten Character Recognition Multilayer Neural Network for Handwritten Character Recognition – Devanagari Numeral Recognition – Isolated Handwritten Devanagari Character Recognition suing Fourier Descriptor and Hidden markov Model.

UNIT II

Face Biometrics & Retina and Iris Biometrics: Introduction –Background of Face Recognition – Design of Face Recognition System – Neural Network for Face Recognition – Face Detection in Video Sequences – Challenges in Face Biometrices – Face Recognition Methods – Advantages and Disadvantages – Performance of Biometrics – Design of Retina Biometrics – Iris Segmentation Method – Determination of Iris Region – Experimental Results of Iris Localization – Applications of Iris Biometrics – Advantages and Disadvantages. vein and fingerprint biometrics & biometric hand gesture recognition for Indian sign language. Biometrics Using Vein Pattern of Palm – Fingerprint Biometrics – Fingerprint Recognition System – Minutiae Extraction – Fingerprint Indexing – Experimental Results – Advantages and Disadvantages – Basics of Hand Geometry – Sign Language – Indian Sign Language – SIFT Algorithms Practical Approach Advantages and Disadvantages.

UNIT III

Privacy Enhancement Using Biometrics & Biometric Cryptography And Multimodal Biometrics: Introduction – Privacy Concerns Associated with Biometric Developments – Identity and Privacy – Privacy Concerns – Biometrics with Privacy Enhancement – Comparison of Various Biometrics in Terms of Privacy – Soft Biometrics - Introduction to Biometric Cryptography – General Purpose Cryptosystem – Modern Cryptography and Attacks – Symmetric Key Ciphers – Cryptographic Algorithms – Introduction to Multimodal Biometrics – Basic Architecture of Multimodal Biometrics – Multimodal Biometrics Using Face and Ear – Characteristics and Advantages of Multimodal Biometrics Characters – AADHAAR : An Application of Multimodal Biometrics.

UNIT IV

Watermarking Techniques & Biometrics: Scope And Future Introduction – Data Hiding Methods – Basic Framework of Watermarking – Classification of Watermarking – Applications of Watermarking – Attacks on Watermarks – Performance Evaluation – Characteristics of Watermarks – General Watermarking Process – Image Watermarking Techniques – Watermarking Algorithm – Experimental Results – Effect of Attacks on Watermarking Techniques – Scope and Future Market of Biometrics – Biometric Technologies – Applications of Biometrics -Biometrics – and Information Technology Infrastructure – Role of Biometrics in Enterprise Security – Role of Biometrics in Border Security – Smart Card Technology and Biometric – Radio Frequency Identification Biometrics–DNABiometrics–ComparativeStudyofVariousBiometricsTechniques.

UNIT V

Image Enhancement Techniques & Biometrics Stands: Introduction – current Research in image Enhancement Techniques – Image Enhancement – Frequency Domain Filters – Databases and Implementation – Standard Development Organizations – Application Programming Interface – Information Security and Biometric Standards – Biometric Template Interoperability.

Text Books:

1. Biometrics: Concepts And Applications By G R Sinha And Sandeep B. Patil, Wiely, 2013.
2. Biometrics for Network Security – Paul Reid, Pearson Education.

Reference Books:

1. Biometrics – Identity verification in a networked world – Samir Nanavathi, Micheal Thieme, Raj Nanavathi, Wiley – dreamTech.
2. Biometrics – The Ultimate Reference – John D. Woodward, Jr.Wiley Dream tech. and Reporting", SPD Shroff,2012

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COMPUTER SCIENCE & ENGINEERING

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

E – COMMERCE (B253OE1)

Course Objective:

Introduction to information systems for business and management and it is designed to familiarize students with organizational and managerial foundations of systems, the technical foundation for understanding information systems.

Course Outcomes:

1. Identify the major categories and trends of e-commerce applications.
2. Identify the essential processes of an e-commerce system.
3. Identify several factors and web store requirements needed to succeed in e-commerce.
4. Discuss the benefits and trade-offs of various e-commerce clicks and bricks alternatives.
5. Understand the main technologies behind e-commerce systems and how these technologies interact.
6. Discuss the various marketing strategies for an online business.
7. Define various electronic payment types and associated security risks and the ways to protect against them.

UNIT I

Electronic Commerce- Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, Ecommerce organization applications. Consumer Oriented Electronic commerce - Mercantile Process models.

UNIT II

Electronic Payment Systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Inter Organizational Commerce - EDI, EDI Implementation, Value added networks.

UNIT III

Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses.

UNIT IV

Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research. Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering.

UNIT V

Multimedia - Key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing, Desktop video conferencing.

Text Book:

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson.

References Books:

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley.
2. E-Commerce, S.Jaiswal –Galgotia.
3. E-Commerce, Efrain Turbon, Jae Lee, David King, H.Michael Chang.
4. Electronic Commerce – Gary P.Schneider –Thomson and Reporting", SPD Shroff, 2012.

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COMPUTER SCIENCE & ENGINEERING

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

INFORMATION SECURITY AND AUDIT (B253OE1)

Course Objective:

To introduce the fundamental concepts and techniques in computer and network security, giving students an overview of information security and auditing, and to expose students to the latest trend of computer attack and defense. Other advanced topics on information security such as mobile computing security, security and privacy of cloud computing, as well as secure information system development will also be discussed.

Course Outcomes:

At the end of the program, graduates will be able to

1. Get insights into various fields of information security with a deep understanding of theoretical aspects of security and related analysis.
2. Get a broader understanding of various security systems, protocols,complexities, standards, practical applicability, and their limitations.
3. Enhance their inquisitiveness to ever-evolving domain of information security and apply their knowledge to solve problems.
4. Understand the "art" and "science" of research and should be capable enough to apply this training to newer/other fields and problems.
5. Solve security issues with understanding of system security and cryptographic attributes with a relevance to standards.

UNIT I

A model for Internetwork security, Conventional Encryption Principles & Algorithms (DES, AES, RC4, Blowfish), Block Cipher Modes of Operation, Location of Encryption Devices, Key Distribution. Public key cryptography principles, public key cryptography algorithms (RSA, Diffie- Hellman, ECC), public Key Distribution.

UNIT II

Approaches of Message Authentication, Secure Hash Functions (SHA-512, MD5) and HMAC, Digital Signatures, Kerberos, X.509 Directory Authentication Service, Email Security: Pretty Good Privacy (PGP)

IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT III

Web Security: Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).
Firewalls: Firewall Design principles, Trusted Systems, Intrusion Detection Systems

UNIT IV

Auditing for Security: Introduction, Basic Terms Related to Audits, Security audits, The Need for Security Audits in Organization, Organizational Roles and Responsibilities for Security Audit, Auditors Responsibility In Security Audits, Types Of Security Audits.

UNIT V

Auditing for Security: Approaches to Audits, Technology Based Audits Vulnerability Scanning and Penetration Testing, Resistance to Security Audits, Phase in security audit, Security audit Engagement Costs and other aspects, Budgeting for security audits, Selecting external Security Consultants, Key Success factors for security audits.

Text Books:

1. Cryptography and Network Security by William Stallings, Fourth Edition, Pearson Education2007.
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education,2008.
3. Cryptography & Network Security by Behrouz A. Forouzan, TMH2007.
4. Information Systems Security by Nina Godbole, WILEY 2008.

Reference Books:

1. Information Security by Mark Stamp, Wiley – INDIA,2006.
2. Fundamentals of Computer Security, Springer.
3. Network Security: The complete reference, Robert Bragg, Mark Rhodes,TMH
4. Computer Security Basics by Rick Lehtinen, Deborah Russell & G.T.GangemiSr., SPD O'REILLY2006.
5. Modern Cryptography by Wenbo Mao, Pearson Education2007.
6. Principles of Information Security, Whitman, Thomson and Reporting", SPD Shroff, 2012.

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COMPUTER SCIENCE & ENGINEERING

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EMBEDDED SYSTEMS (B253OE1)

Course Objective:

Understand embedded-system programming and apply that knowledge to design and develop embedded solutions and interaction with peripheral devices

Course Outcomes:

1. Upon completion of the course, students will be able to:
2. Describe the architecture and programming of ARM processor.
3. Explain the concepts of embedded systems
4. Understand the Concepts of peripherals and interfacing of sensors.
5. Capable of using the system design techniques to develop firmware
6. Illustrate the code for constructing a system

UNIT I

Introduction To Embedded Computing and ARM Processors : Complex systems and micro processors– Embedded system design process –Design example: Model train controllerInstruction sets preliminaries – ARM Processor – CPU: programming input and output-supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption.

UNIT II

Embedded Computing Platform Design : The CPU Bus-Memory devices and systems– Designing with computing platforms – consumer electronics architecture – platform-level performance analysis – Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT III

Sensor Interfacing with Arduino: Basics of hardware design and functions of basic passive components-sensors and actuators Arduino code – library file for sensor interfacing construction of basic applications.

UNIT IV

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit-Oscillator Unit – Real Time Clock-Watchdog Timer -Embedded Firmware Design Approaches and Development Languages.

UNIT V

Embedded C Programming: Introduction-Creating ‗hardware delays' using Timer 0 and Timer 1-Reading switches-Adding Structure to the code-Generating a minimum and maximum delay-Example: Creating a portable hardware delay- Timeout mechanisms-Creating loop timeouts-Testing loop timeouts- hardware timeouts-Testing a hardware timeout.

Text Books:

1. Marilyn Wolf, ―Computers as Components – Principles of Embedded Computing System Design‖, Third Edition ―Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.(unitI&II).
2. https://www.coursera.org/learn/interface-with-arduino#syllabus (Unit III).
3. Michael J. Pont, ―Embedded C‖, 2 nd Edition, Pearson Education, 2008.(Unit IV & V).

Reference Books:

1. Shibu K.V, ―Introduction to Embedded Systems‖, McGraw Hill.2014.
2. Jonathan W.Valvano, ―Embedded Microcomputer Systems Real Time Interfacing‖, Third Edition Cengage Learning, 2012.
3. Raj Kamal, ―Embedded Systems-Architecture, programming and design‖, 3rd Edition, TMH.2015.
4. Lyla, ―Embedded Systems‖, Pearson , 2013.
5. David E. Simon, ―An Embedded Software Primer‖, Pearson Education,2000.

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INTELLECTUAL PROPERTY RIGHTS (B253OE1)

Course Objective:

Promote the creation of intellectual property by providing incentives and secondly to promote the dissemination of the knowledge in intellectual properties by affording protection to its creators.

Course Outcomes:

1. IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents.
2. Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements.
3. Student get an insight Laws related in India
4. Student able to learn on Trademarks
5. Student get an insight on Trade secrets
6. Student get an insight on Cyber law

UNIT I

Introduction to Intellectual Property Law – The Evolutionary Past - The IPR Tool Kit- Para - Legal Tasks in Intellectual Property Law Ethical obligations in Para Legal Tasks in Intellectual Property Law - Introduction to Cyber Law – Innovations and Inventions Trade related Intellectual Property Right.

UNIT II

Introduction to Trade mark – Trade mark Registration Process – Post registration Procedures – Trade mark maintenance - Transfer of Rights - Inter parties Proceeding – Infringement - Dilution Ownership of Trade mark – Likelihood of confusion - Trademarks claims – Trademarks Litigations – International Trade mark Law.

UNIT III

Introduction to Copyrights – Principles of Copyright Principles -The subjects Matter of Copy right – The Rights Afforded by Copyright Law – Copy right Ownership, Transfer and duration – Right to prepare Derivative works – Rights of Distribution – Rights of Perform the work Publicity Copyright Formalities and Registrations - Limitations - Copyright disputes and International Copyright Law – Semiconductor Chip Protection Act

UNIT IV

The law of patents-patent searches –Patent ownership and transfer-Patent infringement-International Patent Law.

UNIT V

Introduction to Trade Secret – Maintaining Trade Secret – Physical Security – Employee Limitation – Employee confidentiality agreement - Trade Secret Law - Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law.

Text Books:

1. Debirag E.Bouchoux: "Intellectual Property" 4e . Cengage learning, New Delhi.
2. M.Ashok Kumar and Mohd.Iqbal Ali: "Intellectual Property Right" Serials Pub.
3. Cyber Law. Texts & Cases, South-Western's Special Topics Collections
4. Prabhuddha Ganguli: ' Intellectual Property Rights" Tata Mc-Graw –Hill, New Delhi
5. J Martin and C Turner "Intellectual Property" CRC Press.
6. Richard Stimm " Intellectual Property" Cengage Learning and Reporting", SPD Shroff, 2012.

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COMPUTER SCIENCE & ENGINEERING

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

JAVA PROGRAMMING (B253OE1)

Course Objective:

Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.

Course Outcomes:

1. Understand the concepts of OOP as well as the purpose and usages of inheritance, polymorphism, and encapsulation principles.
2. Identify classes, objects, members of a class and the relationships among them needed for a specific problem.
3. Develop Java application programs using sound OOP practices(ex. Interfaces and APIs)
4. Develop programs using the Java collection APIs as well as Java standard class library.

UNIT I

Java Basics - History of Java, Java buzzwords, comments, data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow block scope, conditional statements, loops, break and continue statements, simple java program, arrays, input and output, formatting output, Review of OOP concepts, encapsulation, inheritance, polymorphism, classes, objects, constructors, methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection, building strings, exploring string class, Enumerations, autoboxing and unboxing, Generics.

UNIT II

Inheritance – Inheritance concept, benefits of inheritance, Super classes and Sub classes, Member access rules, Inheritance hierarchies, super uses, preventing inheritance: final classes and methods, casting, polymorphism dynamic binding, method overriding, abstract classes and methods, the Object class and its methods. Interfaces – Interfaces vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interface. Inner classes– Uses of inner classes, local inner classes, anonymous inner classes, static inner classes, examples. Packages - Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

UNIT III

Data structures creation and manipulation in java – Introduction to Java Collections, Overview of Java Collection frame work, Commonly used Collection classes– Array List, Linked List, HashSet, HashMap, TreeMap, Collection Interfaces – Collection, Set, List, Map, Legacy Collection classes – Vector, Hashtable, Stack, Dictionary(abstract), Enumeration interface, Iteration over Collections – Iterator interface, List Iterator interface. Other Utility classes – String Tokenizer, Formatter, Random, Scanner, Observable, java.util. Files – streams- byte streams, character streams, text Input/output, binary input/output, random access file operations, File management using File class, java.io. Networking – Introduction, Manipulating URLs, Ex. Client/Server Interaction with Stream Socket Connections, Connectionless Client/Server Interaction with Datagrams,java.net.

UNIT IV

Exception Handling – Dealing with errors, benefits of exception handling, the classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes. Guide lines for proper use of exceptions. Multithreading - Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, interthread communication, thread groups, daemon threads.

UNIT V

GUI Programming with Java - The AWT class hierarchy, Introduction to Swing, Swing vs. AWT, MVC architecture, Hierarchy for Swing components, Containers – Top-level containers – JFrame, JApplet, JWindow, JDialog, Light weight containers – JPanel, A simple swing application, Overview of several swing components- Jbutton, JToggleButton, JCheckBox, JRadioButton, JLabel, JTextField, JTextArea, JList, JComboBox, JMenu, Java's Graphics capabilities – Introduction, Graphics contexts and Graphics objects, color control, Font control, Drawing lines, rectangles and ovals, Drawing arcs, Layout management - Layout manager types – border, grid, flow, box. Event Handling - Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, Semantic and Low-level events, Examples: handling a button click, handling mouse and keyboard events, Adapter classes. Applets – Inheritance hierarchy for applets, differences between applets and applications, life cycle of an applet – Four methods of an applet, Developing applets and testing, passing parameters to applets, applet security issues.

Text Books:

1. Java: the complete reference, 8th edition, Herbert Schildt,TMH.
2. Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education
3. Java: How to Program P.J.Deitel and H.M.Deitel, 8th edition, PHI.

Reference Books:

1. Java Programming, D.S.Malik, Cengage Learning.
2. Core Java, Volume 1-Fundamentals, eighth edition, Cay S.Horstmann and Gary Cornell, Pearson Education.
3. An introduction to Java programming and object oriented application development, R.A. Johnson Cengage Learning.
4. Advanced Programming in Java2, K.Somasundaram, Jaico Publishing House.
5. Programming in Java, S.Malhotra and S.Choudhary, Oxford Univ.Press.
6. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu,TMH.
7. Object Oriented Programming through Java, P. Radha Krishna, Universities Press.
8. An introduction to programming and OO design using Java, J.Nino, F.A.Hosch, John Wiley & Sons.
9. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.
10. Maurach’s Beginning Java2, D.Lowe, J.Murach, A.Steelman,SPD.

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COMPUTER SCIENCE & ENGINEERING

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

LINUX PROGRAMMING (B253OE1)

Course Objective:

Understanding the basic set of commands and utilities in **Linux**/UNIX systems, learn to develop software for Linux/UNIX systems, learn the C language and get experience programming in C and learn the important **Linux**/UNIX library functions and system calls.

Course Outcomes:

1. To understand the LINUX system structure.
2. To understand and use command line shell.
3. To make effective use of UNIX utilities and Shell scripting language such as bash.
4. To produce programs similar to standard UNIX utilities such as ls, mv, cp etc. using UNIX system calls.
5. To develop the skills necessary for Unix systems programming including file system programming, process and signal management, and inter process communication.
6. To develop the basic skills required to write network programs using Sockets.

UNIT I

Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities.
Sed-Scripts, Operation, Addresses, Commands, Applications, awk- Execution, Fields and Records, Scripts, Operation, Patterns, Actions, Associative Arrays, String and Mathematical functions, System commands in awk, Applications. Introduction, shell responsibilities, pipes and Redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts. Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

UNIT II

Files and Directories- File Concept, File types, File System Structure, file metadata-Inodes, kernel support for files, system calls for file I/O operations- open, create, read, write, close, lseek, dup2, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions - chmod, fchmod, file ownership-chown, lchown, fchown, links-soft links and hard links – symlink, link, unlink.
Directories - Creating, removing and changing Directories- mkdir, rmdir, chdir, obtaining current working directory getcwd, Directory contents, Scanning Directories - opendir, readdir, close dir, rewind dir, seek dir, tell dir functions.

UNIT III

Process – Process concept, Layout of a C program image in main memory, Process environment-environment list, environment variables, getenv, setenv, Kernel support for process, process identification, process hierarchy, process states, process control - process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process, system call interface for process management-fork, vfork, exit, wait, waitpid, exec family, system, I/O redirection, Process Groups, Sessions and Controlling Terminal, Differences between threads and processes.
Signals – Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions.

UNIT IV

Inter process Communication - Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, pipes-creation, IPC between related processes using unnamed pipes, FIFOs creation, IPC between unrelated processes using FIFOs (Named pipes), differences between unnamed and named pipes, popen and pclose library functions.
Message Queues- Kernel support for messages, APIs for message queues, client/server example. Semaphores-Kernel support for semaphores, APIs for semaphores, file locking with semaphores.

UNIT V

Shared Memory- Kernel support for shared memory, APIs for shared memory, shared memory example.
Sockets- Introduction to Berkeley Sockets, IPC over a network, Client-Server model, Socket address structures (UNIX domain and Internet domain), Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs-Single **Server**- Client connection, Multiple simultaneous clients, Comparison of IPC mechanisms.

Text Books:

1. Unix System Programming using C++, T.Chan,PHI.
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH,2006.
3. Beginning Linux Programming, 4th Edition, N.Mathew, R.Stones, Wrox, Wiley India Edition,rp-2008.
4. Unix Network Programming, W.R.Stevens,PHI.
5. Unix and Shell programming, B.A.Forouzan and R.F.Gilberg, Cengage Learning.

Reference Books:

1. Linux System Programming, Robert Love, O'Reilly, SPD,rp-2007.
2. Unix for programmers and users, 3rd Edition, Graham Glass, King Ables,Pearson Education,2003.
3. Advanced Programming in the Unix environment, 2nd Edition, W.R.Stevens, Pearson Education.
4. System Programming with C and Unix, A.Hoover,Pearson.
5. Unix System Programming, Communication, Concurrency and Threads,K.A.Robbins and S.Robbins, Pearson Education.
6. Unix shell Programming, S.G.Kochan and P.Wood, 3rd edition, Pearson Education.
7. Shell Scripting, S.Parker, Wiley India Pvt.Ltd.
8. C Programming Language, Kernighan and Ritchie, PHI.

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COMPUTER SCIENCE & ENGINEERING

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MOBILE APPLICATION SECURITY (B253OE1)

Course Objective:

Conduct an analysis of iOS and Android file system data to plunder compromised devices and extract sensitive mobile device use information, analyze Apple iOS and Android applications with reverse-engineering tools and to conduct an automated security assessment of mobile applications.

Course Outcomes:

1. To understand the mobile issues and development strategies.
2. To understand the WAP and mobile security issues.
3. To understand the Bluetooth security issues.

UNIT I

Top Mobile Issues and Development Strategies: Top Issues Facing Mobile Devices, Physical Security , Secure Data Storage (on Disk), Strong Authentication with Poor Keyboards , Multiple-User Support with Security, Safe Browsing Environment , Secure Operating Systems, Application Isolation, Information Disclosure, Virus, Worms, Trojans, Spyware, and Malware , Difficult Patching/Update Process, Strict Use and Enforcement of SSL, Phishing , Cross-Site Request Forgery (CSRF), Location Privacy/Security, Insecure Device Drivers, Multifactor Authentication, Tips for Secure Mobile Application Development.

UNIT II

WAP and Mobile HTML Security :WAP and Mobile HTML Basics , Authentication on WAP/Mobile HTML Sites, Encryption , Application Attacks on Mobile HTML Sites ,Cross-Site Scripting , SQL Injection , Cross-Site Request Forgery , HTTP Redirects , Phishing , Session Fixation , Non-SSL Login , WAP and Mobile Browser Weaknesses, Lack of HTTP Only Flag Support , Lack of SECURE Flag Support , Handling Browser Cache , WAP Limitations.

UNIT III

Bluetooth Security: Overview of the Technology , History and Standards , Common Uses , Alternatives , Future, Bluetooth Technical Architecture , Radio Operation and Frequency, Bluetooth Network Topology , Device Identification , Modes of Operation , Bluetooth Stack ,Bluetooth Profiles , Bluetooth Security Features , Pairing, Traditional Security Services in Bluetooth, Security "Non-Features" , Threats to Bluetooth Devices and Networks, Bluetooth Vulnerabilities , Bluetooth Versions Prior to v1.2, Bluetooth Versions Prior to v2.1.

UNIT IV

SMS Security: Overview of Short Message Service, Overview of Multimedia Messaging Service, Wireless Application Protocol (WAP), Protocol Attacks , Abusing Legitimate Functionality, Attacking Protocol Implementations, Application Attacks , iPhone Safari , Windows Mobile MMS, Motorola RAZR JPG Overflow, Walkthroughs ,Sending PDUs, Converting XML to WBXML .

UNIT V

Enterprise Security on the Mobile OS: Device Security Options , PIN , Remote , 346 Secure Local Storage , Apple iPhone and Keychain , Security Policy Enforcement ,Encryption ,Full Disk Encryption ,E-mail Encryption , File Encryption , Application Sandboxing, Signing, and Permissions , Application Sandboxing , Application Signing, Permissions , Buffer Overflow Protection ,Windows Mobile , iPhone ,Android ,BlackBerry , Security Feature Summary.

Text Book:

1. "Mobile Application Security", Himanshu Dwivedi, Chris Clark, David Thiel, TATA McGRAW-Hill.

Reference Books:

1. "Mobile and Wireless Network Security and Privacy", Kami S.Makki,et al,Springer.
2. "Android Security Attacks Defenses", Abhishek Dubey, CRC Press.

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COMPUTER SCIENCE & ENGINEERING

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OPENSTACK CLOUD COMPUTING (B253OE1)

Course Objective:
Manage cloud resources according to current industry best practices. Each topic includes lab exercises, opportunity to apply knowledge in a realistic environment.

Course Outcomes:

1. Learn concepts of virtualization and how it's used on the cloud
2. Justify the relationship between virtualization and the cloud
3. Have a stronghold on cloud and OpenStack along with its ecology and components
4. Having hands on installing VM and OpenStack

UNIT I

Keystone OpenStack Identity Service. Installing OpenStack Identity service. Starting OpenStack ImageService. Installing OpenStack Image Service, Configuring OpenStack Image Service with MySQL, Configuring OpenStack, Image Service with OpenStack Identity Service, Managing images with OpenStack Image Service, Registering a remotely stored image, Sharing images among tenants, Viewing shared images. Starting OpenStack Compute. Installing OpenStack Compute Controller services, Creating a sandbox Compute server with VirtualBox and Vagrant, Installing OpenStack Compute packages, Stopping and starting Nova services. Installation of command-line tools on Ubuntu. OpenStack Compute services. Compute managing security groups. Launching our first Cloud instance, terminating your instance.

UNIT II

Installing Open Stack Object Storage. Configuring Open Stack Object Storage Service, Making rings, Stopping and starting OpenStack Object Storage. Configuring OpenStack Object Storage with OpenStack Identity Service, Setting up SSL access, Testing OpenStack Object Storage. Using OpenStack Object Storage. Installing the swift client tool. Creating containers, Uploading objects, Listing containers and objects, Downloading objects, Deleting containers and objects. Using OpenStack Object StorageACLs. Administering OpenStack Object Storage. Preparing drives for OpenStack Object Storage, Managing OpenStack Object Storage cluster with swift-init, Checking cluster health. Benchmarking OpenStack Object Storage. Detecting and replacing failed hard drives , Collecting usage statistics.

UNIT III

Starting OpenStack Block Storage. Configuring OpenStack Compute for Cinder volume. OpenStack Networking. Configuring Flat networking with DHCP. Configuring VLAN Manager networking. Configuring per tenant IP ranges for VLAN Manager. Automatically assigning fixed networks to tenants, Modifying a tenant's fixed network, Manually associating floating IPs to instances, Manually disassociating floating IPs from instances, Automatically assigning floating IPs. Creating a sandbox Network server for Neutron with VirtualBox and Vagrant. Installing and configuring OVS for Neutron. Creating a Neutron network 203, Deleting a Neutron network, Creating an external Neutron network.

UNIT IV

Using OpenStack Dashboard. Installing OpenStack Dashboard, Using OpenStack Dashboard for key management, Using OpenStack Dashboard to manage Neutron networks, Using OpenStack Dashboard for security group management, Using OpenStack Dashboard to launch instances, Using OpenStack Dashboard to terminate instances, Using OpenStack Dashboard for connecting to instances using VNC, Using OpenStack Dashboard to add new tenants, Using OpenStack Dashboard for user management.

Automating OpenStack Installations. Installing Opscode Chef Server. Installing Chef Client, Downloading cookbooks to support DHCP, Razor, and OpenStack. Installing PuppetLabs Razor and DHCP from cookbooks. Setting up a Chef environment for OpenStack. Booting the first OpenStack node into Razor, Defining a Razor broker, model, and policy. Monitoring the node installation. Using Chef to install OpenStack, Expanding our OpenStack environment.

UNIT V

Highly Available OpenStack. Using Galera for MySQL clustering. Configuring HA Proxy for MySQL Galera load balancing, Installing and setting up Pacemaker and Corosync, Configuring Keystone and Glance with Pacemaker and Corosync, Bonding network interfaces for redundancy.

Trouble shooting. Understanding logging. Checking OpenStack services. Trouble shooting OpenStack Compute services. Trouble shooting OpenStack Object Storage services. Trouble shooting OpenStack Dashboard.

Troubleshooting OpenStack Authentication, Troubleshooting OpenStack Networking, Submitting Bug reports, Getting help from the community.

Monitoring. Monitoring OpenStack services with Nagios. Monitoring Compute services with Munin. Monitoring instances using Munin and Collectd. Monitoring the storage service using StatsD/Graphite. Monitoring MySQL with Hyperic.

Text Book:

1. OpenStack Cloud Computing Cookbook - Second Edition, Kevin Jackson , Cody Bunch, October 2013, Packt Publishing-Open Source.

Reference Books:

1. https://www.packtpub.com/virtualization-and-cloud/openstack-cloud-computing-cookbook-second-edition.

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COMPUTER SCIENCE & ENGINEERING

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

OPERATIONS RESEARCH (B253OE1)

Course Objective:

Use quantitive methods and techniques for effective decisions–making; model formulation and applications that are used in solving business decision problems.

Course Outcomes:

1. To introduce the methods of Operations Research.
2. To emphasize the mathematical procedures of non linear programming search techniques.
3. To introduce advanced topics such as Probabilistic models and dynamic programming.

UNIT I

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions.

UNIT II

Transportation Problem: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method.
Assignment Model: Formulation. Hungarian method for optimal solution. Solving unbalanced problem. Traveling salesman problem as assignment problem.

UNIT III

Sequencing Models: Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines – Processing n Jobs through m Machines.
Replacement Models: Replacement of Items that deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy.

UNIT IV

Dynamic Programming: Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, Stage Coach/Shortest Path and Reliability problems.
Games Theory: Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.

UNIT V

Inventory Models: Inventory costs. Models with deterministic demand – model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite.
Queuing Theory: Essential Features of a queuing system. Performance measures of a queuing system. Model 1: {(M/M/1) : (∞/FCFS)} Single server, Unlimited Queue model. Model 2: {(M/M/1) : (∞/SIRO)} Single server, Unlimited Queue model. Model III: {(M/M/1): (N/FCFS)} Single server, Finite Queue model.

Text Books:

1. J K Sharma. "Operations Research Theory & Applications 4e", Macmillan India Ltd.
2. P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co.,2007.

Reference Books:

1. Pradeep Prabhakar Pai, Operations Research – principles and Practice, Oxford University Press,2012.
2. A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education.
3. P Sankara Iyer,"Operations Research", Tata McGraw-Hill,2008.
4. N.V.S. Raju, "Operations Research", HI-TECH,2002.
5. Col. D. S. Cheema, "Operations Research", Laxmi Publications Ltd.,2005.
6. F.S. Hillier, G.J. Lieberman, "Introduction to Operations Research – 8ed",TMH.
7. H.S. Kasana & K.D. Kumar, "Introductory Operations Research – Theory and applications", Springer, 2003,rp2005.
8. Billy E. Gillett, "Introduction to Operations Research – A Computer-Oriented Algorithmic Approach", Tata McGraw-Hill, 1979,rp2004.
9. A.B.Rao, Operations Research, Jaico.
10. Ravindran, Phillips, Solberg, Operations Research, 2nd edition, WileyIndia.
11. W.L.Winston, Operations Research, 4th edition, CengageLearning.
12. R. Panneerselvam, "Operations Research", PHI-2e, 2006,rp2008.
13. ANITHA H S, "Operations Research", EXEL books,2011.

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PRINCIPLES OF INFORMATION SECURITY (B253OE1)

Course Objective:

Awareness of key information security principles regarding information, confidentiality, integrity and availability and some of the skills, knowledge and roles/careers opportunities within the information security industry.

Course Outcomes:

1. Identify and explain risk and potential security issues.
2. Demonstrate responsible computer use as it deals with social, political, legal and ethical issues in today's electronic society.
3. Demonstrate foundation knowledge of information security/assurance within the organization.

UNIT I

Introduction to Information Security, Need for Security,

UNIT II

Legal, Ethical and Professional Issues in Information Security, Planning For Security.

UNIT III

Risk Management, Security Technology: Firewalls and VPNs, Security Technology: Intrusion Detection and Prevention Systems, and Other Security Tools.

UNIT IV

Cryptography, Physical Security, Implementing Information Security.

UNIT V
Security and Personnel, Information Security Maintenance.

Text Book:

1. Principles of Information Security by Whitman, Thompson.

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SOCIAL MEDIA INTELLIGENCE (B253OE1)

Course Objective:

Create an interactive learning community around the theme of SMI. This includes familiarizing students with the types and uses of social media, and providing a basic level of hands-on experience in managing, analyzing, and mining social data using available tools (e.g., dashboards) and automated methods (e.g., natural language processing and machine learning technologies).

Course Outcomes:

Upon completion of this course students will be able to:

1. Understand a wide range of social media usage, management, and mining concepts and tasks and their relevance to the information needs of diverse individuals, communities and organizations.
2. Enhance interpersonal and written communication skills.
3. Collaborate effectively with peers through course assignments.
4. Apply social media marketing, management, and mining methods to address information needs, questions, and issues.

UNIT I

The Beginnings of Social Media Intelligence: What is Social Media monitoring? Anecdotal referencing of Social Media Comments, Text Mining, Some Simple Metrics, Using Social Media as Early Warning System.

Fundamental of Opinion Formation: Affecting Opinion versus Biasing Expression, How Do We Form Opinions?, How Do Expectations Affect Opinion?, How Do Expertise and Knowledge Influence How We Form Opinions?, Opinion Formation in a Social Context, Bandwagon behavior and Information Cascades, Implications for Social Media Intelligence.

UNIT II

Why Do We Share our Opinions: Poster versus Lurkers, What Motivates Us to Post/, Posting Motivations and Selection effects, Implications for Social Media Intelligence.

The Social effects of Strangers : How Does Social Context Affect Our Behavior?, How Influential is the Social Context/, How Does Social Context Affect Opinion Expression/, Bandwagon Behavior in Opinion expression, Differentiating Our opinions, Multiple Audience Effects, can We Trust the Wisdom of Crowds.

UNIT III

Opinion Ecosystems and the Evolution Within: Life Cycle Dynamics, Preference Mismatching and Sequential Dynamics, Social Dynamics, Are Social Media Communities the Cause of Opinion Radicalization? Online Echo Chambers, Implications for Social Media Monitoring and Metrics. Are Social Media Fragmenting the Population? : Self-Organization, Birds of a Feather Flock Together, Geography No Longer Defines Our Communities, The influential Hypothesis, The New Influential, How Can We Identify Influential, Influence in e- Commerce, Some Concluding Remarks.

UNIT IV

Managing Social Media Communities for Better Social Media Intelligence: Creating an Inviting Environment, The Benefits of a Well-Managed Opinion Community (and the Costs of Not Managing the Community at All) Quality of Intelligence Depends on the Quality of the Opinion Community, Creating and Manipulating Buzz, Buzz Campaign or Fraud?,

Identifying Fraudulent Opinions Cutting Through the Online Chatter : A New Paradigm for Marketing Research, Measure What Matters, Cast a Wide Net, Analyze the Text, Understand the biases, Establish Links to Performance metrics.

UNIT V

Intelligence Integration : Overview of Marketing Research Methods, Using Social Media for Marketing research, Tracking Brand Health, Understanding Market Structure, Social Shopping, Integration with Data from Other Parts of the Organization, Intelligence Dashboards. Building Social Media Intelligence into Our Strategies: How Can Social Media Intelligence Help Integrate an Organization's Strategy?, Multichannel Strategies, Rapid Response System, Integrated CRM, Leveraging Social Data, Seeding Strategies.

Moving from Social Media monitoring to Social Media Intelligence: Social Media Intelligence today, Social Media Intelligence tomorrow, Building on the Science of Opinion, tapping into Opinion Ecosystems, Developing an Integrated Strategy.

Text Books:

1. Social Media Intelligence: by Wendly W.Moe, David A. Schweidel, Cambridge University, edition 2014.

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SOFTWARE ENGINEERING (B253OE1)

Course Objective:

An ability to work in one or more significant application domains, demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the **software** lifecycle.

Course Outcomes:

1. Understanding of software process models such as waterfall and evolutionary models.
2. Understanding of software requirements and SRS document.
3. Understanding of different software architectural styles.
4. Understanding of software testing approaches such as unit testing and integration testing.
5. Understanding on quality control and how to ensure good quality software. Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, legacy software, Software myths.

UNIT I

A Generic view of Process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.
Process models: The waterfall model, Incremental process models, Evolutionary process models, specialized process models, The Unified process.

UNIT II

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document. Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. System models: Context Models, Behavioral models, Data models, Object models, structured methods.

UNIT III

Design Engineering: Design process and Design quality, Design concepts, the design model, pattern based software design. Creating an architectural design: software architecture, Data design, Architectural styles and patterns, Architectural Design, assessing

alternative architectural designs, mapping data flow into software architecture. Modeling component-level design: Designing class-based components, conducting component- level design, Object constraint language, designing conventional components. Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

UNIT IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.
Product Metrics: Software Quality, Frame work for Product metrics, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.
Metrics for Process and Products: Software Measurement, Metrics for software quality.

UNIT V

Risk Management: Reactive Vs Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.
Quality Management: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

Text Books:

1. Software Engineering A practitioner's Approach, Roger S Pressman, sixth edition,. McGraw Hill International Edition.
2. Software Engineering, Ian Sommerville, seventh edition, Pearson education.

Reference Books:

1. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
2. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill,2008.
3. Fundamentals of Software Engineering, Rajib Mall, PHI,2005.
4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition,2006.
6. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition ,2006.
7. Software Engineering Foundations, Yingxu Wang, Auerbach Publications,2008.
8. Software Engineering Principles and Practice, Hans Van Vliet, 3rd edition, John Wiley &SonsLtd.
9. Software Engineering 3: Domains, Requirements,and Software Design, D.Bjorner, Springer InternationalEdition.
10. Introduction to Software Engineering, R.J.Leach, CRCPress.

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WEB USABILITY (B253OE1)

Course Objective:

Develop both theoretical and practical skills and knowledge in the field of web usability and accessibility.

Course Outcomes:

1. User-oriented design, to evaluate web usability and identify and prioritize usability adaptations
2. Planning, execution and analysis of usability tests
3. Evaluation, design and adaptation of web pages for people with disabilities and alternative user agents (mobile devices, screen readers, etc.) according to current guidelines
4. In depth studies of web markup languages in order to increase usability and accessibility

UNIT I

Introduction to Usability, Human Factors,

UNIT II

User-Centered Design, Usability Aware Design,

UNIT III

Accessibility, Understanding your Users and Goals,

UNIT IV

Heuristic Evaluation, Usability Testing,

UNIT V

Other Tools and Techniques, Transferring Data into Change

Text Book:

1. Web Usability Hand Book by Mark Pearrow, Thomson Delmar learning.

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OPERATING SYSTEMS (B253OE1)

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.

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ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I)

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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DISASTER MANAGEMENT (Audit Course - I)

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:

Students will be able to

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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VALUE EDUCATION (Audit Course - I)

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 judgements

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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CONSTITUTION OF INDIA (Audit Course - I)

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 to Freedom, 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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PEDAGOGICAL STUDIES (Audit Course - II)

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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SOFT SKILLS (Audit Course - II)

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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COMPUTER SCIENCE & ENGINEERING

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

STRESS MANAGEMENT BY YOGA (Audit Course - II)

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 Ashram (Publication Department), Kolkata.

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2/0/0/0

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

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.