SYLLABUS OF

M.TECH IN INFORMATION TECHNOLOGY

DEPT.OF STATISTICS, UTKAL UNIVERSITY

UTKAL UNIVERSITY
M. Tech. Degree in Information Technology
(Semester System)

The course in M. Tech. (IT) shall comprise of sixteen theory papers, each carrying 100 marks and of three hours duration spreading over first three semesters. There shall be one practical paper in each of the first three semesters carrying 100 marks and of three hours duration, one paper on comprehensive viva-voce & Thesis (Preparatory Part Evaluation) in the third semester carrying 100 marks, and final Thesis in the fourth semester carrying 300 marks.

PAPER CODE	SUBJECT	MARKS	
		Mid Sem.	End Sem.
	FIRST SEMESTER		
MTIT 101	Mathematical Foundations of Computer Science	30	70
MTIT 102	Advanced DBMS	30	70
MTIT 103	Advanced Computer Architecture	30	70
MTIT 104	Design and Analysis of Algorithms	30	70
MTIT 105	**Statistical Methods with LAB**	30	70
MTIT 106	Software Engineering	30	70
MTIT 107	**Practical: ORACLE**		100
	SECOND SEMESTER		
MTIT 201	Advanced Operating System	30	70
MTIT 202	Cryptography and Security	30	70
MTIT 203	Theory of Computation	30	70
MTIT 204	**Data Analytics using R**	30	70
MTIT 205	Elective – 1	30	70
MTIT 206	**Machine Learning**	30	70
MTIT 207	Practical: JAVA		100
	THIRD SEMESTER		
MTIT 301	**IoT**	30	70
MTIT 302	**Cloud Computing**	30	70
MTIT 303	Data Mining and Business Intelligence	30	70
MTIT 304	**Elective – 2**	30	70
MTIT 305	**Practical: PYTHON**		100
MTIT 306	Comprehensive Viva-Voce and Thesis (Preparatory Part Evaluation)		50+50
	FOURTH SEMESTER		
MTIT 401	Thesis		300

ELECTIVE PAPERS

SECOND SEMESTER (Elective -1)

Mobile Computing / Principle of Programming Language & Compiler Techniques.

THIRD SEMESTER (Elective -2)

Soft Computing / Pattern Recognition

- More number of elective papers may be added later as per requirement and availability of resource persons.

DETAILED SYLLABUS

SEMESTER- I

MTIT-101 : MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Objective & Outcome:-

The objective of this course is to gain mathematical maturity to handle logical and abstract processes. Discrete structures including graph and some important counting techniques which are essential for Students of computer science.

Unit-I Propositional Logic: Declarative sentences, Natural reductions, Propositional logic as on formal language, Normal forms.

Unit-II Predicate Logic: The needs for a richer language, Predicate logic as formal language, Proof theory of predicate logic, Semantics of predicate logic. Relations, Equivalence Relation, Functions, Boolean Algebras.

Unit-III Algebra Structure : Monaids and Groups, Binary Group Codes, Lattices, Rings, Integral Domains, Fields, Ideals, Polynomial, Rings, Polynomial Codes.

Unit-IV Graph Theory (I) : Definition of a graph, The Degree of Vertex, Sub graphs, Degree Sequences, Connected Graphs, Cut-Vertices and Bridges, Special Graphs, Digraphs, Properties of Trees, Tree Traversals.

Unit-V Graph Algorithms (MST ,shortest path) ,Graph Coloring , B F S , D F S, Graph Enumerations.

Books Recommended:

1. M.R.A. Hulth, M.D. Ryan, Logic in Computer Science : Modeling and Reasoning about systems, Cambridge University Press, 2000.
2. G. Birkhoff and T.C. Modern Applied Algebra, CBS Publisher, 1987. Ch. 1(1.1-1.5), 2(2.1-2.5,2.6), 5(5.1-5.5, 5.7-5.9), 7,8,9, (9.1-9.4), 10 (10.1,10.2,10.5,10.7), 11 (11.1-11.4).

MTIT-102 : ADVANCED D.B.M.S.

Objective & Outcome:

Advance database management system focuses on generating professionals in Database Systems to investigate new demands and the utilization of new innovations in the management of data. The advanced Database Management System course is designed to address new technologies and techniques and their application, implementation in the field of database. The program aims at equipping students with expertise in a range of highly marketable, hands-on skills required in data modelling .Students are taught to develop advanced skills in managing corporate database systems and web-enabled database applications.

Unit-I Relational data model, Integrity constraints, Relational Queries, Relational Algebra, Tuple Relational Calculus, Domain Relational Calculus, SQL.

Unit-II Design Guidelines for relational schemas and its algorithms, functional Dependencies, reasoning about functional dependencies. Normal forms (1 NF, 2NF, BCNF, 4NF and 5 NF) other kinds of Dependencies, Design of Relational Database.

Unit-III Query Processing and Query Evaluation, External storing, Evaluating relational operators, Selection Operation, Projection Operation, Join Operation, Typical Relational Query Optimizer, Translating SQL, query into relational algebra, Estimating the cost of a plan. Relation algebra equivalence.

Unit-IV Transaction processing Transaction and system concepts, Schedules and recoverability, Locking techniques and concurrency control, Concurrency control based on Timestamp ordering, Multisession concurrency control techniques, Multiple granularity locking. Recovery technique based on Deferred and Immediate update, Database security, discretionary Access control.

Unit-V Introduction to Distributed Database, Distributed DBMS Architecture, Storing data in a Distributed DBMS, Distributed Database Design, Semantic Data Control, Distributed Query Processing and Optimization.

Books Recommended:

1. Ramez Elmasri and Shakant B. Navathe, Fundamentals of database systems Addison wisely.
2. Raghu Ramakrishna and Johannes Gehrke, Database Management Systems me Graw Hill.

References:

1. J.D. Ullman, Principles of Database and Knowledge Base systems, Computer Science Press, 1998, Volume I and II.
2. A sillberschatz, H.E. Korth and S. Sudarsha, Database System Concepts, Me Graw Hill, 1997.

MTIT- 103 : ADVANCED COMPUTER ARCHITECTURE

Objective & Outcome:

The objective of this course is to provide theoretical insights into the design & organization of modern computing systems, including structured design methods, analytical techniques, Fundamental architectural issues and the inherent limitations of the traditional approaches.

At the end of this course, the students will be able to:

- Define the fundamentals and compare among various multi-processor architectures.
- Explain the effectiveness of pipelining, classify and compute the speedup thereof.
- Elaborate the hazards of pipeline architecture and various techniques to overcome them.
- Describe cache optimization techniques, virtual memory concepts, and IO mechanisms.
- Compare various industrial processors and explain basics of interconnection networks.

Prerequisite: Introduction to Computer Organization (Digital Logic Circuits, Processor Organization, I/O Organization).

Unit-I Fundamentals of Computer Design : Introduction the task of a computer designer, Technology and usage trends, Cost Performance measures, Quantitative Principles of Computer Design, The concept of memory hierarchy.

Instruction set principles and Examples : Introduction, Classification of Instruction

Unit-II Pipelining Basic concepts, Pipeline for DLX, Pipeline Hazards, Data and Control Hazards, Difficulties in implementation, Last ruction set design and pipelining. The MIPS R 4000 Pipeline.

Unit-III Instruction level Parallelism (H.P.) : Concepts and challenges, Overcoming Data Hazards with Dynamic Scheduling, Reducing Branch Penalties with Dynamic Hardware Prediction, ILP with multiple issue, Hardware Support for Extracting More Parallesim, studies of H.P. The Power PC 620.

Unit-IV Memory Hierarchy Design : Basic concepts of memory, Internal organization of Memory Chips, Caches Reducing Cache Misses and Miss Penalty, Reducing Hit Time, Main memory, Virtual Memory, Issues in the Design of Memory Hierarchies, Alpha AXP 21064 Memory Hierarchies, Fallacies and Pitfalls in Memory Hierarchy Design.

Storage Systems : Types of storage device, Busses I/O Performance measures, Reliability, Availability and RAID, Interfacing to OS, Designing an I/O System, Unix File System Performance.

Unit-V Multiprocessor : Taxonomy of Parallel Architecture, Performance Matrices and Advantages for communication Mechanisms, Challenges of parallel processing, Characteristics of Application Domains, centralized. Shared memory architectures, Distributed shared memory architectures, synchronization memory system issues, Design and performance of SGI challenges multiprocessor.

Books Recommended

1. J.L. Hennessy and D.A. Patterson – Computer Architecture – A Quantitative Approach 2nd edition – Morgan Kaufmann Publishers, 1996 (Chapters 1,2,3,4,5,6,8).

References:

1- V.C. Hammncher, Z.G. Vranesic, Znky – Computer Organization Mc Graw Hill, 1996 (Chapter –1,2,3,4,5 Appendix A).
2. M.M. Mano – Computer.

MTIT- 104 : DESIGN AND ANALYSIS OF ALGORITHMS

Objective & Outcome:

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

On completion of the course, one can:
Argue the correctness of algorithms using inductive proofs and invariants. Analyse worst-case running times of algorithms using asymptotic analysis. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyse

them. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyse them. Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyse them. Explain the different ways to analyse randomized algorithms (expected running time, probability of error). Recite algorithms that employ randomization. Explain the difference between a randomized algorithm and an algorithm with probabilistic inputs. Analyse randomized algorithms. Employ indicator random variables and linearity of expectation to perform the analyses. Recite analyses of algorithms that employ this method of analysis. Explain what amortized running time is and what it is good for. Describe the different methods of amortized analysis (aggregate analysis, accounting, and potential method). Perform amortized analysis. Explain what competitive analysis is and to which situations it applies. Perform competitive analysis. Compare between different data structures. Pick an appropriate data structure for a design situation. Explain what an approximation algorithm is, and the benefit of using approximation algorithms.

Unit-I Design and Analysis Techniques (I): Introduction, Growth of Function, Recurrences, Divide and Conquer (Heap Sort, Quick Sort, Fast Fourier Transforms), Lower bounds of sorting counting sort.

Unit-II Design and Analysis Techniques (II) : Randomization (Randomized Quick sort, Primarily testing), Dynamic Programming (Floyd – Warshall Algorithm, Longest Common Subsequence), Greedy Method (Single Source Shortest path, Matroids, Task Scheduling).

Unit-III Analysis of Data Structure : Binomial Heaps, Fibonaeei Heaps, Disjoint Sets, Suffix Trees, String matching Algorithm (Ukonnen's algorithm) and applications, Amortized Analysis.

Unit-IV NP-Completeness Polynomial Time, Polynomial time verification, NP Completeness and Reducibility, NP- Complete Problems. Approximation Algorithms The Vertex Cover Problem, The Travelling Sale man Problem.

Unit-V NP Completeness proof ,Hamiltonian path and Hamiltonian cycle reduction , Proof of NP- Complete Problems ,clique ,Vertex Cover ,Independent Vertexsit ,Graph Coloning.

Books Recommended:

1. T.H. Coreman, C.E.I. eiserson and R.L. Rivest, C. Steain – Introduction to Algorithms, Protein hall of India, 2003.
2. M.R. Garey and D.S. Jhonson, Computers and Intractability – a theory of NP completeness, W.H. Freeman, 1979.
3. M. De Berg, M. Vankreveld, M. Overmars, O. Sehwrzkopf Computational Geometry Algorithm Springer Verlog, 2000.

References:

1. Aho, Hoperaft , Ullman, The Design and Analysis of Computer Algorithms, Addison, Wesley Longmans, 1998.
2. M.T. Godrich and R. Tamassaia – Algorithm Design : Foundations, Analysis and Internet Examples – Joohn Willey and Sons, 2002.
3. E. Horowitz, S. Sahani, S. Rajasekarm- Fundamental of Computer Algorithms.

MTIT-105 : STATISTICAL METHODS WITH LAB

Objective & Outcome:

The main objective of this paper is to introduce students to the basics of probability theory and statistical inference which is required for the foundation of data science.

After completion of this course the students are able to:

- Understand the concepts of probability and its distributions
- Understand the sample and sampling distributions
- learn t, F, chi-square applications
- Understand the concepts of estimation and properties of a good estimator
- Understand various methods of estimation procedure
- Learn hypothesis testing problem
- Understand various parametric and non-parametric tests and its applications

Unit-I- Probability and Distributions:

Probability spaces, Conditional probability, Independence, Discrete and continuous random variables, Distributions: Binomial, Poisson and Normal, Expectation, Law of large numbers, Central limit theorem.

Unit-II-Distributions Derived from the Normal Distribution:

Introduction, X^2, *t,* and *F* distribution, The sample Mean and the Sample Variance, Problems, Survey Sampling : Introduction, Population parameters, Sample random Sampling - The Expectation and variance of the Sample Mean, Estimation of the Population Variance, The Normal Approximation to the Sampling Distribution of $\bar{X}$, Estimation of a Ratio.

Unit-III-Estimation of Parameters and Fitting of Probability Distributions:

Introduction, Parameter Estimation, The Method of Moments, The Method of Maximum Likelihood, Maximum Likelihood Estimates of Multinomial Cell Probabilities, Large sample theory for maximum likelihood estimates, Confidence intervals from Maximum likelihood estimates, The Bayesian Approach to Parameter Estimation – Further Remarks on priors, Large Sample Normal Approximation to the Posterior, computational Aspects, Efficiency and Sufficiency.

Unit-IV-Testing Hypotheses and Assessing goodness of Fit:

Introduction, The Neyman-Person Paradigm- Specification of the Significance Level and the concept of a *p*-value, The Null Hypothesis, Uniformly Most Powerful Tests, The Duality of Confidence Intervals and Hypothesis Tests, Generalized Likelihood Ratio Test, Likelihood Ratio tests for the Multinomial Distribution, Probability Plots, Tests for Normality.

Unit-V Comparing Two Samples:

Introduction, comparing Two Independent Sample – Methods Based on the Normal Distribution, A Nonparametric Method-the Mann Whitney Test, Comparing Paired Samples, Methods Based on the Normal Distribution, A Nonparametric Method-The Signed Rank Test, The Analysis of Variance : Introduction, The One-Way Layout- Normal Theory : the F Test, The Problem of Multiple Comparisons, a Nonparametric Method-The Kruskal Wallis Test

LAB WORK: Implementation of some of the techniques (selected by the instructor) using R Programming

Reference Books:

1. Mathematical Statistics and Data Analytics - John A Rice, CENGAGE Learning , 3RD Edition.
2. Robert I. Kabacoff, R in Action –Data analysis and graphics with R, Dreamtech press.
3. Christian Heumann, Michael Schomaker and Shalabh, Introduction to Statistics and Data Analysis- With Exercises, Solutions and Applications in R; Springer, 2016.

MTIT-106 : SOFTWARE ENGINEERING

Objective & Outcome:-

The objective of this course is to learn the concepts & practices of software engineering starting with different phases of SDLC up to deployment & maintenance covering all facets of software development in industry.

Upon completion, students will be able to understand the SDLC phases and apply suitable life-cycle model in building of software
products based on their characteristics. Apply various requirement analysis tools for the requirements engineering process. Describe the project management components and apply them for cost, time & amp; effort estimation for software development projects. Explain the design artifacts, testing strategies and implement them appropriately. Achieve competitive advantage and enhanced quality by applying advanced concepts.

Unit-I Introduction, Software life cycle modules, Requirements Analysis and specification, Software design, Function oriented software design.

Unit-II Introduction to object oriented Analysis and Design, Iterative Development and the unified process, case study – The next Gen POS, Inception, Understanding Requirements, Use case Model, Identifying other requirements, from inception to elaboration.

Unit-III Elaboration use case model, Drawing system sequence diagrams, visualizing concepts, adding associations, adding attributes adding details with operation contracts, interaction diagrams notations, GRASP, use case realization, Determining visibility, creating design class diagram.

Unit-IV Elaboration Interaction 2 : Interaction 2 and other requirements GOF Design pattern. Special topics on drawing and tools, planning and project queues comments on interactive development and the UP Rational Unfiled Process.

Unit-V Coding and Testing, Software reliability and quality management, computer Aided Software Engineering Software maintenance.

Books Recommended

1. Rajib Mail : Fundamentals of Software Engineering 2nd E.d. PHI.
2. I. Summerville : Software Engineering Pearson Education.
3. Craig Larman : Applying UMI and Patterns An introduction OOA and D and the Unified Process 2nd Ed., Pearson Education Asia.

References

1. Martin Flower, UMI, Distiled Pearson Education.
2. G. Booch, I Jacobson, J. Ramburg, UML user Guide, Pearson.

MTIT 107(LAB) : ORACLE

Marks Distributions

Lab Work - 70 marks

Viva-voce + Records - 30 marks

SECOND SEMESTER

MTIT- 201 : ADVANCED OPERATING SYSTEM

Objective & Outcome:

The objective of this course is to understand the fundamental concepts, techniques & algorithms, and internal working principles of a computer operating system to become a system designer or an efficient application developer. In addition to this, the objective of this course is to explore the advanced operating system concepts like synchronization in distributed systems, failure and recovery in distributed systems, communication and scheduling and deadlock handling in distributed systems.

At the end of this course, the students will be able to:

- Explore principles behind various types of operating systems, system components, system calls, protection mechanisms and services.
- Explain different schedulers, scheduling policies, and design new scheduling algorithms for real life problems. Describe the significance of process synchronization through classical synchronization problems and deadlock handling mechanisms.
- Describe the working principle of main memory, cache memory and virtual memory organization and solve memory related problems. Articulate secondary storage management, and analyze the performance of various disk scheduling algorithms
- Conceptualize the Synchronization, communication and scheduling in parallel systems, Distributed systems, their communication mechanisms, distributed objects and middleware
- Explain the Failures and recovery management, System support for Internet-scale computing

Unit-I Single Machine Operating System (I) : Process, CPU Scheduling (basic concepts, scheduling and algorithms, algorithm evaluation) synchronization (critical section problem, semaphores, classical problems of synchronization, critical regions, monitors). Deadlocks (modeling and characterization, prevention, avoidance, detection, recovery).

Unit-II Single Machine Operating System II : Memory Management (Address space, swapping, continuous allocation, paging, segmentation) Virtual memory (demand paging, page replacement algorithm, allocation of frames, thrashing, demand segmentation), file system interface (access methods, directory structure, protection and consistency). File system implementation I/O systems, Secondary storage structure.

Unit-III Distributed Operating Systems : Theoretical Foundations (limitation of a distributed system, clocks, causal ordering of messages, global state, cuts of a distributed computation, termination detection), Distributed Mutual Exclusion (Non-token-based algorithms Lamport, Richart, Agrawala and Mackawa’s algorithms, token based algorithm Suzuki Kasam, Singhal and Raymond’s algorithms), Distributed Deadlock (basic concept, deadlock handling strategies, control organization for distributed deadlock detection, distributed deadlock, detection algorithms), Classification of Agreement Problems, Solution to Byzantine agreement problem and application to fault tolerance.

Unit-IV Distributed Resource Management and Failure Recovery : Distributed File Systems (Mechanism for building distributed file systems, design issue, case studies, disk space management), Distributed shared Memory (Central sever, migration, read-replication and full replication algorithms, memory coherence, coherence protocols, design issues), Distributed Scheduling (issues in load distributing algorithms senders initiated, receive initiated, systematically initiated and adaptive algorithms, performance comparison, load sharing policies, task migration). Recovery (backward and forward error recovery, recovery in concurrent system, check points, synchronous asynchronous check pointing and recovery).

Unit-V Case Study of Linux : Kernel (System calls, memory management, paging, inter process communication, File system, device drivers, multiprocessing, modules and debugging). System Administration (cron, inxineted, confing filles etc). Network administration NESNIS Auto FS, Samba).

Books Reccomnded- A Siberschat and P.B.

MTIT-202 : CRYPTOGRAPHY AND SECURITY

Objective & Outcome:

This course provides an overview of modern cryptographic theories and techniques, mainly focusing on their application into real systems. Topics include number theory, probability and information theory, computational complexity, symmetric and asymmetric cryptosystems, one-way functions, block and stream ciphers, public key infrastructure (PKI), cryptographic protocols in many real systems. Cryptography and network security is the most required technology to secure communication in the internet. Upon completion, the students would be able to understand the security threat in the network, Provide security of the data over the network, Do research in the emerging areas of cryptography and network security. Implement various networking protocols and above all Protect any network from the threats in internet.

Unit I: Overview of cryptography, substitution and affine cipher and their cryptanalysis, Perfect Security, Block cipher, Data Encryption Standard(DES), Differential and linear Cryptanalysis, Block Cipher Design Principles, Block Cipher modes of operation, Advanced Encryption Standard.

Unit II: Principles 'of Public- key Cryptosystems, The RSA Algorithm, Key Management, Diffie- Hellman Key Exchange, Authentication Functions, Message Authentication codes(MAC), Hash Functions, Security of Hash Functions and MAC, Secure Hash Algorithm, HMAC.

Unit III: Discrete Logarithms, ElGamal Cryptosystem, Algorithm for Discrete Logaritlun Problem, security of EIGamal System, Schnorr signature scheme, The EIG-amal signature scheme, The digital signature algorithm, Provable secure signature schemes.

Unit IV: Elliptic curve over the reals, Elliptic curves modulo a prime, Properties of Elliptic curves Point compression and ECles, Computing point multiples on Elliptic curves, Elliptic curve digital signature algorithm, Elliptic curve factorization, Elliptic curve primarily test.

Unit V: Network Security Practice: Kerberos, X.509 Authentication Service, Public Key Infrastructure. E-Mail Security (Pretty Good Privacy), IP Security(Architecture, Authentication Header, Encapsulating Security Payload, Combining Security, Associations, Key Management), Web Security(Secure Sockets Layer and Transport Layer Security).

Books Recommended

1. W.Sta1lings- Cryptography and Network Security Principles"and Practice, Person Education Asia, 2000. (3"J Edition) Chapters: [1,3, 5 , 9, 10(10.1,10.2), II, 12(12.2,12.4), 13(13.3), 14,15,16,17].
2. D.Stinsori, Cryptography: Theory and Practice, CRC press, 2006. Capters: [1,2(2.3),6,7,12].

References:

1. A. Menezes, P. Van Oorsch, S. Vanstans- Handbook of Applied Cryptography, CRCpress,1997. '
2. B. Schmeier- Applied Cryptography, New York, Wiley, 1996.

M**TIT-203: THEORY OF COMPUTATION**

Objective & Outcome:

The primary objective of this course is to introduce the basic principles, techniques, and Applications of automata theory concepts in real world problems.

- To understand the concept of machines: finite automata, pushdown automata, linear bounded automata, and Turing machines.
- To understand the formal languages and grammars: regular grammar and regular Languages, context-free languages and context-free grammar; and introduction to Context-sensitive language and context-free grammar, and unrestricted grammar and Languages.
- To understand the relation between these formal languages, grammars, and machines.
- To understand the complexity or difficulty level of problems when solved using these machines.
- To understand the concept of algorithm.
- To compare the complexity of problems.

Upon successful completion of this course, the student shall be able to understand:

- Able to design Finite Automata machines for given problems
- Describe the types of grammar and derivation tree
- Able to analyze a given Finite Automata machine and find out its Language
- Able to design Pushdown Automata machine for given CF language(s)
- Able to generate the strings/sentences of a given context-free languages using its Grammar
- Able to design Turing machines for given any computational problem
- Develop a computational model using Turing machine for the given problem.
- Examine the complexity for P and NP completeness for the given problem.

Unit-I Regular Language and finite Automata : Deterministic and Non-Determining Finite Automata, Equivalent Automata, Minization, of Finite Automata, Regular languages and Regular Expression, Closure Properties for Regular languages, Kliene’s Theorem, the Pumping lemma and its applications the my hill Nerude Theorem.

Unit-II Context Free Languages and Pushdown : Context Free, Grammars and their Derivations, Trees, Regular Grammers, Chomsky, Normal Form, Bara Hillels Pumping Lemma, Closure Properties for Context Free Languages, Decision Problems involving CFL, Pushdown Automata, Compliers and Formal Languages.

Unit-III The Church Turning Thesis : Turning Machines, Multiple Turning Machines, Non-determinist turning machines, Enumerators, Definition of Algorithm, Terminology for Describing Turning Machines, Decidability : Decidable problems concerning regular and context free language, the halting problem, Turing Unrecognizable language.

Unit-IV Undecidable problems from language theory reduction via computation Histories, Post Correspondence Problem, Mapping Reducibility, Computable Function.

The Rearsion Theorem did Applications, Decidability of Logical Theories Turning Reducibility, Definition of Information.

Unit-V Complexity Theory : Review of NP Completeness, Space Complexity (Savitchi Theorem, The Class Pspace. The Classes L and NL, Completeness) Intractability (Hierarchy Theorems, Relativization, Circuit Complexity), Probabilistic Algorithm (Class BPP), Alternation, Interactive Proof System (IP=PSPACE).

Books Recommended :

1. J.E. Hoporoft, J.D. Ullman – Introduction to Automata Theory, Language and Computation, - Narosa, 19
2. M. Sipser – Introduction to Theory of Computation – PWS Publishers, 1997.

Reference :

1. M.D. Daye, R. Signak, E.J. Weyuker Comutability, Complexity and languages, Academic Press, 1994.
2. C.H. Padamitrios – Computational Complexity – Addison Wesley, 1994.

MTIT-204: DATA ANALYTICS USING R

Objective & Outcome:

The main objective of this paper is to give a first-hand experience of data analysis using R programming. Also, provide a foundation to regression develop models and it's applications to various real life problems;
After completion of this course the students are able to

- Learn Data handling in R
- Understand Exploratory data analysis
- Develop regression model and its solution using R
- Understand logistic regression and other advanced techniques
- Understand classification and discriminant function
- Understand supervised and unsupervised learning

Unit-I : Introduction to Data Analytics, Variables and Data Types, Control Structures, Array, Matrix, Vectors, Factors, Functions, Data Manipulation in R, Data Import and Export, R packages.

Unit-II : Understanding the Exploratory Data Analysis (EDA), Implementation of EDA on various datasets, Understanding on Data Visualization, Graphical functions present in R, plot various graphs like Table plot, histogram, boxplot, Customizing Graphical Parameters to improvise the plot.

Unit-III: Linear and Multiple Regression, Ridge Regression, Lasso Regression, K Nearest Neighbours Regression & Classification, Bootstrapping and Monte-Carlo simulation.

Unit-IV: Supervised Learning with Regression and Classification techniques -1 Bias-Variance Dichotomy, Model Validation Approaches Logistic Regression Linear Discriminant Analysis Quadratic Discriminant Analysis Regression and Classification Trees, Support Vector Machines.

Unit-V: Supervised Learning with Regression and Classification techniques -2 Ensemble Methods: Random Forest, Creating a Perfect Decision Tree, Classification Rules for Decision Trees. Unsupervised Learning and Challenges for Big Data Analytics Clustering Associative Rule Mining Challenges for big data analytics, Prescriptive analytics.

Reference Books

1. Trevor Hastie, Robert Tibshirani,Jerome Friedman *, The Elements of Statistical Learning-Data Mining, Inference,and Prediction*,Second Edition, Springer Verlag, 2009.
2. **(For lab only**) -G.James,D.Witten,T.Hastie,R.Tibshirani-*An introduction to statistical Learning with applications in R*,Springer,2013.
3. C.M.Bishop –Pattern Recognition and Machine Learning,Springer,2006

MTIT-205 : ELECTIVE – 1
(Any one of the following)

MOBILE COMPUTING

Objective & Outcome:

The objective of this course is to study networking principles & wireless communication on cellular networks, wireless internet, wireless devices & satellite systems for unobtrusive connectivity that is always available.

Upon completion, student will be able to understand different frequency bands & their communication domains and explain the GSM & GPRS functionalities in cellular network. Explain the MAC layer protocols of WLAN, Ad hoc Network and different 2G and 3Gstandards. Implement different protocols of Mobile network and transport layer and analyse their performance. Comprehend the access and communication mechanisms of satellite network and VPN with cellular network. Use appropriate wireless technologies in commercial and enterprise application developments.

Unit-I Overview of wireless technologies, signal propagation, multiplexing, modulation, spread spectrum, Media access control : SDMA, FDMA, TDMA, CDMA, MAC Mechanisms in MANETs (MAC Protocols Enhancing Temporal and Spatial Channel Utilization).

Unit-II Cellular systems GSM, DECT, UMTS, IMT-2000, Satellite Systems basic, routing, localization, handover.

Unit-III Wireless Network packet radio network, Wireless LAN : IEEE 802, 11b, Bluetooth, Wireless ATM.

Unit-IV Mobile Networking: Mobile IP, Routing and Mobility Management in MANETs : Table Driven, On Demand Hybrid, Power- Aware, QoS – Location Based Routing. Wireless TCP : Indirect TCP, Snooping TCP, Mobile TCP, Transaction Oriented TCP.

Unit-V Analytic Mobility Models, of PCS Networks, Battery Power Management in Portable Devices, Mobile Application and Services, Security for Mobile Agents.

Books Recommended

1. Mobile Communication : Jochen Schiler (Pearson Education Asia).
2. Mobile Computing Handbook : Mahammad Hays, Imad Mahagoub, Auerbach, Publication.

PRINCIPLE OF PROGRAMMING LANGUAGE AND COMPILER TECHNIQUES

Objective & Outcome:

The objective of this course is to:

Provide an understanding of the fundamental principles in compiler design, to provide the skills needed for building compilers for various situations that one may encounter in a career in Computer Science, to Learn the process of translating a modern high-level language to executable code required for compiler construction.

At the end of course students will be able to:

- Understand fundamentals of compiler and identify the relationships among different phases of the compiler.
- Understand the application of finite state machines, recursive descent, production rules, parsing, and language semantics.
- Analyze & implement required module, which may include front-end, back-end, and a small set of middle-end optimizations.
- Use modern tools and technologies for designing new compiler.

Unit-I Compliers & Translators, Need of Translators, Structure of A complier, Phases, Lexical Analysis, Syntax Analysis, Intermediate Code Generation, Code Optimization, Code Generation, Book Keeping, A Symbol Table in Brief, Semantic Analysis, L-Value, r-values, Error Handling.

Unit-II: Rules of Lexical Analyser, Ned for Lexical Analysis, Input Buffering, Preliminary Scanning, A Simple Approach to the Design of Lexical Analysers, Transition Diagrams, Regular Expression, String & Languages, Finite Automata, Non-deterministic Automata, Deterministic Automata, From regular Expression to finite Automata, Context free Grammars, Derivations & Parse Trees, Parser4s , shift Reduce Parsing, Operator Precedence Parsing.

Unit-III: Symbol Tabel Management, contents of a Symbol Table, Names & Symbol Table records, reusing of symbol table spaces, array names, indirection in Symbol table entries, Data Structure for Symbol Tables, List, Self Organizing Lists, Search Trees, Hash Tables, Errors, Reporting Errors, Sources of Errors Syntactic Errors, Semantic Errors, dynamic Errors, Lexical Phase Errors, Minimum Distance

Matching, Syntactic Phase Error, Time of Detection , Ponic mode, Case study on Lex and Yacc.

Unit-IV: Principal Sources of Optimization, Inner Loops, Language Implementation Details Inaccessible to the User. Further Optimization. Algorithm Optimization, Loop Optimization, Code Motion, Induction Variables, reduction in Strength, Basic Blocks Flow Graphs, DAG Representation of Basic Blocks, Value Numbers & Algebraic Laws, Global Data Flow Analysis, Memory Management Strategies, Fetch Strategy, Placement Strategies, Replacement Strategies, Address Binding, compile Time, Load Time, Exaction Time, Static Loading Dynamic Loading, Dynamic Linking.

Unit-V: Problems in code Generat5ion, A Simple code Generator, next-Use Information, Register Descriptors, Address Descriptors, Code Generation Algorithm, Register Allocation & Assignment, Global Register Allocation, Usage Counts. Register Assignment for Outer Loops, Register Allocation by Graph coloring. Code Generation From DAG's, Peep-hole Optimization, Redundant Loads & Stores, Un-Reachable Code, Multiple Jumps, Algebraic Simplifications, Use of Machine Idioms.

Books Recommended:

1. Aho,Lam,Sethi,Ullman-Pearson Education.

COMPUTER GRAPHICS AND ANIMATION

Objective & Outcome:

The objective of this course is to understand the basics of various inputs and output computer graphics hardware devices as well as the course will offers an in-depth exploration of fundamental concepts in 2D and 3D computer graphics including 3D modelling, geometric transformations, 3D viewing and rendering.

On completion of this course one will be able to:

Apply concepts of graphics system, output primitives such as VDU, raster-scan, random scan, line drawing algorithms, basic transformation and matrix representation to represent various patterns in 2-dimensions. Transform real-world objects to any view-ports, and compare the accuracy and quality of the images in both the coordinate systems especially for live video streaming. Apply the process of line clipping, polygon clipping, aliasing and anti-aliasing, two dimensional object representations, fractal geometry, three dimensional geometric representations to display real-world objects. Exhibit projection, 3D-transformation of objects and represent multiple images in a scene with visible surface detection mechanisms such as Z-Buffer, A-Buffer, Painter's and scan line algorithms. Employ Illumination and polygon rendering techniques such as Back-Face detection, Gouraud Shading, Phong-Shading to various 3-dimensional images, design various animation applications using Virtual Reality environment.

Unit-I Conceptual Framework for interactive Graphics. Scan conversion for lines, circles, filing of rectangles, Polygons, Pattern filling. Chipping lines, Circles, Polygons, Antialiasing.

Unit-II Geometrical Transformations : 2D transformations homogenous co-ordinates composition of 2D transformation. The window to view port transformation, efficiency, Matrix representation and composition of 3D transformation viewing in 3D projections, specifying an arbitrary 3D view examples of 3D viewing, planner geometric projections, co-ordinate systems.

Unit-III Parametric cubic curves : B spline curves, rational cubic polynomial cubic curve segment, Subdividing curves, Drawing curves.

Parametric bicubic surfaces Be / ier surface, B-spline surfaces, Displaying bicubic surfaces.

Unit-IV Light and colour, Achromatic light, colour models for raster graphics, Using colour in computer graphics. Visible surface determination, Techniques for efficient visible surface algorithms, The Z-buffer algorithm.

Unit-V Illumination and shading, phong illumination model, Gourand and Phong shading Texture mapping and shadows, Recursive ray tracing and radiosity.

Books Recommended :

1) LEDFoley, AVanDam, S.E.Lenet,H.

MTIT-206-MACHINE LEARNING

Objective & Outcome:

The objective of this course is to:

To provide a strong foundation of fundamental concepts in Artificial Intelligence,

To provide a basic exposition to the goals and methods of Artificial Intelligence,

To enable the student to apply these techniques in applications which involve perception, reasoning and learning.

On completion of the course students will be able to

Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.

Apply these techniques in applications which involve perception, reasoning and learning.

Explain the role of agents and how it is related to environment and the way of evaluating it and how agents can act by establishing goals.

Acquire the knowledge of real world Knowledge representation.

Analyse and design a real world problem for implementation and understand the dynamic behaviour of a system.

Use different machine learning techniques to design AI machine and enveloping applications for real world problems.

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, The mistake bound model of learning – Instance-Based Learning- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions.

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

- Machine Learning – Tom M. Mitchell, – MGH
- Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)
- G.James,D.Witten,T.Hastie,R.Tibshirani-*An introduction to statistical learning with applications in R*,Springer,2013

MTIT 207 : JAVA

Marks Distributions

Lab Work	- 70 marks
Viva-voce + Records	- 30 marks

THIRD SEMESTER

MTIT-301- IoT (INTERNET OF THINGS)

Objective & Outcome:

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT.
IoT cuts across different application domain verticals ranging from civilian to defence sectors. Internet of Things is a course that deals with the study of how devices are connected and how it helps to stay connected over the Internet. The course teaches the individuals on how the Internet of Things is helpful in our daily lives and how to stay connected over the Internet. The course gives the students an insight into what is covered in the subject and all the aspects to give the individual a better understanding of the course.
Students studying Internet of Things are further hired as IoT Engineers, IoT Expert, Development Engineer in IoT Applications, and more job profiles in this field to explore.

Unit-I: Introduction to Internet of Things**:** Sensing, Actuation, Basics of Networking, Evolution of IoT Technology, Need of IoT in today's world, Basic components of IoT, Applications of IoT, Service Oriented Architecture of IoT, Wireless Sensor Networks.

Unit-II: Associated Technologies with IoT**:** Big Data, Cloud Technology, Smart Grid, Internet of Vehicles (IoV), Machine to Machine (M2M), Cyber Physical System (CPS), Software Defined Networks (SDN), Mobile Technology:3G/4G/5G, Challenges in IoT.

Unit-III: Connectivity Protocols: Internet Protocol: IPv4/IPv6, Routing Protocol for Low power and lossy Networks (RPL). **Data Protocol:** Message Queuing Telemetry Transmission (MQTT),Constrained Application Protocol(CoAP), Advanced Message Queuing Protocol (AMQP).

Unit-IV: Communication Protocols**:** IEEE 802.15.4, ZigBee, 6LowPAN, Wireless HART, ZWave, Bluetooth, Near Field Communication (NFC), Radio Frequency Identification (RFID).

Unit-V: Implementation of IoT: Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino, Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi. Industrial IoT, **Case Study:** Agriculture, Healthcare, Activity Monitoring.

Books Recommended:

The Internet of Things: Enabling Technologies, Platforms, and Use Cases, by Pethuru Raj and Anupama C. Raman (CRC Press)

1. Internet of Things: A Hands-on Approach, by Arshdeep Bahga and Vijay Madisetti (Universities Press)
2. An Introduction to Internet of Things : Connecting Devices, Edge Gateway, and Cloud with Applications, by Rahul Dubey
3. The Internet of Things in the Cloud: A Middleware Perspective by Honbo Zhou

MTIT-302 : CLOUD COMPUTING

Objective & Outcome:

The objective of this course is to study fundamental concepts of cloud computing platforms, technologies, service & deployment models, commercial implementations, and security aspects of applications on cloud.

On completion, one will be able to:

- Define different types of computing paradigms and concepts of cloud technologies. Explain the cloud computing architecture, models, and various virtualization techniques.
- Understand the IaaS and PaaS implementations by leading vendors in the industry. Appreciate the SaaS model implementations and importance of SLA in cloud environment.
- Describe various aspects of security, privacy, and performance in cloud environments.

Unit-I: Introduction to Cloud Computing: Network Concept and Topology: Design issue of layers: OSI and TCP/IP Models, IPv4 and IPv6 Communication Protocols: IEEE 802 Network protocol standards. Evolution of Cloud Computing: Distributed systems, Definition of Cloud Computing: Defining a Cloud. Deployment models: Public, Private, Hybrid and Community Clouds. Service models: Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Characteristics of Cloud Computing: A shift in paradigm Benefits and advantages of Cloud Computing

Unit-II: Use of Platforms in Cloud Computing: Concepts of Abstraction and Virtualization: Layered Structure and Virtualization, Mapping Technique of Virtual Machine to Physical Machine, Virtualization Model for Cloud Computing and its representation.

Virtualization technologies: Types of virtualization, Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing; Classification of Virtualization Environment: Scheduling-based Environment, Load-Distribution-Based Environment, Energy Aware-Based Environment, Operational-Based Environment, Distributed Pattern-Based Environment, Transactional-Based Environment

Unit-III: Cloud Infrastructure: Types of services required in implementation – Consulting, Configuration, Customization and Support. Cloud Management: An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle)

Cloud Database: Non-Relational Data Models, Heterogeneous Databases in DaaS, Mongo DB, CAP Theorem, Commercial Cloud Database Platform

Unit- IV: Concepts of Cloud Security: Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Public and Private cloud Computing Security, Distributed-Denial-of-Service Attacks. Shared Cloud Computing Services, Phishing and Social Engineering Attacks System Vulnerabilities Auditing and Compliance in Cloud Environment: Data Security in Cloud Computing Environment, Need for Auditing in Cloud Computing Environment, Third Party Service Provider, Cloud Auditing Outsourcing Lifecycle Phases, Auditing Classification.

Unit- V : Use Case: Google Cloud: as an example of use of load balancing Hypervisors: Virtual machine technology and types, Hypervisor Classification, Examples: VMware, vSphere Machine imaging (including mention of Open Virtualization Format – OVF)

Amazon Web Services: Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store, Amazon SimpleDB and Relational Database Service. Microsoft Cloud Services: Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services

Books Recommended:

1. "*Cloud computing: A practical approach"*, Anthony T. Velte, Tata Mcgraw-Hill
2. "*Cloud Computing Solutions: Architecture, Data Storage, Implementation and Security"*, Souvik Pal, Dac-Nhuong Le, P. K. Pattnaik, John Wiley & Sons Inc, 2020 [ISBN: 781119681656]
3. "*Cloud Computing Bible",* Barrie Sosinsky, Wiley India Pvt. Ltd, 2013
4. "*Building applications in cloud: Concept, Patterns and Projects"*, Moyer, Pearson

MTIT 303: DATA MINING AND BUSINESS INTELLIGENCE

Objective & Outcome:

Be familiar with mathematical foundations of data mining tools. Understand and implement classical models and algorithms in data warehouses and data mining Characterize the kinds of patterns that can be discovered by association rule Mining, classification and clustering. Master

data mining techniques in various applications like social, scientific and environmental context. Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

Upon completion, one will be able to:

- Describe Bloom's Taxonomy Level.
- Understand the functionality of the various data mining and data warehousing component Knowledge.
- Understand the strengths and limitations of various data mining and data warehousing models Apply, Create Explain the analysing techniques of various data.
- Analyse Describe different methodologies used in data mining and data ware housing.
- Analyse, compare different approaches of data ware housing and data mining with various technologies.

UNIT-I Introduction and general principle: On-line Transaction Processing (OLTP); Data Warehouse (DW) architecture fundamentals, Business Intelligence Overview.

UNIT-II Data Warehouse process: Meta Data process; Data Warehouse Design; Star and Snowflake schemas; Online Analytical Processing (OLAP) ROLAP data model; Multidimensional Database (MDD), Data cubes; architecture; MOLAP data model, Logical Models for multidimensional information; Conceptual Models for multidimensional information; Query & Reporting, Executive Information Systems; (EIS), Data Warehouse and business strategy.

UNIT-III Data Mining (DM): Fundamental concepts, Architectural aspects of Data Mining; Data Mining techniques; Data Mining issues and challenges. Business Context of Data Mining: Data mining for process improvement, Data Mining as a research tool; Data Mining for marketing, Data Mining for customer relationship management.

UNIT-IV Association Rules: Introduction and overview, Discovering Association Rules; A priori algorithm, Partition algorithm, Incremental algorithm; Border algorithm, Association rules with item Constraints. Classification and Clustering: Introduction, Clustering Paradigms, Partitioning Algorithm; K-means clustering algorithm, Hierarchical clustering; Fuzzy c-means algorithm, Categorical clustering Algorithm.

Unit – V Advanced Mining Techniques: Web mining (Web content mining, Web usage Mining, Web; structure mining) and mining for e-business, text mining etc.; DW and DM Applications; Business Intelligence, Customer Relationship Management; with case studies.

Books Recommended:

1. Datamining,Concepts & Techniques-Han,Kamber,Pei(Morgan Kaufmen)

MTIT 304 : ELECTIVE-2
(Any one of the following)

SOFT COMPUTING

Objective & Outcome:

The primary objective of this course is to introduce the basic principles, techniques, and applications of Soft computing techniques in real world problems.

- Artificial Intelligence, Various types of production systems, characteristics of production systems.
- Neural Networks, architecture, functions and various algorithms involved.
- Fuzzy Logic, Various fuzzy systems and their functions.
- Genetic algorithms, its applications and advances.

At the end of the course the student should be able to:

- Learn about soft computing techniques and their applications.
- Analyze various neural network architectures.
- Understand perceptron and counter propagation networks.
- Analyse the genetic algorithms and their applications.

- Develop application on different soft computing techniques like Fuzzy, GA and Neural network.
- Describe about hybrid soft computing techniques and its applications.
- Explain about the fuzzy logic concepts and fuzzy system.

Unit-I: Evolutionary Computation, Fuzzy sets, Membership Function Formulation and Parameteritation.Fuzzy if-then rules, Fuzzy Reasoning, Fuzzy interface system.

Unit-II: Derivative based optimization, Gradient-based method, Derivative-Free optimization, Genetic Algorithms and simulated Annealing.

Unit-III: Adaptive Neural Networks, Back Propagation for Feed forward Networks.BPPT, RTRL,Back Propagation Multilayer Perceptions,Rudial Basics Function Networks

Unit-IV: Sequential, Auxilary and Embedded Hybridization, Adaptive Neuro-Fuzzy Interface Systems, Neuro Genetic Modeling.

Unit-V: Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables, and Applications

Books Recommended: 1) Neuro-Fuzzy and Soft Computing, Jang, Sun, & Mizutani, PHI.

PATTERN RECOGNITION

Objective & Outcome:

The objective of this course is:
Analysis and Realization of pattern recognition concepts, acquire knowledge about state-of-the-art algorithms used in pattern recognition, detailed study and analysis of Bayes classifier, linear discriminant Analysis etc. and practical problem-solving using pattern recognition techniques.

On completion of this course, one will be able to:

- Understand and apply various algorithms for pattern recognition.

- Realize the clustering concepts and algorithms.
- Bring out structural pattern recognition and feature extraction techniques.
- Analyse Bayes classifier, linear discriminant Analysis etc.
- Identify, analyse, formulate, and solve engineering problems using pattern recognition techniques.

Unit-I: Introduction, Image acquisition process, Sampling & quantization, Pixel neighbourhood properties, Geometric Transformations, Frequency Transformations, Multi-resolution Expansions

Unit-II: Edge Detection, Multi-resolution Expansions, Wavelet Transforms, Image Segmentation, Thresholding, Edge-based Segmentation, Region-based Segmentation, Matching, Evaluation Issues in Segmentation, Mathematical concepts, Operators based on first order derivative (Roberts, Prewitt and Sobel),

Unit- III: Image Data Compression, Image Data Properties, Discrete Image Transforms in Image Data Compression, Laplacian (Second order derivative based edge detection), LOG

Unit-IV: Morphological Image Processing, Dilation and Erosion, Opening and Closing, Basic Morphological Algorithms, Supervised algorithm.

Unit-V: Unsupervised Clustering Algorithm, K-NN, Support Vector Machine, Neural Networks, Deep learning Overview

Books Recommended:

1. Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, Pearson Education, Second Edition.
2. Image Processing, Analysis and Machine Vision, Sonka, Hlavac, Boyle 3rd edition

Reference Book:

1. Fundamentals of Digital Image Processing, Anil K. Jain, PHI.
2. Pattern Recognition and Image Analysis, Earl Gose and Richard Johnsonbaugh Steve Jost, PHI.

MTIT 305(LAB) : PYTHON

Marks Distributions

Lab Work - 70 marks

Viva-voce + Records - 30 marks

MTIT 306 : COMPREHENSIVE VIVA (THESIS)

Marks Distributions

Comprehensive Viva	- 50 marks
Thesis (Preparatory Part Evaluation)	- 50 marks

FOURTH SEMESTER

MTIT 401 : PROJECT/ THESIS WORK

Marks Distributions

Comprehensive Viva on the Project	- 300 marks

LAB

SEMESTER-(I) ORACLE:

CHAPTER 1: DATABASE DESIGN

CHAPTER 2: ORACLE STANDARD INTERFACES

CHAPTER 3: THE SAMPLE DATABASE

CHAPTER 4: DATA DEFINITION LANGUAGE

CHAPTER 5: DATA MANIPULATION LANGUAGE

CHAPTER 6: TRANSACTION CONTROL

CHAPTER 7: SQL OPERATORS

CHAPTER 8: SQL FUNCTIONS

CHAPTER 9: JOINING TABLES

CHAPTER 10: SET OPERATORS

CHAPTER-11: SQL SUBQUERIES

CHAPTER 12: GROUPS

CHAPTER 13: MORE DATABASE OBJECTS

CHAPTER 14: INTRODUCTION PLSQL

CHAPTER 15: DECLARATIONS AND DATA TYPES

CHAPTER 16: LANGUAGE COMPONENTS

CHAPTER 17: CURSORS

CHAPTER 18: EXCEPTIONS

SEMESTER-(II) JAVA:

CHAPTER 1: BASICS OF JAVA & OOPS CONCEPTS

CHAPTER 2: STRING HANDLING

CHAPTER 3: EXCEPTION HANDLING

CHAPTER 4: NESTED CLASSES

CHAPTER 5: MULTITHREADING

CHAPTER 6: INPUT AND OUTPUT

CHAPTER 7: NETWORK ING

CHAPTER 8: SWING

CHAPTER 9: LAYOUT MANAGERS

CHAPTER 10: EVENT HANDLING

CHAPTER-11: APPLET

CHAPTER 12: COLLECTION

CHAPTER 13: JDBC

SEMESTER-(III) PYTHON: