Integral University Lucknow
Department of Computer Science & Engineering

MTECH CSE (Spl. In Adv. Computing & Data Science)

The department of Computer Science & Engineering proposes a two-year M.Tech programme in Computer Science and Engineering, or CSE, with a specialization in "Advanced Computing & Data science".

Salient features:

Intake: Twenty (20)

Duration: Two years, divided into four semesters. The programme will offer one year of research based dissertation work. To graduate, students must complete all academic requirements, including a dissertation.

Admissions: Admissions for the year 2018 will be managed by Integral University.

Eligibility and Admission Criteria:

The candidate must have passed any one of the following:

Bachelor of Engineering /Bachelor of Technology in CSE/IT/ EC from a recognized university, MCA Degree (3 Year Programme)
Aggregate marks in the qualifying degree must be no less than 55% or equivalent cumulative grade point average (CGPA). Undergraduate candidates appearing for their final semester/year may also apply. If admitted, students in this category must submit their provisional degree certificate within 30 days of commencement.

Selection Procedure:

Applicants will be shortlisted on the basis of IUET/Academic Score and/or interview.

Those applicants who have a valid GATE score in any of these subjects: Computer Science, Information Technology, Electronics and Communication will be exempted from written test. The list of selected candidates, in order of merit, will be posted on the website. All admissions will be managed by Integral University.

Justification Why Advanced Computing & Data Science:

In an increasingly competitive marketplace, organizations need skilled professionals to interpret a growing stream and variety of data. Increasingly, industry focuses on how "big data" can be used to help decision makers improve organizational competitiveness.

The proposed M.Tech CSE programme with specialization in Advanced Computing & Data science is designed to meet this growing need. Our students gain hands-on experience with a variety of analytical tools available for the purpose of structuring large data sets, to unearth hidden information and patterns key to enterprise. Students also gain experience using different software tools and functions, including data mining, predictive modelling, and visual analytics using large data sets.

Program Educational Objectives:

Students will be prepared:

- To review and understand foundational Concepts in Computer Science, Data Science and Engineering.
- To critically analyze current trends and learn future issues from a system perspective at multiple levels of detail and abstraction.
- To design and implement databases, dimensional models, and data warehousing strategies.
- To apply advanced methods of data management and data mining in a variety of organizational environments.
- To transform large data sets into actionable information in an easy-to-understand format.
- To support organizational decision-making through the use of advanced analytical tools.
- To manage the quality, security, and privacy of data relevant to an organization to enhance its value.
- To apply the interaction between theory and practice for problem solving based on case studies
- To pursue lifelong multidisciplinary learning as professional engineers and scientists to effectively communicate technical information, function effectively on teams, and apply computer engineering solutions within a global, societal, and environmental context
- To critically analyze existing literature, identify the gaps in the existing literature, map the existing problems as Big Data and propose innovative and research oriented solutions.
- To process, model, analyze and visualize humongous data and uncover the data-driven latent insights
- To manage real life complex data analytics projects.

Program Outcomes:

Students will be enabled to:

- Assess alternative approaches and infrastructures for implementing big data analytics.
- Evaluate the appropriate methods and tools for data analysis in specific organizational contexts, including selecting a modeling approach, building a model using appropriate tools, validating the model, and deploying the model for prediction and analysis.
- Develop experience tackling industry and organization-specific problems and challenges using advanced analytics and computational methods.

Career Opportunities:

Our graduating students go on to become data scientists, data analytics specialists, and software engineers at companies and research labs. Their experience spans Indian industry, from e-commerce, financial services and online retail to meteorology, agriculture and entertainment.

Integral University Lucknow
Department of Computer Science & Engineering
Study & Evaluation Scheme
MTECH CSE (Spl. In Adv. Computing & Data Science)

Semester I

S. No.	Subject Code	Category	Subject	Periods				Evaluation Scheme				Subject Total
								Sessional			Exam.	
				L	T	P	C	CT	TA	Total	ESE	
1	CS 518	DC	Soft Computing	3	1	0	4	25	15	40	60	100
2	CS 546	DC	Mathematical Programming	3	1	0	4	25	15	40	60	100
3	CS 516	DC	Advance Data Structures & Algorithm	3	1	0	4	25	15	40	60	100
4	CS525	DC	Advanced concepts of database design	3	1	0	4	25	15	40	60	100
5	CS 519	DC	Soft Computing Lab	0	0	2	2	30	30	60	40	100
6	CS 543	DC	Advanced Database System Lab	0	0	2	2	30	30	60	40	100
			Total	12	4	4	20	160	120	280	320	600

L-Lecture T-Tutorial P-Practical C-Credits CT-Class Test TA-Teacher Assessment
Sessional Total (CA) = Class Test + Teacher Assessment
Subject Total = Sessional Total (CA) + End Semester Examination (ESE)
DC- Departmental Core
DE- Departmental Elective

Integral University Lucknow
Department of Computer Science & Engineering
Study & Evaluation Scheme
MTECH CSE (Spl. In Adv. Computing & Data Science)

Semester II

S. No.	Subject Code	Category	Subject	Periods				Evaluation Scheme				Subject Total
								Sessional			Exam.	
				L	T	P	C	CT	TA	Total	ESE	
1	CS 520	DC	Advance Distributed Operating Systems	3	1	0	4	25	15	40	60	100
2	CS 544	DC	Machine Learning: Theory and Methods	3	1	0	4	25	15	40	60	100
3		DE	Elective -1	3	1	0	4	25	15	40	60	100
4		DE	Elective -2	3	1	0	4	25	15	40	60	100
5	CS 545	DC	R Programming Lab	0	0	2	2	30	30	60	40	100
6	CS 549	DC	Machine learning Tools Lab	0	0	2	2	30	30	60	40	100
			Total	12	4	4	20	160	120	280	320	600

L-Lecture T-Tutorial P-Practical C-Credits CT-Class Test TA-Teacher Assessment
Sessional Total (CA) = Class Test + Teacher Assessment
Subject Total = Sessional Total (CA) + End Semester Examination (ESE)
DC- Departmental Core
DE- Departmental Elective

Elective -1

1. Advanced Human Computer Interaction (CS 540)
2. Software Testing & Quality Management (CS 524)
3. Advance Concepts of Database Design (CS 525)
4. Advance Cryptography & Network security (CS 526)

Elective- 2

1. Advance Real Time Systems (CS 527)
2. Forensic & Cyber Crime (CS 528)
3. Digital Image Processing & its Applications(CS 529)
4. Applied Data mining and Warehousing (CS 530)

Integral University Lucknow
Department of Computer Science & Engineering
Study & Evaluation Scheme
MTECH CSE (Spl. In Adv. Computing & Data Science)

Semester III

S. No.	Subject Code	Category	Subject	Periods				Evaluation Scheme				Subject Total
								Sessional			Exam.	
				L	T	P	C	CT	TA	Total	ESE	
1	CS 609	DC	Big Data	3	1	0	4	25	15	40	60	100
2		DE	Elective-3	3	1	0	4	25	15	40	60	100
3		DE	Elective-4	3	1	0	4	25	15	40	60	100
4	CS 699	DC	M.Tech Dissertation	0	0	4	4	-	-	60	40	100
5	CS 617	DC	Big Data Management and Data Analytics Lab	0	0	2	2	30	30	60	40	100
			Total	09	3	6	18	-	-	240	260	500

L-Lecture T-Tutorial P-Practical C-Credits CT-Class Test TA-Teacher Assessment
Sessional Total (CA) = Class Test + Teacher Assessment
Subject Total = Sessional Total (CA) + End Semester Examination (ESE)
DC- Departmental Core
DE- Departmental Elective

Elective- 3

1.Ad-hoc Sensor Network (CS-603)
2.Agile Software Engineering (CS-605)
3.Advanced Cloud Computing (CS-606)

Elective-4:

1.Natural Language Processing CS618
2. Advanced Statistical Techniques for data Analytics CS624
3. Internet of ThingsCS626

Integral University Lucknow
Department of Computer Science & Engineering
Study & Evaluation Scheme
MTECH CSE (Spl. In Adv. Computing & Data Science)

Semester IV

S. No.	Subject Code	Category	Subject	Periods				Evaluation Scheme				Subject Total
								Sessional			Exam.	
				L	T	P	C	CT	TA	Total	ESE	
1	CS 699	DC	M.Tech. Dissertation	0	0	0	4	-	-	60	40	100
2	CS 699	DC	M.Tech. Dissertation	0	0	0	4	-	-	60	40	100
3	CS 699	DC	M.Tech. Dissertation	0	0	0	4	-	-	60	40	100
4	CS 699	DC	M.Tech. Dissertation	0	0	0	4	-	-	60	40	100
			Total	0	0	0	16	-	-	240	160	400

L-Lecture T-Tutorial P-Practical C-Credits CT-Class Test TA-Teacher Assessment
Sessional Total (CA) = Class Test + Teacher Assessment
Subject Total = Sessional Total (CA) + End Semester Examination (ESE)
DC- Departmental Core
DE- Departmental Elective

Total Credit of the Course: 20+20+18+16 = 74

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH CSE (Spl. In Adv. Computing & Data Science)
Subject Name: Advance Data Structure and Algorithm, Subject Code: CS-516
w.e.f. July-2016

L T P C
4 0 0 4

UNIT 1
Overview of data structures Review of Arrays, sparse matrices, Stacks, Queues, linked lists, doubly linked lists, Applications, dynamic storage management
Overview of Advance Data structure Red-Black Trees, AVL Trees and B Trees. [8]

UNIT 2
Algorithms and various analysis models, Analyzing Recursive Programs using various strategies
Divide and Conquer Paradigm: Divide and conquer recurrence equations and their solutions, Review of various examples Binary search, Quick sort, merge sort. [8]

UNIT 3
Basic traversal and search techniques: Game Tree, traversal techniques of graph, connected component and spanning tree, Bi-connected components, AND/OR graph,
LOWER BOUND THEORY comparison tree and lower bound through reduction. [8]

UNIT4
APPROXIMATION ALGORITHMS: Introduction, absolute approximation, ἐ- Approximation, Polynomial time approximation scheme, fully Polynomial time approximation scheme,
NP Hard and NP Complete problem basic concept, Cook Theorem, NP Hard graph problems, NP Hard scheduling problems, NP Hard code generating problems. [8]

UNIT 5
PRAM Algorithms: Introduction, computational model, fundamental techniques and algorithms, merging and lower bounds
MESH Algorithms: computational model, packet routing fundamental algorithm, merging computing the convex hull. [8]

Text Books:
1. Fundamental of computer algorithms-Ellis Horowits, Sartaj Sahani,Saguthevar Rajasejaran (Universities press) second Edition
2. The design and analysis of Computer algorithms- Aho, hopcraft &ulman (Pearson Education)

Ref. Books:
1. Introduction to Algorithms- Thomas H. Coremen, Charles S. Lieserson, Ronald L Rivest and Clifford Stein (PHI)-2nd edition
2. Randomized Algorithms- Rajiv Motwani and Prabhakar Raghavan (Cambridge University Press)
3. Algorithm Design Foundation analysis and Internet examples-Michael T. Goodrich,Roberto Tamassia(Wiley student Edition)

Prerequisite – None Corequisite - None

Mathematical programming (CS-546)
M.Tech (CSE) Specialization inACDS

Unit 1

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3 1 0

Mathematical Foundation: Basic Theory of Sets And Functions: Sets, Vectors, Sequences of Subsequences, Mapping and Functions, Continuous Functions; Vector Spaces; Matrices and Determinants; Linear Transformation and Rank; Convex Sets and Convex Cones, Convex and Concave Functions. [8]

Unit 2

Linear Programming: Definitions and Terminologies, Basic Solutions of Linear Programs, Fundamental Properties for Linear Programs; Simplex Methods: Theory of Simplex Methods, Method of Computation Replacement Operation; Degeneracy in Linear Programming: Charnes' Perturbation Method. [8]

UNIT 3

Duality in Linear Programming: Cannonical Dual Programs and Duality Theorems, Equivalent Dual Forms, Lagrange Multipliers and Duality, Duality in the Simplex Method; Bounded Variable Problems; Transportation Problems; Assignment Problems. [8]

UNIT 4

Nonlinear and Dynamic Programming: Constrained and Unconstrained Optimization, Kuhn-Tucker Optimality Conditions; Quadratic Programming: Wolfe's Method, Dantzig's Method, Beale's Method, Lemke's Complementary Pivoting Algorithm. [8]

UNIT 5

Methods of Nonlinear Programming: Separable Programming, Kelley's Cutting Plane Method, Zoutendijik's Method of Feasible Direction, Rosen's Gradient Projection Method, Zangwill's Convex Simplex Methods, Dantzig's Method for Convex Programs; Goal Programming, Multiple Objective Linear Programming, Functional Programming. [8]

REFERENCES:

1. S. M. Sinha, “Mathematical Programming: Theory and Methods”,Elsevier, 2005.
2. Steven Vajda “Mathematical Programming” Courier Corporation, 2009.
3. Melvyn Jeter, “Mathematical Programming: An Introduction to Optimization”, CRC Press, 1986.
4. A. Bachem, M. Grötschel, B. Korte, “Mathematical Programming The State of the Art”, Springer Science & Business Media, 2012

Integral University, Lucknow
Department of Computer Science & Engineering
M.Tech (CSE) Specialization inACDS
Subject Name: Soft Computing, Subject Code: CS-518
w.e.f. July-2016

L T P C
4 0 0 4

UNIT-1 Introduction of soft computing: [8]

What is Soft Computing, soft computing vs. hard computing, soft computing paradigms, and applications of soft computing. **Basics of Machine Learning**. **Dealing with Imprecision and Uncertainty-** Probabilistic Reasoning-Bayesian network, Pearl"s Scheme for Evidential Reasoning, Dempster-Shafer Theory for Uncertainty Management, Certainty Factor Based Reasoning

UNIT-2 Neural Networks: [9]

Basics of Neural Networks- Neural Network Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, characteristics and applications of ANN, McCulloch Pitt model, different activation functions, **Supervised Learning algorithms-** Perceptron (Single Layer, Multi layer), Linear separability, ADALINE, MADALINE, RBF networks , Widrow Hoff, learning rule, Delta learning rule, Back Propagation algorithm, **Un-Supervised Learning algorithms-** Hebbian Learning, Winner take all, Self Organizing Maps, Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Associative Memory.

UNIT-3 Fuzzy Logic: [9]

Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions, Fuzzy rule base system : fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, Mamdani **Fuzzy Models** – Sugeno Fuzzy Models, Adaptive Neuro-Fuzzy Inference Systems Architecture.

UNIT-4 Optimization: [8]

Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton"s Method, Simulated Annealing, Random Search, Downhill Simplex Search

Derivative-free Optimization- Genetic algorithm Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, mutation operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

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UNIT-5 Evolutionary Computing: [8]

Genetic programming (GP), Ant colony optimization (ACO), Particle swarm optimization (PSO), Artificial Immune System (AIS).

References :

1. S, Rajasekaran & G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications", PHI Publication.
2. S.N. Sivanandam & S.N. Deepa, "Principles of Soft Computing", Wiley Publications.
3. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India.
4. SAndries P Engelbrecht, Computational Intelligence: An Introduction, Wiley Publications.

Prerequisite – None Corequisite - None

Integral University, Lucknow
Department of Computer Science & Engineering
M.Tech. CSE (ACDS)

Subject Name: Advance Concepts of Database Design, Subject Code: CS-525
w.e.f. July-2016

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UNIT 1

Indexing – Primary & Secondary Index, Multilevel Indexing, B tree Indexing, B+ tree indexing, Hashing- Static & dynamic

Query Processing- Measures of query cost, selection operations, Join operations, Evaluation of expressions- Materialization, Pipelining.

Query Optimization- Introduction, generating equivalence relation, Transformation of relational expression- equivalence rules, Choice of evaluation plans, Cost estimation- cost based optimization, Heuristic optimization, Statistical Information for Cost Estimation. [8]

UNIT 2

Database Tuning- Database workload, Physical design and tuning decisions, Need for database tuning, Index selection, Tuning Indexes, Tuning the conceptual schema, Tuning queries and views, DBMS Benchmarks.

Object Oriented Database System- properties, need for OODBMS, Structured types, Inheritance, Multiple Inheritance, Object identity, Object containment, Nested Relational Model . [8]

UNIT 3

Distributed Database System- Heterogeneous and Homogeneous Databases, Distributed Data Storage –Data replication, Data fragmentation, Distributed Transactions, Concurrency Control in Distributed Databases Commit Protocols -Two Phase commit, Three- Phase commit, Deadlock handling, Distributed Query Processing In R * System . [8]

UNIT 4

Database Security- Database Security and Authorization, Introduction to Database Security Issues, Types of Security, Database Security and DBA, Access Protection, User Accounts, and Database Audits Access Control and Grant & Revoke on Views and Integrity Constraints, Discretionary Access Control, Role of DBA, Security in Statistical Databases. [7]

UNIT 5

Enhanced Data Model for Advanced Applications- Active database concept and triggers and their design and implementation issues, Temporal data base concepts, Spatial and multimedia databases, Introduction to deductive databases, introduction to expert database system. [8]

REFERENCES

1. Korth, Silberchatz, Sudarshan, "Database Concepts", Addison Wesley.
2. Majumdar & Bhattacharya, "Database Management System", TMH.
3. Elmastri, Navathe, "Fundamentals of Database Systems", Addison Wesley.
4. Date C.J., "An Introduction to Database System", Addison Wesley.
5. Ramakrishnan, Hadzilacous, Goodman, "Concurrency Control & Recovery", Addiosn Wesley. 6. Ceri & Palgatti, "Distributed Databases", McGraw Hill.

Prerequisite – None Corequisite - None

Integral University, Lucknow Department of Computer Science & Engineering

M.Tech. ACDS(CSE)

Subject Name: Soft Computing Lab, Subject Code: CS-519

w.e.f. July-2016

L T P C
0 0 3 2

1. Exposure to Scilab Script & Functions.
2. Write a program for Recursion in Scilab.
3. Write a program in Scilab for decision control and loops.
4. Write a program in Scilab for surface plots.
5. Write a program in Scilab for File Handling.
6. Find whether the given matrix is (a) reflexive (b) tolerance and (c) transitivity matrix or not by writing a Scilab program.
7. Find whether the given matrix is symmetry or not by writing a Scilab program.
8. Write a program in Scilab to calculate union, intersection, complement and difference of two fuzzy sets.
9. Find the fuzzy relation between two vectors *R* and *S,* Using max–product and max-min method by writing a Scilab program.
10. Illustrate different types of generalized bell membership functions using Scilab program
11. Design networks of McCulloch-Pitts neurons that implement logical NOT, AND and OR gates. Draw each network and label all the weight and threshold values.
12. Write a program of Perceptron Training Algorithm.
13. Write a program to implement delta rule.
14. Write a Scilab program for Hebb net to classify two dimensional input patterns bipolar with their targets given „*" indicates a „+1" and „." Indicates „-1".
15. Implement Classical Genetic Algorithm in Scilab.
16. Write a Scilab program for Linear & Quadratic optimization.

Additional Assignments:

17. Using Scilab program find the crisp lambda cut set relations, for the given fuzzy matrix and λ.

18. Use Scilab‟s Fuzzy Logic Toolbox to model the tip given after a dinner for two, where the food can be disgusting, not good, bland, satisfying, good, or delightful, and the service can be poor, average, or good.

19. Implement Multi-objective Genetic Algorithm in Scilab.

20. Write a Scilab program to implement Simulated Annealing.

21. The data presented in the Table 1, show the weights of eye lenses of wild Australian rabbits as a function of age. No simple analytical function can exactly interpolate these data, because we do not have a single valued function. Instead, we have a nonlinear least squares model of this data set, using a negative exponential, as described by
    $Y = 2.33.846(1 – \exp(-0.006042x)) + \in$
    Where $\in$ is an error term.
    Using the back- propagation algorithm, design a multiplayer perceptron that provides a nonlinear least-squares approximation to this data set. Compare your result against the least-sequence model described.

Ages (days)	Weights (mg)	Ages (days)	Weights (mg)	Ages (days)	Weights (mg)	Ages (days)	Weights (mg)
15	21.66	75	94.6	218	174.18	338	203.23
15	22.75	82	92.5	218	173.03	347	188.38
15	22.3	85	105	219	173.54	354	189.7
18	31.25	91	101.7	224	178.86	357	195.31
28	44.79	91	102.9	225	177.68	375	202.63
29	40.55	97	110	227	173.73	394	224.82
37	50.25	98	104.3	232	159.98	513	203.3
37	46.88	25	134.9	232	161.29	535	209.7
44	52.03	142	130.68	237	187.07	554	233.9
50	63.47	142	140.58	26	176.13	591	234.7
50	61.13	147	155.3	258	183.4	648	244.3
60	81	147	152.2	276	186.26	660	231
61	73.09	150	144.5	285	189.66	705	242.4
64	79.09	159	142.15	300	186.09	723	230.77
65	79.51	165	139.81	301	186.7	756	242.57
65	65.31	183	153.22	305	186.8	768	232.12
72	71.9	192	145.72	312	195.1	860	246.7
75	86.1	195	161.1	317	216.41	846	378.08

Table 1: Weights of Eye Lenses of Wild Australian Rabbits

Integral University, Lucknow
Department of Computer Science & Engineering
M.Tech CSE (Spl. in ACDS)
Advanced Database System Lab(CS543)

L T P C
0 0 3 2

1. Data definition language command.
2. Data Manipulation language command.
3. Data control language command and Data control transfer language command.
4. In Built function command.
5. Nested queries and join queries command.
6. Set operator command.
7. View operator command.
8. Procedure and function command.
9. Trigger command.
10. Control structure command.
11. Study and compare following command:
    a. Oracle
    b. Mysql
    c. DB2

Integral University, Lucknow
Department of Computer Science & Engineering
M.Tech ACDS Full Time (CSE)
Subject Name: Advance Distributed Operating Systems, Subject Code: CS-520
w.e.f. July-2016

L T P C
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UNIT-1
Advanced Operating Systems: Overview and architecture, Distributed computing models and their comparison,
Client Server Models: addressing, architecture, implementation. *Case Study.' World Wide Web 1.0*
Interprocess Communication: API for internet protocol, Marshalling. Client server communication, group communication *Case Study.' CBCAST protocol in ISIS.* [9]

UNIT-2
Distributed objects and remote invocation: communication between Distributed objects, RPC, events and notification *Case Study: Java RMI*
Operating System Support: Operating System layer. Protection , processes ands threads, operating system architecture
Distributed clock synchronization: physical clock , logical clock. [8]

UNIT-3
Distributed File System: Models, service interface and directory interface design, DFS system structure, *Case Study: Google file system.*
Security in distributed systems: problems and design issues,
Fault tolerance and recovery: basic concepts, fault models, agreement problems and its applications, commit protocols, voting protocols, checkpointing and recovery.

[I

UNIT-4
Distributed Multimedia systems: Characteristics of multimedia, multimedia data. Quality of service management, resorce management, stream adaptation.
Case Study: Tiger video file server.
Distributed shared memory: design and implementation issues, sequential consistency and Ivy. *Case Study: Munin*
[8]

UNIT-5
Real time distributed operating system: Design issues, distributed communicatins in LAN and WAN, scheduling: static and dynamic, scheduling algorithms, *Case Study: MARS.*
Emerging trends in distributed computing: Introduction, Grid computing-architeture application, SOA overview, design, service oriented grid, advantages and future scope, Cloud computing- feature and architecture.
[9]

REFERENCE:
1. Distributed Systems — Coulouris [Pearson Education]
2. Distributed Operating Systems- Tannenbaum [Pearson Education]
3. Distributed Systems : Principles and Paradigms — Tannenbaum [Pearson Education]

Prerequisite — None Corequisite - None

Machine Learning Techniques
Subject Code: CS544

LTPC
3 1 0 4

Pre-Requisite: NIL
Co-Requisite: NIL

UNIT I INTRODUCTION

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search. [8]

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.[8]

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model. [8]

UNIT IV INSTANT BASED LEARNING

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning. [8]

UNIT V ADVANCED LEARNING

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning. [8]

REFERENCES:

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
3. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

Integral University, Lucknow Department of Computer Science & Engineering
M.Tech. ACDS Full Time (CSE)
Subject Name: Advanced human Computer Interaction, Subject Code: CS-540
w.e.f. July-2016

L	T	P	C
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Unit-1

Introduction: Course objective and overview, Historical evolution of the field, Concept of usability - definition and elaboration, HCI and software engineering [8]

Unit-2

Interactive system design (theory and practice) : GUI design and aesthetics, Prototyping techniques, Model based Design and evaluation: Basic idea, introduction to different types of models, GOMS family of models (KLM and CMN-GOMS), Fitts' law and HickHyman's law, Model-based design case studies. [8]

Unit-3

Guidelines in HCI: Shneiderman's eight golden rules, Norman's seven principles, Nielsen's ten heuristics with example of its use, Heuristic evaluation, Contextual inquiry, Cognitive walkthrough. Empirical
research methods in HCI: Introduction (motivation, issues, research question formulation techniques) Experiment design and data analysis (with explanation of one-way ANOVA). [8]

Unit-4

Task modeling and analysis : Hierarchical task analysis (HTA), Engineering task models and Concur Task Tree (CTT). Dialog Design: Introduction to formalism in dialog design, design using FSM (finite state machines), State charts and (classical) Petri Nets in dialog design, Cognitive architecture:
Introduction to CA, CA types,relevance of CA in IS design, Model Human Processor (MHP). [8]

Unit-5

Design -Case Studies: Case Study 1- MultiKey press Hindi Text Input Method on a Mobile Phone Case Study 2 - GUI design for a mobile phone based Matrimonial. Case Study 3 - Employment
Information System for unorganised construction workers on a Mobile Phone. [8]

REFERENCES:

1. Dix A., Finlay J.,Abowd G. D. and Beale R. Human Computer Interaction, 3 rd edition, Pearson Education, 2005.

2.Preece J., Rogers Y.,Sharp H.,Baniyon D., Holland S. and Carey T. Human Computer Interaction,Addison-Wesley, 1994.

3. B.Shneiderman; Designing the User Interface,Addison Wesley 2000 (Indian Reprint).

Prerequisite – None Corequisite - None

Integral University, Lucknow
Department of Computer Science & Engineering
B.Tech.-M.Tech Dual Degree & M.Tech. Full Time (CSE)
Subject Name: Software Testing & Quality Management, Subject Code: CS-524
w.e.f. July 2016

L T P C
4 0 0 4

UNIT-1

Introduction to Software Testing **[8]**

Evolution, Myths, Facts, Goals, Psychology, Models, Principles , Axiom of Testing, Study of Bugs: Classification, Priority, Severity and their tracking .Software Testing: Terminology, Life cycle, Methodology, Types of Testing, Test planning: Test Plan Specification, Leveled Test Plan, Development of Test Plan ,Master Test plan ,Phase Wise Test Plan, Test management, Software Testing Guidelines, Defect Management, Analyzing & Reporting Test.

UNIT 2

Testing Technique **[8]**

Static Testing: Inspection, Structured Walkthrough, Technical reviews, Automated Techniques ,Black box testing, Types of Black box Testing: Requirement based Testing, Positive & Negative Testing, Boundary Value Analysis, Compatibility Testing, Domain Testing, Graph Based Testing, Robustness Testing , Syntax Testing, Finite State Testing, CauseEffect Graphing Based Testing. White Box Testing, Types of White box Testing: Basis Path Testing, Control Structure Testing, Mutation Testing, and Gray Box Testing. Software Testability, Software Test Automation, Test Metrics and its Measurements.

UNIT 3

Software Testing Strategies **[8]**

Model for Software Testing, Unit Testing, Integration, System & Acceptance Testing: Alpha Testing, Beta Testing, Stress testing, Load testing, Reliability Testing, Scalability Testing . Performance Testing, Regression Testing, Ad-hoc Testing, Usability and Accessibility Testing, Object Oriented Testing: Object-Oriented Testing Model, Object-oriented Software Test Strategy.

UNIT 4

Introduction to Software Quality **[8]**

Concepts of quality, perspectives and expectations, Quality Framework, Quality engineering: Activity and process, Quality planning, Quality assessment and improvement. Quality assurance: Classification, Q.A activities, Q.A. Techniques, Defect prevention and process improvement, Software Inspection, Formal Verification, Introduction to Software Reliability Engineering, Software Quality Measurement & Metrics.

UNIT 5

Quality Models **[8]**

McCall's model, Bohem's model, Dromey's model, FURPS Model,ISO-9126 Model, Cost Of Quality, Software Quality Factors, Quality Control , CMMI-Framework : Process Area Components, Capability & Maturity Levels, Relationship Among Process Areas.

References:

1. Software Testing : K.Mustafa,R.A. Khan ,Narosa
2. Software Testing : Srinivasan Desikan,Pearson
3. Software Testing : Naresh Chauhan , Oxford
4. Software Quality Engineering : Jeff Tian ,Wiley
5. Software Testing Fundamentals: Marnie L.Hutcheson,Wiley
6. Software Testing : Ron Patton, Pearson

Prerequisite – None Corequisite - None

Integral University, Lucknow Department of Computer Science & Engineering
M.Tech ACDS Full Time (CSE)
Subject Name: Advance Concepts of Database Design, Subject Code: CS-525
w.e.f. July-2016

L T P C
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UNIT 1

Indexing – Primary & Secondary Index, Multilevel Indexing, B tree Indexing, B+ tree indexing, Hashing- Static & dynamic

Query Processing- Measures of query cost, selection operations, Join operations, Evaluation of expressions- Materialization, Pipelining.

Query Optimization- Introduction, generating equivalence relation, Transformation of relational expression- equivalence rules, Choice of evaluation plans, Cost estimation- cost based optimization, Heuristic optimization, Statistical Information for Cost Estimation. [8]

UNIT 2

Database Tuning- Database workload, Physical design and tuning decisions, Need for database tuning, Index selection, Tuning Indexes, Tuning the conceptual schema, Tuning queries and views, DBMS Benchmarks.

Object Oriented Database System- properties, need for OODBMS, Structured types, Inheritance, Multiple Inheritance, Object identity, Object containment, Nested Relational Model . [8]

UNIT 3

Distributed Database System- Heterogeneous and Homogeneous Databases, Distributed Data Storage –Data replication, Data fragmentation, Distributed Transactions, Concurrency Control in Distributed Databases Commit Protocols -Two Phase commit, Three- Phase commit, Deadlock handling, Distributed Query Processing In R * System . [8]

UNIT 4

Database Security- Database Security and Authorization, Introduction to Database Security Issues, Types of Security, Database Security and DBA, Access Protection, User Accounts, and Database Audits Access Control and Grant & Revoke on Views and Integrity Constraints, Discretionary Access Control, Role of DBA, Security in Statistical Databases. [7]

UNIT 5

Enhanced Data Model for Advanced Applications- Active database concept and triggers and their design and implementation issues, Temporal data base concepts, Spatial and multimedia databases, Introduction to deductive databases, introduction to expert database system. [8]

REFERENCES

1. Korth, Silberchatz, Sudarshan, "Database Concepts", Addison Wesley.
2. Majumdar & Bhattacharya, "Database Management System", TMH.
3. Elmastri, Navathe, "Fundamentals of Database Systems", Addison Wesley.
4. Date C.J., "An Introduction to Database System", Addison Wesley.
5. Ramakrishnan, Hadzilacous, Goodman, "Concurrency Control & Recovery", Addiosn Wesley. 6. Ceri & Palgatti, "Distributed Databases", McGraw Hill.

Prerequisite – None Corequisite - None

Integral University, Lucknow Department of Computer Science & Engineering
M.Tech. ACDS Full Time (CSE)
Subject Name: Advance Cryptography & Network Security, Subject Code: CS-526
w.e.f. July-2016

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UNIT-1

Introduction and Mathematical Foundations: Introduction, Overview on Modern Cryptography, Number Theory, Probability and Information Theory.

Classical Cryptosystems: Classical Cryptosystems, Cryptanalysis of Classical Cryptosystems, Shannon's Theory. [8]

UNIT-2

Symmetric Key Ciphers: Modern Block Ciphers (DES), Modern Block Cipher (AES)

Cryptanalysis of Symmetric Key Ciphers: Linear Cryptanalysis, Differential Cryptanalysis, Other Cryptanalytic Techniques, Overview on S-Box Design Principles, Modes of operation of Block Ciphers. Key distribution. [8]

UNIT-3

Stream Ciphers and Pseudorandomness: Stream Ciphers, Pseudorandom functions.

Hash Functions and MACs: Hash functions: The Merkle Damgard Construction, Message Authentication Codes (MACs). [8]

UNIT-4

Asymmetric Key Ciphers: Construction and Cryptanalysis: More Number Theoretic Results, The RSA Cryptosystem,Primality Testing, Factoring Algorithms, Other attacks on RSA and Semantic Security of RSA, The Discrete Logarithm Problem (DLP) and the Diffie Hellman Key Exchange algorithm, The ElGamal Encryption Algorithm, Cryptanalysis of DLP. [8]

UNIT-5

Digital Signatures: Signature schemes. **Modern Trends in Asymmetric Key Cryptography:** Elliptic curve based cryptography,

Network Security: Secret Sharing Schemes, A Tutorial on Network Protocols, Kerberos, Pretty Good Privacy (PGP), Secure Socket Layer (SSL), Intruders and Viruses, Firewalls. [8]

References:

1. William Stallings, "Cryptography and Network Security: Principles and Practice" Prentice Hall, New Jersey
2. . Johannes. A. Buchmann, "Introduction to cryptography", Springer Verlag. Bruce Schiener, "Applied Cryptography".
3. Behrouz A. Forouzan, "Cryptography & Network Security" , TMH

Prerequisite – None Corequisite - None

Integral University, Lucknow
Department of Computer Science & Engineering
M.Tech. ACDS Full Time (CSE)
Subject Name: Advance Real Time Systems, Subject Code: CS-527
w.e.f. July-2016

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UNIT 1

Introduction- Definition, Structure, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Periodic Task Model, Critical and Non- critical tasks Precedence Constraints. [6]

UNIT 2

Real Time Scheduling of Uni- processor systems- Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems. Classical Uniprocessor Scheduling Algo- Rate Monotonic, EDF, Uniprocessor Scheduling of IRIS Tasks: Identical and Nononidentical Linear & Concave Reward Function, 0/1 Reward Function. [10]

UNIT 3

Real Time Scheduling of Multi- Processor systems- Multiprocessor and Distributed System Model, Bin- Packing Assignment Algorithm for EDF, Next-Fit Algorithm for RM Scheduling, Myopic Offline Scheduling, FAB Algorithm & Buddy Strategy.

Real Time Database: Real Time vs. General purpose Database, Main Memory database, Concurrency Control Issues.

[8]

UNIT 4

Real Time Operating Systems- An overview of RTOS, Real Time Threads, Tasks & Kernels, Case Study of QNX, VRTX, Vx Works.

Fault Tolerance in Real Time Operating Systems- Introduction to Fault, Fault Detection and Error Containment, Redundancy, Data Diversity, Reversal Checks, Malicious & Integrated Failure Handling. Clock Synchronization: Introduction to Clocks. [8]

UNIT 5

Real Time Communication- Model of Real Time Communication, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols, Real Time Protocols, VTCSMA, Communication in Multicomputer System, N/W Topologies. [8]

REFERENCE

1. C.M. Krishna & Shin, "Real Time Systems", Mc Graw Hill 1985.
2. Jane W.S. LIU, "Real Time Systems", Pearson Education".
3. Levi & Agarwal, "Real Time System", McGraw Hill.
4. Mall Rajib, "Real Time Systems", Pearson Education

Prerequisite – None Corequisite - None

Integral University, Lucknow
Department of Computer Science & Engineering
M.Tech. ACDS Full Time (CSE)
Subject Name: Forensic & Cyber Crime,
Subject Code: CS-528
w.e.f. July-2016

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UNIT 1

Cyber Forensic Basics - Introduction to Cyber Forensics, Storage Fundamentals, File System Concepts, Operating System Software and Basic Terminology, Introduction to Encase Forensic Edition, Analysis and Advanced Forensic Tool Kit. Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.

[8]

UNIT 2

Cyber Crimes and Cyber Laws- Introduction to IT laws & Cyber Crimes – Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Mail Bombs, Exploitation, Stalking and Obscenity in Internet. Information Technology Act, 2000. Intellectual Property Right, Penalties Under IT Act Offences, Digital Signature and Electronic Signature Under IT Act Statutory Provisions Establishment of Authorities and their functions, Certifying Authorities & Cyber Regulation Appellate . [9]

UNIT 3

Cyber Forensics Investigation- Introduction to Cyber Forensic Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences, Password Cracking. [8]

UNIT 4

Data and Evidence Recovery :Data Recovery, Introduction to Deleted File Recovery, Formatted Partition Recovery, Data Recovery Tools, Data Recovery Procedures and Ethics, Preserve and safely handle original media, Document a "Chain of Custody", Complete time line analysis of computer files based on file creation, file modification and file access. [8]

UNIT 5

Cyber Security- Introduction to Cyber Security, Implementing Hardware Based Security, Software Based Firewalls, Security Standards, Assessing Threat Levels, Forming an Incident Response Team, Reporting Cyber crime, Operating System Attacks, Application Attacks, Reverse Engineering & Cracking Techniques and Financial Frauds.

[7]

TEXT BOOKS:

1. Nelson, B., Phillips, A., Enfinger, F. and Steuart, C., Guide to Computer Forensics and Investigations, Fourth Edition. Thomson/Course Technology, 2008. 4'th Edition
2. Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004.
3. "Understanding Forensics in IT ", NIIT Ltd, 2005.

REFERENCES:

1. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw -Hill, New Delhi, 2006.
2. Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005.
3. Faiyaz Ahmad, "Cyber law and Information Security", Dreamtech, New Delhi, 2013.

Prerequisite – None Corequisite - None

Integral University, Lucknow Department of Computer Science & Engineering

M.Tech. Full Time ACDS (CSE)

Subject Name: Digital Image Processing & its Applications, Subject Code: CS-529

w.e.f. July-2016

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UNIT 1:

Digital Image Fundamentals: Image Sensing, and Acquisition, Image Sampling and Quantization, Basic Relationship between Pixels.

Sensor and Imaging: Imaging Optics, Radiometry of Imaging, illumination sources andtechniques, Camera Principles, Color Imaging, Single Sensor Color Imaging and Color Demosaicing, Range Images, 3D Imaging. [8]

UNIT 2:

Signal Representation: Vector Space and Unitary Trasnsforms, Multi-Resolutional SignalRepresentation, Wavelet Decomposition, Scale space and diffusion, Representation of color,Retinex Processing, Markov Random Field Modellings of Images. [8]

UNIT 3:

Non-linear Image Processing: Median and Order Statistics Filters, Rank-Ordered-Mean Filtersand Signal Dependent Rank-Ordered-Mean Filters, TwoDimensional Teager Filters,Applications of nonlinear filters in image enhancement, edge detections, noise removal etc. [9]

UNIT 4:

Image Processing in Biometric Security : Introduction, Fingerprint Recognition, Face Recognition, Iris Recognition, Vein Pattern Recognition, Multimodal Biometrics Techniques. Biometric System Architeture, Extraction Algorithm, Matching Algorithm, Authentication, Biometric System Evaluation, Privacy issues. [9]

UNIT 5:

Image Processing in Medical Field: Introduction, CT scan images, MRI, Seeded segmentation methods : Desirable properties, Pixel Based Methods, Contour Based Methods,Geodesic Active Contours, level set method, deformable model, graph based method, Image analysis of retinal images : acquisition, preprocessing. [8]

References:

1.R.C Gonzalez and R.E. Woods, " Digital Image Pr ocessing" , Addison Wesley, 1992.
2.A.K.J ain, " Fundamentals of Digital Image Pr ocessing" , Pr entice Hall of India.
3. Digital Image Processing–M. Anji Reddy, BS Publications.

Prerequisite – None Corequisite - NoN

Integral University, Lucknow
Department of CSE
M.Tech. Full Time ACDS (CSE)
Subject Name: Applied Data Mining and Warehousing, Subject Code: CS-530

UNIT-1
INTRODUCTION TO DATA WAREHOUSING [8]
Introduction to data warehousing, evolution of decision support systems, modeling a data warehouse, granularity in the data warehouse, Data warehouse life cycle, Data Warehousing Components, Multidimensional data model, OLAP vs OLTP, Types of OLAP servers, OLAP operations, Categorization of OLAP Tools, Data cubes, Schemas for Multidimensional Database.

UNIT 2
DATA WAREHOUSE PROCESS AND ARCHITECTURE [8]
3–Tier data warehouse architecture, Distributed and virtual data warehouses, Data warehouse implementation, tuning and testing of data warehouse. Data Staging (ETL) Design and Development, data warehouse visualization, Data Warehouse Deployment, Maintenance, Growth, Data Warehousing and Business Intelligence Trends - Business Applications- tools-SAS

UNIT 3
INTRODUCTION TO DATA MINING [8]
Data mining-KDD versus data mining, Relation to Statistics-Databases, Stages of the Data Mining Process, task primitives, Data Mining Techniques, Data mining knowledge representation, Architecture of a Typical Data Mining Systems, Classification of Data Mining Systems, Data mining query languages, Integration of a Data Mining System with a Data Warehouse – Issues, Data preprocessing, Mining frequent patterns- association-correlation.

UNIT 4
CLASSIFICATION AND CLUSTERING [8]
Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Clustering techniques, Partitioning methods, k-means, Hierarchical Methods, distance based agglomerative and divisible clustering, Density-Based Methods, expectation maximization, Grid Based Methods, Model-Based Clustering Methods, Constraint, Based Cluster Analysis, Outlier Analysis.

UNIT 5
TEXT & WEB DATA MINING [9]
Overview of text mining, General Architecture, Algorithms, Core Operations, Preprocessing, Types of Problems, basics of document classification, information retrieval, information extraction, probabilistic models for text mining**,** prediction and evaluation, Mining Text Streams, Opinion Mining and Sentiment Analysis, Web Mining Theoretical background, Algorithms and techniques, web content mining, web link mining, structured data extraction, web usage mining, Recommender Systems
– Web Recommender systems based on User and Item – PLSA and LDA Models.

References:

1. Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", Tata McGraw Hill Edition, Tenth Reprint 2007.
2. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, third edition2011, ISBN: 1558604898.
3. Sholom Weiss, Nitin Indurkhya, Tong Zhang, Fred Damerau "The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data", Springer, paperback 2010
4. Ronen Feldman, James Sanger -"The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data"- Cambridge University press, 2006.
5. Bing Liu, "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data-Centric Systems and Applications)", Springer; 2nd Edition 2009
6. Zdravko Markov, Daniel T. Larose, "Data Mining the Web: Uncovering Patterns in Web Content, Structure, and Usage", John Wiley & Sons, Inc., 2007
7. Soumen Chakrabarti, "Mining the Web: Discovering Knowledge from Hypertext Data", Morgan Kaufmann; edition 2002

Prerequisite – None Corequisite - None

Integral University Lucknow
Department of Computer Science & Engineering
Machine Learning Techniques Lab
Subject Code: CS549

1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
2. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
3. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
4. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
5. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
6. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
7. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
8. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Integral University, Lucknow
M.Tech ACDS(CSE)
Subject: Ad-hoc Sensor Network (CS-603)

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UNIT-1

Key definitions of ad-hoc/sensor networks, Advantages of ad-hoc/sensor networks, Unique constraints and characteristics of MANET, challenges & Performance parameters of Adhoc networks, Types & Applications of MANETs, Introduction of sensor network, sensor networks vs. ad-hoc networks, sensor network limitations, Design issues. [8]

UNIT 2

Routing in Ad Hoc Networks

Introduction, Topology based routing protocol- Proactive routing- DSDV, WRP, TBRPF, OLSR, multipoint relay, STAR, Reactive routing- DSR, AODV, TORA, Hybrid routing approach- ZRP, FSR, LANMAR, CBRP, Position based routing- Location services- DREAM, quorum based location service, GLS, home zone, forwarding strategies- greedy packet forwording, Restricted Directional flooding- DREAM, LAR, RDMAR , Hierarchical routing, Other position based routing protocols. [10]

UNIT 3

Wireless sensor networks

Design Issues, Challenges of Wireless sensor network, Energy consumption, Clustering of sensors- regularly placed sensor, randomly distributed sensors, Heterogeneous WSNs. Mobile Sensors, attacks on sensor network routing- Spoofed, altered, or replayed routing information, selective forwarding, sinkhole attacks, the Sybil attack, Wormholes, HELLO flood attacks, Acknowledgement spoofing, application of sensor networks. [8]

UNIT 4

Data retrieval in sensor networks

Introduction, Classification of WSNs- Architecture of sensor networks, network architecture, Routing Layer- Network structure based- flat routing- Directed diffusion, sequential assignment routing, MCFA, coherent and non-coherent processing, energy aware routing, Hierarchical routing- CBRP, LEACH, PEGASIS, MECN, TEEN, APTEEN, routing in fixed size clusters, sensor aggregates routing, Hierarchical power- Aware routing, flat versus Hierarchical. [8]

UNIT 5

Security

Introduction, distributed system security, security in Ad- Hoc networks- requirements, security solutions constraints, challenges.

Key Management- background, Diffie- Hellman key agreement, N- Party Diffie- Hellman Key agreement, The tree based generalized Diffie-Hellman protocol, Cooperation in MANETS, WSN security, Key distribution and management, Requirements for bootstrapping security in sensor networks, key distribution techniques in sensor networks- using a single network-wide key, using pair wise-shared keys, random key pre-distribution scheme, security protocols for sensor network, general consideration of using public key method, SPINS: SNEP AND µTELSA. [10]

REFERENCES:

1. AD HOC & SENSOR NETWORK "Theory and Application" by Carlos de Morais Cordeiro, World scientific press.
2. "Wireless Ad Hoc and Sensor Networks" by Houda Labiod , Willy Publication

Prerequisite – None Corequisite - None

Agile Software Engineering
CS-605
w.e.f. July-2017

L T P C
4 0 0 4

COURSE OUTCOMES
The student shall be able to:
- Understand The XP Lifecycle, XP Concepts, Adopting XP
- Work on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements, Customer Tests
- Implement Concepts to Eliminate Waste

UNIT 1
Why Agile? Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, How to Be Agile? Agile Methods Don't Make Your Own Method, The Road to Mastery, Find a Mentor. [8]

UNIT 2
Understanding XP: The XP Lifecycle, The XP Team, XP Concepts, Adopting XP: Is XP Right for Us? Go!, Assess Your Agility. [8]

UNIT 3
Practicing XP: Thinking: Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, Collaborating: Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand Up Meetings, Coding Standards, Iteration Demo, Reporting, Releasing:"Done Done", No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation, Planning: Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating, Developing: Incremental Requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design, Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory Testing. 10 hours. [8]

UNIT 4
Mastering Agility: Values and Principles: Commonalities, About Values, Principles, and Practices, Further Reading, Improve the Process: Understand Your Project, Tune and Adapt, Break the Rules, Rely on People: Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, Eliminate Waste: Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput. [8]

UNIT 5
Deliver Value: Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, Seek Technical Excellence: Software Doesn't Exist, Design Is for Understanding, Design Tradeoffs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery.
Text: 1. The Art of Agile Development (Pragmatic guide to agile software development), James shore, Chromatic, O'Reilly Media, Shroff Publishers & Distributors, 2007. [8]

REFERENCE
1. Agile Software Development, Principles, Patterns, and Practices, Robert C. Martin, Prentice Hall; 1st edition, 2002
2., "Agile and Iterative Development A Manger's Guide", Craig Larman Pearson Education, First Edition, India, 2004.

Pre-Requisite: ASEPM CS-517 Co-Requisite: None

Advance Cloud Computing
CS-606/CSE-606
w.e.f. July-2017

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UNIT 1

Introduction to Cloud Computing : Definition(s) of Cloud Computing, Characteristics of Cloud, Cloud Deployment Models, Cloud Service Models, Driving Factors and Challenges of Cloud and Overview of Applications of Cloud.

Cloud Concepts & Technologies: Virtualization, Load Balancing, Scalability & Elasticity, Deployment, Replication, Monitoring, MapReduce, Identity and Access Management, Service Level Agreements and Billing. [8]

UNIT 2

Cloud Services and Platforms : various types of cloud services including compute, storage, database, application, analytics, network and deployment services.

Hadoop & MapReduce: Overview of Hadoop echosystem, MapReduce architecture, MapReduce job execution flow and MapReduce schedulers. [8]

UNIT 3

Cloud Application Design: cloud application design considerations, cloud application reference architectures, design methodologies such as SOA, CCM and MVC, data storage technologies and cloud deployment approaches.

Big-Data Analytics: big data analytics approaches: approaches for clustering big data, approaches for classification of big data and recommendation systems. [8]

UNIT 4

Cloud Security: Cloud security challenges, approaches for authorization authentication, identify & access management, data security, data integrity encryption & key management.

Cloud Application Benchmarking & Tuning: cloud application workload characteristics, performance metrics for cloud applications, cloud application testing, performance testing tools and a load test and bottleneck detection case study. [8]

UNIT 5

Cloud Computing Case-Studies: Review of Technical papers from Major journals (IEEE Transactions) and major conferences (IEEE / Springer etc.) on Cloud
Computing / Software Engineering / Other Thrust Areas and Presentations by Students on their understanding of the same, after reviewing the papers concerned. [8]

Text-Book:

- Cloud Computing A Hands-on Approach by A. Bagha & V. Madisetti [ISBN: 978-81-7371-923-3] Published by University Press, pp. 456, Printed in 2014.

Additional References:

- Distributed and Cloud Computing From Parallel Processing to the Internet of Things by K. Hwang, G.C. Fox, J.J. Dongarra [ISBN: 978-93-81269-23-7] Published by Elsevier India Pvt. Ltd., pp. 648, Printed in 2013.
- Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012.
- Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011.
- Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
- Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010.

Prerequisite – None Corequisite - None

Big Data

CS-609

w.e.f. Session 2020-21

L T P C

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Unit-1 **(9)**

Introduction of Big Data: Classification of Digital Data, Evolution of Big Data, Challenges of Big Data, Characteristics of Big data-The 5V's , Features of Big data, BI versus Big data, Cloud versus Big data, Business Drivers for Big Data, Big data applications and Case Studies.

Big Data Analytics: Need for Big Data Analysis, Stages of Big Data Analysis, Types of Big Data Analysis, In-Memory Analytics, In- Data Processing, Parallel and Distributed systems, Data Mining versus Data Analysis, Introduction to Data Science.

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Unit-2 **(8)**

NoSQL- Types of NoSQL Databases, Advantages of NoSQL, SQL versus NoSQL, NewSQL,

Introduction to MongoDB- Data Types in MongoDB, MongoDB query language-Insert method, Save Method, update method, remove and Find method, Aggregate function, Map Reduce Function.

Unit-3 **(7)**

HADOOP- Introduction to Hadoop, Hadoop Ecosystems and its Components, Hadoop Architecture, Features of Hadoop, Hadoop-Pros and Cons, Hadoop 1.0 and Hadoop 2.0, Use case of Hadoop, , Hadoop Installation.

Unit-4 **(8)**

HDFS-Introduction, HDFS Architecture, NameNode and DataNode, HDFS reading and writing, Replica Placement strategy, Special features of HDFS.

Introduction to Map Reduce, Shuffle and Sorting of Map reduce Task, Job Scheduling in Map Reduce, Example of Map Reduce Algorithms.

Unit-5 **(8)**

HBase- Introduction to HBase, HBase overview, HBase architecture, RDBMS versus HBase.

Apache Hive: Introduction, Hive features, Hive architecture, Hive data types, Hive Query language. Apache Pig : Pig Architecture, Pig Latin data model, Data types in Pig, Relational operators, EVAL Function, Complex data types, Piggy Bank, User Defined functions, Word count using Pig.

REFERENCES:

1. Big Data and Analytics, by Seema Acharya and Subhashini Chellappan, Willey Publication
2. Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
3. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly, Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
5. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss

Prerequisite – Java Programming Co requisite - None

Integral University, Lucknow
Department of cse
M.Tech ACDS(CSE)
Natural Language Processing(CS-618)
w.e.f. July-2017

L-T-P-C:
4-0-0-4

Chapter-1
Introduction- Human languages, models, ambiguity, processing paradigms; Phases in natural language processing, applications. Text representation in computers, encoding schemes.

Chapter-2
Linguistics resources- Introduction to corpus, elements in balanced corpus, Treebank, Prop Bank, WorldNet, Verb Net etc. Resource management with XML, Management of linguistic data with the help of GATE, NLTK. Regular expressions, Finite State automata, word recognition, lexicon. Morphology, acquisition models, Finite State Transducer.

Chapter-3
N-grams, smoothing, entropy, HMM, ME, SVM, CRF. Part of Speech tagging- Stochastic POS tagging, HMM, Transformation based tagging (TBL), Handling of unknown words, named entities, multi word expressions. Natural language grammars, lexeme, phonemes, phrases and idioms, word order, agreement, tense, aspect and mood agreement, Context Free Grammar, spoken language syntax.

Chapter-4
Semantics- Meaning representation, semantic analysis, lexical semantics, WorldNet.
Word Sense Disambiguation- Selection restriction, machine learning approaches, dictionary based approaches.
Discourse- Reference resolution, constraints on co-reference, algorithm for pronoun resolution, text coherence, discourse structure.

Chapter-5
Applications of NLP- Spell-checking, Summarization Information Retrieval- Vector space model, term weighting, homonymy, polysemy, synonymy, improving user queries. Parsing- Unification, probabilistic parsing, Tree Bank. Machine Translation– Overview.

Textbook:
1. Daniel Jurafsky and James H Martin. *Speech and Language Processing, 2e*, Pearson Education, 2009
Reference Books:
1. James A.. *Natural language Understanding 2e*, Pearson Education, 1994
2. Bharati A., Sangal R., Chaitanya V.. *Natural language processing: a Paninian perspective*,PHI, 2000
3. Siddiqui T., Tiwary U. S.. *Natural language processing and Information retrieval*.

Prerequisite – None Corequisite – None

Integral university, Lucknow
M.Tech ACDS (CSE)
Internet of Things (CS626)

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UNIT I [8]

FUNDAMENTALS OF IOT
Introduction Characteristics Physical design Protocols Logical design Enabling technologies IoT Levels Domain Specific IoTs IoT vs M2M.

UNIT II [8]
IOT DESIGN METHODOLOGY
IoT systems management IoT Design Methodology Specifications Integration and Application Development.

UNIT III [8]
BUILDING IOT WITH RASPBERRY PI Physical device Raspberry Pi Interfaces Programming APIs / Packages Web services

UNIT IV [8]
BUILDING IOT WITH GALILEO/ARDUINO
Intel Galileo Gen2 with Arduino Interfaces Arduino IDE Programming APIs and Hacks

UNIT V [8]
CASE STUDIES and ADVANCED TOPICS
Various Real time applications of IoT Connecting IoT to cloud Cloud Storage for Iot Data Analytics for IoT Software & Management Tools for IoT

OUTCOMES:
Upon the completion of the course the student should be able to
- Design a portable IoT using Arduino/ equivalent boards and relevant protocols.
- Develop web services to access/control IoT devices.
- Deploy an IoT application and connect to the cloud.
- Analyze applications of IoT in real time scenario

REFERENCES :
1.Arshdeep Bahga, Vijay Madisetti, “Internet of Things A hands on approach”, Universities Press, 2015.
2.Manoel Carl os Ramon, “Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress, 2014.
3. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.

Prerequisite – None Corequisite – None

Integral University, Lucknow
Department of CSE
M.Tech ACDS(CSE)
Advanced Statistical Techniques for Data Analytics(CS 624)

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Unit-I [8]

Data- Structured and Unstructured data, Importance, and analytics**; Data Sources-** Primary and Secondary data, advantages and disadvantages, Properties and data sets; **Classic data sets-** Iris flower data set, Categorical data analysis, robust statistics, Time series.

UNIT-II [9]

Data Analytics-Overview, data life cycle, Methodology ; **Key Stakeholders-** Data analyst, Data Scientist; **Data Analytics Project-** Problem definition, data collection, cleansing data, summarizing, data exploration.

Unit-III [7]

Data Visualization- Variable types, Distribution function, Cumulative distribution functions, Histograms, Exploratory data analysis, Modeling output, Statistical predictions; **Statistical Techniques for Data Scientist:** Linear Regression, types of Linear Regression, Classification, Re-sampling Methods, subset selection, shrinkinage.

Unit-IV [8]

Statistical Distributions- Poisson Distribution, Binomial Distribution; **Theorems and algorithms-** Bayes Theorem, K-Nearest Neighbor Algorithm, bagging, ROC Curve Analysis; **Hypothesis Testing-** Testing of Hypothesis, Population or Universe, Sampling, Parameters of Statistics, Standard Error.

Unit-V [8]

Test of Significance-Critical Region, Level of Significance, Errors in Sampling, Steps in Testing of Statistical Hypothesis, Test of Significance for Large Samples, Test of Significance of Small Samples; **Time series Analysis-** Forecasting models and methods, Chi-square test, t-test, F-Test.

References

1. M. Goyal, "computer-based numerical & statistical techniques", Infinity Science Press LLC.
2. Rafael A. Irizarry, "Introduction to Data Science", CRC Press.

Prerequisite – None Corequisite – None