(P.G. DEPARTMENT OF COMPUTER SCIENCE)

OUTLINES OF TESTS,
SYLLABI AND COURSES OF READING

FOR

M.Sc. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
(SEMESTER SYSTEM)
FIRST YEAR (Semester I & II)
(2020-21 and 2021-22 Sessions)

FACULTY OF COMPUTING SCIENCES

SRI GURU TEG BAHADUR KHALSA COLLEGE

Sri Anandpur Sahib

An Autonomous College

Affiliated to Punjabi University, Patiala

APPROVED
Board of Studies Meeting held on 30th July, 2020

PROGRAMME OF STUDY OF M.Sc.(AI & DS) PART-I

(SEMESTER-I &II)

FOR SESSIONS 2020-21, 2021-22

Semester-I

Paper Code	Name of Subject	Contact Hours per week				Examination scheme marks				Credit
		L	T	P	Total	Internal	External	Practical	Total	
MSAIDS-111	Introduction to Artificial Intelligence	4	1		5	30	70		100	5
MSAIDS-112	Python Programming	5			5	30	70		100	5
MSAIDS-113	Data Structures & Algorithms	4	1		5	30	70		100	5
MSAIDS-114	Mathematical Foundation Course	4	1		5	30	70		100	5
MSAIDS-115	Elective-I*	4	1		5	30	70		100	5
MSAIDS-116	Software Lab-I (Based on MSAIDS-112 & MSAIDS-113)			4	4	30		70	100	2
	Total	**19**	**4**	**4**	**29**	**180**	**350**	**70**	**600**	**27**

Semester-II

Paper Code	Name of Subject	Contact Hours per				Examination scheme marks				Credit
		L	T	P	Total	Internal	External	Practical	Total	
MSAIDS-121	Introduction to Data Science	4	1		5	30	70		100	5
MSAIDS-122	Web Analytics	4	1		5	30	70		100	5
MSAIDS-123	Machine Learning with R	5			5	30	70		100	5
MSAIDS-124	Probability & Statistics in Data Science	4	1		5	30	70		100	5
MSAIDS-125	Elective-II**	4	1		5	30	70		100	5
MSAIDS-126	Software Lab-II and Minor Project (Based on MSAIDS-123)			4	4	30		70	100	2
	Total	**21**	**4**	**4**	**29**	**180**	**350**	**70**	**600**	**27**

***Elective-I: Students can opt any of the following papers:**

MSAIDS-115 E1	Developing Soft Skills & Personality
MSAIDS-115 E2	Customer Relationship Management
MSAIDS-115 E3	Healthcare Data Analytics

****Elective-II: Students can opt any of the following papers:**

MSAIDS-125 E1	Data Warehousing & Mining
MSAIDS-125 E2	Digital Marketing
MSAIDS-125 E3	Block chain & Bitcoin Fundamentals

NOTE:

The Break-up of Marks for Practical exams (External) will be as under:

1. Viva-Voce(External examination) 20Marks
2. Program Development and Execution 20Marks
3. File Record 30Marks

Internal Assessment will be based on Continuous Comprehensive Assessment (CCA) pattern and the breakup of Internal Assessment will be asunder:

a) Average of Two mid Semester Tests: **60%**

b) Assignment/Seminar/Class Test/Tutorial/Quiz etc.: **20%**

c) Attendance: **10%**

d) Class participation and behavior: **10%**

MSAIDS-111
Introduction to Artificial Intelligence
5 CREDITS: 4H(L) + 1H(T)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Instructions for Paper Setter/Examiners

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

Section-A

Introduction: Introduction to Artificial Intelligence, Background and Applications, Turing Test and Rational Agent approaches to AI, Introduction to Intelligent Agents, their structure, behaviour and environment.

Problem Solving and Searching Techniques: Problem Characteristics, Production Systems, Control Strategies, Breadth First Search, Depth First Search, Hill climbing and its Variations, **Heuristics Search Techniques:** Best First Search, A* algorithm, Constraint Satisfaction Problem, Means-End Analysis

Section-B

Knowledge Representation: Introduction to First Order Predicate Logic, Resolution Principle, Unification, Semantic Nets, Conceptual Dependencies, Frames, and Scripts, Production Rules, Conceptual Graphs.

Expert systems : Basic Components & architecture of Expert systems, representing and using domain knowledge, ES-Shells.

Applications of AI : Game Playing-The minmax Search Procedure, Adding Alpha-beta Cutoff's Planning-Overview, Components of Planning System, Natural Language processing : Overview, Syntactic processing, Semantic analysis, Morphological, Discourse and Pragmatic processing.

BOOKS RECOMMENDED:

1. DAN.W. Patterson, Introduction to A.I and Expert Systems – PHI, 2007.
2. Russell & Norvig, Artificial Intelligence-A Modern Approach, LPE, Pearson Prentice Hall, 2nd edition, 2005.
3. Rich & Knight, Artificial Intelligence – Tata McGraw Hill, 2nd edition, 1991.
4. W.F. Clocksin and Mellish, Programming in PROLOG, Narosa Publishing House, 3rd edition, 2001.
5. Ivan Bratko, Prolog Programming for Artificial Intelligence, Addison-Wesley, Pearson Education, 3rd edition, 2000.

MSAIDS-112
Python Programming
5 CREDITS: 5H(L)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Instructions for Paper Setter/Examiners

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

Section A

Introduction to Python: History of Python, Strength and Weakness, Different Versions, Installing Python , Setting up in local environment, IDLE, Executing from file, command line from interactive mode, Python Identifiers and reserved key words.

Python syntax: Variables and Variables type, Data types, Data Types Conversion, Operators (Arithmetic, Comparison, Assignment, Bitwise, Logical, Membership, Identity), Operators Precedence, Python Decision making (if, el if, else, nested if), Python loops (while, for, nested loops), Break and continue statements.

Python Collections or Sequence: Sequence introduction, Number operations, String Operations, List, Tuple, Dictionary, Set.

Python Functions: Function introduction, User defined functions, Functions with parameters, Keywords and optional parameters, Scope of variables (Global and Local), Anonymous function – Lambda, In-build function, List comprehension.

Section B

Python Modules: Modules, Standard Modules (Sys, Math, Time), Import Statement, from statement, Dir() functions.

Python File handling: Sending Output to STDOUT Using the print() Method, Reading Input with the input() Method, Creating File Objects with the open() Method, Controlling File Access Modes, Working with File Object Attributes, Closing File Objects with the close() Method, Reading and Writing to File Objects with read() and write(),

OOP: Class and object, Attributes, Inheritance, Overloading, Overriding, Polymorphism.

Exceptions handling: Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions, Raise.

Text Books:

1. Paul Gries, Jennifer Campbell, Jason Montojo, Practical Programming- An Introduction to Computer Science Using Python 3.6, Shroff Publications and Distributors.

Reference books:

1. John V Guttag, Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013.

2. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.

MSAIDS-113
Data Structures & Algorithms
5 CREDITS: 4H(L) + 1H(T)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Instructions for Paper Setter/Examiners

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

SECTION A

Data Structure: Introduction to data structure and algorithm, Algorithm analysis: Time space trade off algorithms and Big O notation.

Arrays: Introduction, one dimensional and multidimensional arrays, memory representation of arrays, operations on arrays, sparse arrays and sparse matrices and their implementation, Advantages and limitation of arrays.

Stacks: Introduction; Operation on stacks; Implementation of stacks, Application of stacks: matching parenthesis, evaluation of arithmetic expressions, conversion from infix to postfix, recursion.

Queues: Introduction, operation on queues, circular queue, memory representation of queues, de-queues, priority queues, application of queues.

Linked List: Introduction; operation on linked list, circular linked list, doubly linked list, header linked list, implementation of linked list, application of linked lists.

Trees: Introduction; Binary Tree; Threaded Binary Trees; Binary Search Tree; Balanced Trees; B-Trees; Heap.

SECTION B

Graphs: Introduction Graph: Graph terminology, Memory Representation of Graphs: adjacency matrix representation of graphs, adjacency list or linked representation of graphs,

Operations performed on graphs: Breadth-first and Depth-first search, Dijkastra Shortest Path algorithm, Minimum Spanning Tree, Kruskal Algorithm, Prims Algorithms.

Sorting: Selection Sort, Insertion Sort, Merge Sort, Bucket Sort, Radix Sort, Quick Sort and Heap Sort.

Algorithm Design Techniques: Divide and Conquer Algorithms, Greedy Algorithms, Dynamic Programming, Back Tracking Algorithms.

Hashing: Hashing techniques; Collision resolution; Deleting items from a hash table; Open Addressing, Chaining, Applications of hashing.

TEXT BOOKS:

1. M. A. Weiss, "Data Structures and Algorithm Analysis in C++, Pearson Education.
2. Tanenbaum, Y. Lanhgsam and A. J. Augenstein, "Data Structures Using C", Prentice Hall of India.

REFERENCE BOOKS:

1. Vishal Goyal, Lalit Goyal, Pawan Kumar, A Simplified Approach to Data Structures,Shroff Publishers and Distributors.
2. CORMAN, Introduction to Algorithms
3. S. Sahni, "Data Structures, Algorithms and Application in C++, McGraw-Hill.
4. Donald Knuth : Fundamental Algorithms. Vol-1
5. Donald Knuth : Sorting & Searching. Vol-3

MSAIDS-114
Mathematical Foundation Course
5 CREDITS: 4H(L) + 1H(T)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Instructions for Paper Setter/Examiners

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

SECTION A

Sets: Introduction to the theory of sets, combination of sets, power sets, finite and infinite sets, principle of inclusion and exclusion

Functions: One-to-One Functions and Onto Functions, Inverse and Composition of Functions, Floor Function, Ceiling Function.

Relations and their properties: Relations and types of relations , Equivalence Relations closure of relation, partial ordering.

Algorithms:, Growth of Functions, Big-O Notation, Big-Omega and Big-Theta Notation, Mathematical Induction, The Basic of counting, The Pigeonhole Principle.

SECTION B

Recurrence Relations: Linear recurrence relations with constant coefficients, Solution of non homogeneous recurrence relations. Generating functions

Graphs: Introduction, terminology, Representing Graphs and Graph Isomorphism, Connectivity, Euler Path and Circuits, Shortest Path Problems, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees

Prepositional Logic: Logical Connectives, Well-formed Formulas, Tautologies, Equivalences.

Boolean Algebra: Boolean algebra, Boolean Functions, Connonical Form (Disjunctive NormalForm) of a Boolean function, Karnaugh Maps

Recommended Books:

1. C.L. Liu , D.P. Mahopatra, Elements of Discrete mathematics, 2nd Edition , Tata McGraw Hill, 1985.
2. Kenneth Rosen, Discrete Mathematics and Its Applications, Sixth Edition ,McGraw Hill 2006
3. T.H. Coremen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009
4. M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms , John wiley Publication, 1988

MSAIDS-115 E1
Developing Soft Skills & Personality
5 CREDITS: 4H(L) + 1H(T)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Objectives:
To introduce the students to the theory, fundamentals and tools of communications and to develop in them vital communication skills, which should be integral to personal, social and professional interactions.

INSTRUCTIONS FOR PAPER SETTER

- The Question paper will consist of three sections-A, B & C.
- Section A and B will have four questions with internal choice each from the respective unit of the syllabus and will carry 10 marks each.
- Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

INSTRUCTIONS FOR THE CANDIDATES

- Candidates are required to attempt two questions each from section A and B.
- In Section C they are required to attempt all questions.

Section-A

Introduction to Soft Skills: Interpersonal skills, Importance of Soft Skills.
Communication: Verbal & Non-verbal communication, Role of body language, Essentials of Effective Communication, barriers to Communication.
Team building and team work, Leadership, Qualities of a leader.
Managing Self: Techniques of Time Management, Stress Management.

Section-B

Problem Solving: Approaches for problem solving, Steps followed in problem solving.
Art of listening: Skills for effective listening, Art of Persuasion and Negotiation.
Speaking Skills: Preparing and delivering effective multimedia presentation.
Interview Skills, Participation in Group Discussion, Conducting meeting.

Recommended Books:

1. Dorch, Patricia. *What Are Soft Skills.*New York: Execu Dress Publisher, 2013.
2. Kamin, Maxine. *Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders.* Washington, DC: Pfeiffer & Company, 2013.
3. Kaur, Gurpreet. *Communication Skills & Technical Writing.* Acme, 2014.
4. Turk, Christopher. *Effective Speaking*, South Asia Division: Taylor & Francis, 1985.
5. Lucas, Stephen E. *The Art of Public Speaking*, 11th Edn., International Edn., McGraw Hill Book Co., 2014.
6. Holtz, Shel, *Corporate Conversations*, PHI, New Delhi, 2007.

7. Chauhan, G.S. and Sharma, S. *Soft Skills.* Wiley, New Delhi, 2016.
8. Kumar, Sanajy and PushpLata.*Communication Skills*. New Delhi: OUP. 2011.

MSAIDS-115 E2
Customer Relationship Management
5 CREDITS: 4H(L) + 1H(T)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Instructions for Paper Setter/Examiners

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

Objective:

- To train the participants in the concepts of customer relationship management
- with industry case studies and strategies for implementing them in any
- organization.
- To better understand customer needs and to maintain long-term customer
- relationships.
- Be able to pursue a strategy of Relationship Marketing.

Section-A

Introduction to Customer Relationship Management: Concept- Evolution of Customer Relationships: Customers as strangers- acquaintances- friends and partners. Objectives- Benefits of CRM to Customers and Organizations- Customer Profitability Segments- Components of CRM: Information- Process- Technology and People- Barriers to CRM. Relationship Marketing and CRM: Relationship Development Strategies: Organizational Pervasive Approach- Managing Customer Emotions- Brand Building through Relationship Marketing- Service Level Agreements- Relationship Challenges.

CRM Marketing Initiatives- Customer Service and Data Management : CRM Marketing Initiatives: Cross-Selling and Up-Selling- Customer Retention- Behaviour Prediction- Customer Profitability and Value Modeling- Channel Optimization- Personalization and Event-Based Marketing. CRM and Customer Service: Call Center and Customer Care: Call Routing- Contact Center Sales-Support- Web Based Self Service- Customer Satisfaction Measurement- Call-Scripting- Cyber Agents and Workforce Management.

CRM and Data Management: Types of Data: Reference Data- Transactional Data- Warehouse Data and Business View Data- Identifying Data Quality Issues- Planning and Getting Information Quality- Using Tools to Manage Data- Types of Data Analysis: Online Analytical Processing (OLAP) - Clickstream Analysis- Personalization and Collaborative Filtering- Data Reporting.

CRM Strategy- Planning: Understanding Customers: Customer Value- Customer Care- Company Profit Chain: Satisfaction- Loyalty- Retention and Profits. Objectives of CRM

Strategy- The CRM Strategy Cycle: Acquisition- Retention and Win Back- Complexities of CRM Strategy.

Section-B

CRM Implementation and Evaluation: Planning and Implementation of CRM: Business to Business CRM- Sales and CRM- Sales Force Automation- Sales Process/ Activity Management- Sales Territory Management- Contact Management- Lead Management- Configuration Support- Knowledge Management CRM Implementation: Steps- Business Planning- Architecture and Design- Technology Selection- Development- Delivery and Measurement.

CRM Evaluation: Basic Measures: Service Quality- Customer Satisfaction and Loyalty- Company 3E Measures: Efficiency- Effectiveness and Employee Change.

CRM New Horizons: e-CRM: Concept- Different Levels of E- CRM- Privacy in E-CRM - Software App for Customer Service:# Activity Management- Agent Management- Case Assignment- Contract Management- Customer Self Service- Email Response Management- Escalation- Inbound Communication Management- Invoicing- Outbound Communication Management- Queuing and Routing- Scheduling - Social Networking and CRM - Mobile-CRM - CRM Trends- Challenges and Opportunities - Ethical Issues in CRM.

References:

- Anderrson Kristin and Carol Kerr,"Customer Relationship Management", Tata McGraw-Hill, 2002.
- Ed Peelen, "Customer Relationship Management", Prentice Hall, 2005.
- Bhasin Jaspreet Kaur, "Customer Relationship Management", Dreamtech Press, 2012
- Valarie A Zeithmal, Mary Jo Bitner, Dwayne D Gremler and Ajay Pandit, "Services Marketing Integrating Customer Focus Across the Firm", Tata McGraw Hill, 2010.
- Urvashi Makkar and Harinder Kumar Makkar, "CRM Customer Relationship Management", McGraw Hill Education, 2013.

Outcomes: Students will be able to:

- Explore the concepts of customer relationship management with industry case
- studies.
- Develop metrics for customer retention.
- Apply data mining concepts to implement CRM in real world applications.
- Devise strategies to implement CRM in any organization.

MSAIDS-115 E3
Healthcare Data Analytics
5 CREDITS: 4H(L) + 1H(T)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Instructions for Paper Setter/Examiners

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

Section A

Introduction: Introduction to Healthcare Data Analytics- Electronic Health Records– Components of EHR- Coding Systems- Benefits of EHR- Barrier to Adopting HER Challenges- Phenotyping Algorithms.

Analysis: Biomedical Image Analysis- Mining of Sensor Data in Healthcare- Biomedical Signal Analysis- Genomic Data Analysis for Personalized Medicine.

Analytics: Natural Language Processing and Data Mining for Clinical Text- Mining the Biomedical- Social Media Analytics for Healthcare.

Section B

Advanced Data Analytics: Advanced Data Analytics for Healthcare– Review of Clinical Prediction Models- Temporal Data Mining for Healthcare Data- Visual Analytics for Healthcare- Predictive Models for Integrating Clinical and Genomic Data- Information Retrieval for Healthcare- Privacy-Preserving Data Publishing Methods in Healthcare.

Applications: Applications and Practical Systems for Healthcare– Data Analytics for Pervasive Health- Fraud Detection in Healthcare- Data Analytics for Pharmaceutical Discoveries- Clinical Decision Support Systems- Computer-Assisted Medical Image Analysis Systems- Mobile Imaging and Analytics for Biomedical Data.

References:

1. Chandan K. Reddy and Charu C Aggarwal, “Healthcare data analytics”, Taylor & Francis, 2015
2. Hui Yang and Eva K. Lee, “Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, Wiley, 2016.

MSAIDS-116
Software Lab-I (Based on MSAIDS-112 & MSAIDS-113)
2 CREDITS: 4H(P)

Teaching Hours per week: 4 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

This laboratory course will mainly comprise of exercises based on subject MSAIDS-112: Python Programming & MSAIDS-113: Data Structures & Algorithms. Students are required to develop programs based upon:

1. Various data types
2. Various Operators
3. Lists in Python
4. Functions in Python
5. File Handling Operations
6. OOPs Concepts
7. Exception Handling
8. Implementation of Data Structure Concepts: Array, Stacks, Queue and Searching

The Break-up of Marks for Practical exams (External) will be as under:

1. Viva Voce 20Marks
2. Program Development and Execution 30Marks
3. File Record 20Marks

MSAIDS-121
Introduction to Data Science
5 CREDITS: 4H(L) + 1H(T)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Instructions for Paper Setter/Examiners

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

Section-A

Introduction to Data Science: Data Science-a discipline, Landscape-Data to Data science, Data Growth-issues and challenges, The data science Venn diagram, Foundations of data science.

Data Exploration and Preparation: Structured vs unstructured data, Quantitative vs qualitative data. Four levels of data – nominal, ordinal, interval, ration. Messy data, Anomalies and artifacts in datasets. Cleaning data.

The Five Steps of Data Science: Introduction to data science, Overview of the five steps: Ask an interesting question, Obtain the data, Explore the data, Model the data, Communicate and visualize the results.

Section-B

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

Data Modelling: Basics of Generative modeling and Predictive modeling.

Data Visualization and Presentation: Charts-histograms, scatter plots, time series plots etc. Graphs, 3D Visualization and Presentation.

Data Science and Ethical Issues:- Discussions on privacy, security, ethics; A look back at Data Science; Next-generation data scientists

Text Books:

1. S.J. Russell and P.Norvig: “Artificial Intelligence: A Modern Approach”, Pearson.
2. Sinan Ozdemir, “Principles of Data Science”, Packt Publishing.

Reference Books:

1. E.Rich, K.Knight, S.B. Nair: “Artificial Intelligence”, Tata McGraw Hill Ed Pvt Ltd.
2. Joel Grus: “Data Science from Scratch”, O’Reilly.
3. Foster Provost & Tom Fawcett: “Data Science for Business” O’Reilly
4. Roger D. Peng & Elizabeth Matsui: “The Art of Data Science” Lean Publishing.

MSAIDS-122

Web Analytics

5 CREDITS: 4H(L) + 1H(T)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Instructions for Paper Setter/Examiners

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

Section A

Web Analytics – Basics – Traditional Ways – Expectations – Data Collection – Clickstream Data – Weblogs – Beacons – JavaScript Tags – Packet Sniffing – Outcomes data – Competitive data – Search Engine Data.

Qualitative Analysis – Customer Centricity – Site Visits – Surveys – Questionnaires – Website Surveys – Post visits – Creating and Running- Benefits of surveys – Critical components of successful strategy.

Section B

Web Analytic concepts – URLS – Cookies – Time on site – Page views – Understand standard reports – Website content quality – Navigation reports (top pages, top destinations, site overlay). – Search Analytics – Internal search, SEO and PPC – Measuring Email and Multichannel Marketing - Competitive intelligence and Web 2.0 Analytics – Segmentation – Connectable reports.

Google Analytics: Analytics - Cookies - Accounts vs Property - Tracking Code - Tracking Unique Visitors - Demographics - Page Views & Bounce Rate Acquisitions - Custom Reporting.

Goals & Funnels – Filters - Ecommerce Tracking - Real Time Reports - Customer Data Alert - Adwords Linking - Adsense Linking -Attribution Modeling - Segmentation - Campaign Tracking - Multi-Channel Attribution.

References:

1. Avinash Kaushik, “Web Analytics 2.0: The Art of Online Accountability and Science Of Customer Centricity “, 1st edition, Sybex, 2009.
2. Michael Beasley, “Practical Web Analytics for User Experience: How Analytics can help you Understand your Users”, Morgan Kaufmann, 2013. 20
3. Magy Seif El-Nasr, Anders Drachen, Alessandro Canossa, eds., “Game Analytics: Maximizing the Value of Player Data”, Springer, 2013.
4. Bing Liu, “Web Data Mining: Exploring Hyperlinks, Content, and Usage Data”, 2 nd Edition, Springer, 2011.
5. Justin Cutroni, “Google Analytics”, O’Reilly, 2010.

6. Eric Fettman, Shiraz Asif, Feras Alhlou , “Google Analytics Breakthrough”, John Wiley & sons, 2016.

MSAIDS-123
Machine Learning with R
5 CREDITS: 5H(L)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Instructions for Paper Setter/Examiners

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

Section A

Introduction to R: R Installation Guide and Installing R Packages; Basic data types and data structures in R; Reading, writing, manipulating and visualizing data in R

Introduction to Machine Learning: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation

Linear Regression: Introduction, Definition, (Linear functions and other functions), Various Types of regression models, multiple linear regression, Assumption for errors, The least square regression line

Bayesian Learning: Bayes theorem, Bayes Optimal Classifier, Naïve Bayes classifier, Gibbs algorithm, Bayesian belief networks.

Section B

Classification Techniques: K-Nearest Neighbors, Support Vector Machines, Linear SVM formulation, Nonlinear SVM, Feature Space Kernel Function, KNN modeling, SVM modeling, Decision Trees

Neural networks: Perceptron, Multilayer Neural Network, Backpropagation Algorithm, Recurrent Networks.

Unsupervised Learning: Hierarchical Clustering, K-means Clustering, Expectation Maximization (EM) Algorithm.

Combining Multiple Classifiers: Voting, Bagging, Boosting, AdaBoost

Text Books:

1. Cory Lesmeister, Mastering Machine Learning with R, Packt Publishing
2. Abhijit Ghatak, Machine Learning with R, Springer

Reference Books:

1. Kevin Murphy, Machine Learning, MIT Press
2. Sebastian Raschka and Vahid Mirjalili, Python Machine Learning, Packt Publishing 28
3. Shai Shalev-Shwartz, Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press
4. Stephen Marsland, Machine Learning: An Algorithmic Perspective CRC Press
5. Machine Learning Online Course: http://nptel.ac.in/courses/106105152/

6. Chio, Machine Learning & Security Protecting Systems with Data, Shroff Publications and Distributors
7. Conway, Machine Learning for Hackers, Shroff Publications and Distributors

MSAIDS-124

Probability & Statistics in Data Science

5 CREDITS: 4H(L) + 1H(T)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Instructions for Paper Setter/Examiners

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

Section A

Collection of data, Measures of central tendency (Mean, Median, Mode) , Mean Deviation, Standard Deviation, Variance, Coefficient of Variation, Skewness, Kurtosis, Moments, Corelation(Karl Pearson Coeficient of correlation, Spearmans Rank Corelation) , Regression Analysis

Section B

Probability

Definition, Addition theorem, Independent Events, Conditional Probability, Bayes theorem, Random Variable , Binomial Distribution, Poisson Distribution, Normal Distribution.

Sampling:-

Sample , Hypothesis, Confidence Limits, Central Limit Theorem, Population, Universe, t-test, F-test, Chi- Square test, Anova

Text Books:-

1. Statistical Methods , SP Gupta , Sultan Chand and Sons.
2. Higher Engineering Mathematics , BS Grewal , Khanna Publishers.
3. A Text Book for Statistics , Goon and Gupta.

MSAIDS-125 E1
Data Warehousing & Mining
5 CREDITS: 4H(L) + 1H(T)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Instructions for Paper Setter/Examiners

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

Section A

Data Warehousing: Data warehousing Components –Building a Data warehouse –- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.
Business Analysis: Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multi-relational OLAP – Categories of Tools – OLAP Tools and the Internet.

Section B

Data Mining: Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Pre-processing.
Association Rule Mining And Classification: Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.
Clustering And Trends In Data Mining: Cluster Analysis - Types of Data – Categorization of Major Clustering Methods – K-means– Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications.

References:

1. Han, Kamber "Data Mining: Concepts and Techniques" Morgan Kaufmann
2. Romez Elmasri, Shamkant B.Navathe, *'Fundamentals of Database Systems'* Pearson Education.
3. Silberschatz, Korth, Sudershan "Database System Concepts" 4th Ed. McGraw Hill
4. Connolly & Begg "Database Systems – A practical approach to design, Implementation and Management, 3rd Ed. Pearson Education

MSAIDS-125 E2
Digital Marketing
5 CREDITS: 4H(L) + 1H(T)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Instructions for Paper Setter/Examiners

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

Section-A

Meaning and Definition of Marketing- Basics of Marketing, Features of Marketing, Importance of Marketing, Functions of Marketing, Core Concept of Marketing - Need, Want, Demand, Value and Satisfaction, Production-Concept, Product concept, selling concept Marketing concept, Marketing Mix: Meaning, Seven Ps of marketing mix.

Introduction to Digital Marketing- Key Concepts of Digital Marketing, Traditional Marketing vs. Digital Marketing, The Opportunity of Digital Marketing, Characteristics of Digital Marketing, Implications of Digital Marketing, Strategies in Digital Marketing.

Internet and WWW: Introduction to internet and its working, business use of internet, services offered by Internet, evaluation of internet, internet service provider (ISP), internet addressing (DNS and IP addresses). Introduction and working of WWW, Web browsing (opening, viewing, saving and printing a web page and bookmark).

Search Engine: About search engine, component of search engine, working of search engine, Difference between search engine and web directory.

SECTION B

HTML: Basics of HTML, HTML Tags, Elements of Web page (Text , Image & Hyperlink Elements).

SMO (Social Media Optimization) –Facebook, Twitter, YouTube-Introduction to Social Media, Types of Social Media, How Social Media is affecting Google Search, How to choose right social media, Integrating social media into your website and blogs, Facebook Marketing, Introduction to Facebook, Difference between Profiles, Places, Groups and Pages, Social media and communications strategy, Facebook Connect(Like, Share, Comment),Facebook pages(Creating, Managing, Retention), Facebook Apps, Measuring and Monitoring, Advantages and Challenges ,

Twitter Marketing: Introduction to Micro blogging and Twitter, Twitter Demographics, Use for reputation, promotion, sales, conversing, Who to follow, Tweeting, Searching tweets and users, Measuring Influence, Tools, Tracking Code, Twitter Account Promotion, How to Shorten and Measure your URLs , Photo Sharing Social Network : Picasa, Video Sharing Social Network : YouTube

Email Marketing: Introduction to Email Marketing, How Email Marketing Works, Sending Email

References:

1. William I. Stanton, Ajay Pandit-Marketing Concepts & Cases,- The McGraw Hill companies Ltd. New Delhi
2. Search Engine Optimization Bible, Jerri L. Ledford, Wiley Publishing
3. S.A.Sherlekar, “Marketing Management”, Himalaya Publishing House, Mumbai.
4. E. Stephen Mack, Janan Platt, “HTML 4.0” BPB Publications, New Delhi

MSAIDS-125 E3

Block Chain and Bitcoin Fundamentals

5 CREDITS: 4H(L) + 1H(T)

Teaching Hours per week: 5 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

Instructions for Paper Setter/Examiners

The Question paper will consist of three sections-A, B & C. Section A and B will have four questions each from the respective unit of the syllabus and will carry 10 marks each. Candidates are required to attempt two questions each from section A and B. Section C will consist of 10 short answer type questions covering entire syllabus and will carry 3 marks each. Section C is Compulsory.

SECTION A

Blockchain definition: Bitcoin & Blockchain, Blockchain Structure, Basic Operations. **Ethereum Blockchain:** Smart Contracts, Ethereum Structure, Ethereum Operations.

Integrity of transactions and blocks in blockchain: Algorithms & Techniques: Public-Key Cryptography, Hashing, Transaction Integrity.

Introduction to Crypto and Cryptocurrencies: Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities.

SECTION B

Mechanics of Bitcoin : components of the Bitcoin protocol ,Bitcoin Transactions, Bitcoin Scripts, Applications of Bitcoin Scripts, Bitcoin Blocks, The Bitcoin Network.

How Bitcoin Achieves Decentralization: Centralization vs. Decentralization, Distributed Consensus, Consensus without Identity: the Block Chain, Incentives and Proof of Work

How to Store and Use Bitcoins: Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges,Payment Services,Transaction Fees,Currency Exchange Markets

Reference Books:

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos
2. Blockchain by Melanie Swa, O'Reilly
3. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
4. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits
5. https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

MSAIDS-126
Software Lab-II and Minor Project (Based on MSAIDS-123)
2 CREDITS: 4H(P)

Teaching Hours per week: 4 **Internal Assessment: 30Marks**
Time Allowed: 3Hrs. **External Marks: 70Marks**
Pass Marks: 35%

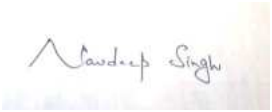
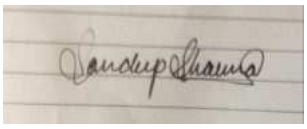
This laboratory course will mainly comprise of exercises based on subject MSAIDS-123: Machine Learning with R and a minor project is to be made by the students based on MSAIDS-123.

The Break-up of Marks for Practical exams (External) will be as under:

1. Viva Voce 20Marks
2. Program Development and Execution 30Marks
3. File Record 20Marks

Members of Board of Studies


1. Dr. Surender Kumar **2. Dr. Dharamveer Sharma** **3. Dr. Major Singh Goraya**

4. Dr. Navdeep Singh **5. Mr. Sandeep Sharma** **6. Mr. Rakesh Kumar**

7. Prof. Tajinder Kaur **8. Prof. Paramjit Kaur** **9. Prof. Amandeep Kaur**