SYLLABUS FOR THE BATCH FROM THE YEAR 2023 TO YEAR 2026

Programme Code: BAIDS

Programme Name: B.Sc. (Artificial Intelligence & Data Science)

(Semester I-VI)

Examinations: 2023-2026

P.G. Department of Computer Science & Applications

Khalsa College, Amritsar

Programme name: B.Sc. (Artificial Intelligence & Data Science)
Programme code: BAIDS
Programme Duration :3 years/4 years (as per NEP 2020)

Programme Objectives

1.	The main objective of this Programme is to enable the students to get a very good exposure to the field of artificial intelligence and data science.
2.	This Programme aims to equip the students with statistical and mathematical reasoning, machine learning to develop their own customized data science algorithms needed for deriving insights from very large data sets.
3.	To prepare students with the skills to perform intelligent data analysis that is a key component in numerous real-world applications.
4.	Expertized with the principles of Artificial Intelligence and problem solving, inference, perception, knowledge representation, and machine learning.
5.	To exhibit high standards with regard to application of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

Programme Specific Outcomes (PSOs):

PSO-1.	Students gain knowledge in the areas like Soft Computing, Artificial Intelligence, Data Science, Paradigm of Programming language, Design and Analysis of Algorithms, Database Technologies core computing subjects.
PSO-2.	Students understand all dimensions of the concepts of software application and projects.
PSO-3.	To make students employable according to current demand of Data Science & Artificial Intelligence Industry.
PSO-4.	Work in a collaborative manner with others on a team, contributing to the management, planning and implementation of a computer system.

B.Sc. (Artificial Intelligence & Data Science)

Semester – I

SN	Course Code	Course Name	Distribution of The Marks				Lectures Per week			Credit Distribution			Total Credit L+T+P	Page No.
			Theory	Internal Assessment	Practical	Total	L	T	P	L	T	P		
Discipline Specific Course(DSC)														
1	BAIDS-111	Basics of AI & Data Science	75	25	-	100	5	1	0	3	1	0	4	4-5
2	BAIDS-112	Computational Problem-Solving Using Python	75	25	-	100	5	1	0	3	1	0	4	6-7
3	BAIDS-113	Big Data Analytics	75	25	-	100	5	1	0	3	1	0	4	8-9
Ability Enhancement Course (AEC)														
4	BCSE-1122	Communication Skills in English	60	25	15	100	4	0	2	3	0	1	4	10-11
5	BHPB-1101/ BPBI-1102 /BPHC-1104	Punjabi/ Basic Punjabi (Mudhli Punjabi) (Compulsory)/ Punjab History & Culture	75	25	-	100	6	0	0	4	0	0	4	12 13 14-15
Skill Enhancement Course(SEC)														
6	BAIDS-114P	LAB I: Computational Problem-Solving Using Python	-	25	75	100	0	0	6	0	0	4	4	16
7	BAIDS-115P	Lab II: MS Office 2010/Open Office	-	25	75	100	0	0	6	0	0	4	4	17-18
Value Added Course(VAC)														
8	ZDA111	*Drug Abuse: Problem, Management and Prevention(Compulsory paper)	-	-	-	50	3	0	0	2	0	0	2	19-20
													Total Credits=30	

Note: * This paper marks will not be included in the total marks.

B.Sc. (Artificial Intelligence & Data Science)
Semester – I
BAIDS-111: Basics of AI & Data Science
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	T	P
3	1	0

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

The main objective of this course is to help the students to understand the basic concepts of artificial intelligence and data science.

UNIT-I

Introduction to Artificial Intelligence: Definition of AI, History of AI, Intelligent Agents, Different types of agents, Problem solving.

Uninformed Search: Breadth First Search, Depth First Search, Depth-Limited Search, Iterative Deepening search.

Heuristic Search technologies: Introduction to heuristic search, Generate and test, Hill Climbing, Best First search, A*, Problem reduction, AO*, Constraint satisfaction.

UNIT-II

Knowledge, Reasoning and Planning: Logical Agents, Classical Planning, A brief introduction to Knowledge representation and Reasoning.

Learning: Learning from examples, Knowledge in learning.

Communicating, perceiving, and Acting: Communication, Natural Language Processing, Perception, Robotics.

Introduction to Data Science: Need for Data Science, Benefits of Data Science, Foundation of Data Science, Data Science process.

UNIT-III

Data Exploration and Preparation: Messy data, Anomalies and artefacts in datasets, Cleaning data.

Data Representation and Transformation: Forms of data- tabular, text data, graph-based data, Modern databases- text files, spreadsheets, SQL databases, NoSQL databases, distributed databases, live data streams.

UNIT-IV

Data modelling: Basics of Generative Modelling and Predictive Modelling.

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

References:

1. S.J. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Pearson.
2. Rich Elaine, Knight Kevin, and Shankar B. Nair, "Artificial Intelligence, Third Edition, Tata-McGraw Hill.
3. Sinan Ozdemir: "Principles of Data Science", Pack Publishing.
4. Foster Provost and Tom Fawcett, "Data Science for Business" O'Reilly.
5. Roger D. Peng & Elizabeth Matsui: "The Art of Data Science" Lean Publishing.

Course Outcomes (Cos):

On the completion of this course, the students will be able:

CO-1.	To familiarize with the concept of artificial intelligence, intelligent agents and different searching techniques.
CO-2.	To understand the basic areas of artificial intelligence including knowledge representation, reasoning, learning, natural language processing, and robotics.
CO-3.	To understand the different needs and benefits of data science.
CO-4.	To acquire the knowledge of preprocessing techniques which are required for the conversion of raw data to the form helpful for further analysis.
CO-5.	To acquire in-depth knowledge about the different methods of data representation and data visualization.

B.Sc. (Artificial Intelligence & Data Science)

Semester – I

BAIDS-112: Computational Problem-Solving Using Python

Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	Demonstrate the ability to solve problems using system approaches, critical and innovative thinking, and technology to create solutions.
2.	Understand the purpose and technology to create solutions.
3.	Create scripts in Python.
4.	Design and develop applications using Python.

UNIT I

Python Introduction: Installing and setting Python environment in Windows and Linux, basics of Python interpreter, Execution of python program, Editor for Python code, syntax, variable, types.

Flow control: if, if-else, for, while, range function, continue, pass, break. Strings: Sequence operations, String Methods, Pattern Matching.

Lists: Basic Operations, Iteration, Indexing, Slicing and Matrixes; Dictionaries: Basic dictionary operations; Tuples and Files.

UNIT II

Functions: Definition, Call, Arguments, Scope rules and Name resolution; Modules: Module Coding Basics, Importing Programs as Modules, Executing Modules as Scripts, Compiled Python files(.pyc).

Standard Modules: OS and SYS, The dir() Function, Packages.

Input output and file handling, Object Oriented Programming features in Python: Classes, Objects, Inheritance, Operator Overloading.

UNIT III

Errors and Exceptions: try, except and else statements, Exception Objects, Regular expressions, Multithreading, Modules to handle multidimensional data: Numpy, Panadas.

Networking: Socket module, Port Scanning, Packet Sniffing, Traffic Analysis, TCP Packet Injection, Log analysis. HTTP Communications with Python built in Libraries, Web communications with the Requests module.

UNIT-IV

Forensic Investigations with Python: geo-locating, recovering deleted items, examining metadata and windows registry.

References:

1 . Lutz Mark, (2009). Learning Python, Latest Edition., O'REILLY Media, Inc.

2. TJ. O'Connor, Violent Python A Cookbook for Hackers, Forensic Analysts, Penetration Testers and Security Engineers(2013), Elsevier.

3. Seitz Justin , (2009). Gray Hat Python: Python Programming with Hackers and Reverse Engineers, Latest Edition, No Starch Press, Inc.

4. Seitz Justin , (2015). Black Hat Python: Python Programming for Hackers and Pentesters, Latest Edition, No Starch Press, Inc

5. Berry Paul, (2011). Head First Python. Latest Edition, O'REILLY Media, Inc.

Course Outcomes:

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

CO-1.	Describe the core syntax and semantics of Python programming language.
CO-2.	Discover the need for working with the strings and functions.
CO-3.	Illustrate the process of structuring the data using lists and dictionaries.
CO-4.	Infer the Object-oriented Programming concepts in Python.
CO-5.	To develop the ability to write database applications in Python.

B.Sc. (Artificial Intelligence & Data Science)
Semester – I
BAIDS-113: Big Data Analytics
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	The Major objective is to optimize business decisions and create competitive advantage with Big Data analytics.
2.	This course provides an overview of Big Data, i.e. storage, retrieval and processing of big data.
3.	It also helps to use various techniques for mining data stream in with reference to big data.
4.	Provide an overview of Apache Hadoop along with understanding of Map Reduce Job.
5.	Exposure to Data Analytics with R Programming Language.

UNIT-I

INTRODUCTION TO BIG DATA: Data Storage and Analysis, Characteristics of Big Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data,3Vs of Big Data, Business Intelligence vs. Big Data. Big Data Analytics: Classification of analytics, Data Science Terminologies in Big Data, CAP Theorem, BASE Concept.

UNIT-II

BASICS OF HDFS (Hadoop Distributed File System): History of Hadoop, Requirement of Hadoop Framework, Design principles of Hadoop, Comparison with other system, Hadoop Distributed File System, Components of Hadoop, Analysing the Data with Hadoop, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume.

Map Reduce: Introduction to Map Reduce, Anatomy of a Map Reduce Job Run, Job Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

UNIT-III

Hadoop Ecosystems: Hive Architecture, Data type, File format, Hive Shell, Hive Services, Hive Meta store, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.

UNIT-IV

Introduction to R Language: Exploratory Data Analytics-Statistical methods for evaluation Hadoop & Map Reduce framework for R, R with Relational Database Management Systems, R with Non-Relational (NoSQL) DBs.

References:

1. Tom White " Hadoop: The Definitive Guide" Third Edition, O'reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
3. Tom White, "Hadoop: The Definitive Guide",O'Reilly,4th Edition,2015.
4. Donald Miner, Adam Shook, "Map Reduce Design Pattern", O'Reilly, 2012
5. Simon Walkowiak, "Big Data Analytics with R" Packet Publishers, 2016

Course Outcomes:

After successful completion of this course, the students will be able to:

CO-1	Understand Big Data and its analytics in the real world.
CO-2	Access and Process Data on Distributed File System using various jobs in Hadoop.
CO-3	Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm.
C0-4	Implement Big Data Activities using Hive.
CO-5	Use of R programming language for implementing Machine Learning Techniques.

B.Sc. (Artificial Intelligence & Data Science)

Semester – I

COMMUNICATION SKILLS IN ENGLISH
Code: BCSE-1122

Time: 3 Hours **Max. Marks: 100**

L	T	P	Credits
3	0	1	4

Theory: 60
Practical: 15
Internal Assessment: 25

Suggested Pattern of Question Paper:
The question paper will be divided into two sections. Section A will consist of Twelve(12) questions of One(1) mark each. Section B will consist of Six questions of Eight(8) marks each. There will be internal choice wherever possible.

Section A

1. Do as directed
   Articles, Conjunctions and Prepositions

(12X1=12 Marks)

Section B

1. Reading Skills: Reading Tactics and strategies; Reading purposes–kinds of purposes; Reading for direct meanings.
2. Comprehension questions of an unseen passage
3. Personal letter and Official/Business letters
4. Writing notices/agenda/minutes for public circulation on topics of professional interest.
5. Writing resume or converting a biographical note into resume

6. Translation from English to Vernacular (Punjabi/ Hindi) (Isolated Sentences)

(6X8=48 Marks)

Course Objectives:

I: To develop competence in written communication.
II: To inculcate innovative and critical thinking among the students.
III: To enable them to grasp the application of communication theories.
IV: To acquire knowledge of the latest technology related to communication skills.
V: To provide knowledge of multifarious opportunities in the field of this programme.

Course Contents:

1. **Reading Skills**: Reading tactics and strategies; Reading purposes–kinds of purposes and associated comprehension; Reading for direct meanings; Reading for understanding concepts, details, coherence, logical progression and meanings of phrases/ expressions.

Activities:

a. Active reading of passages on general topics
b. Reading newspaper, articles, editorials etc.
c. Short questions based on content and development of ideas of a given paragraph.

2. **Writing Skills**: Guidelines for effective writing; writing styles for application, resume, personal letter, official/ business letter, memo, notices etc.

Activities:

a) Personal and business letters.
b) Converting a biographical note into a sequenced resume.
c) Writing notices for circulation/ boards.

d) Making notes of given passage with headings and sub-headings
e) Writing newspaper reports based on given heading.

Recommended Books:

1. *Oxford Guide to Effective Writing and Speaking* by John Seely.
2. *The Written Word* by Vandana R Singh, Oxford University Press.
3. Murphy's English Grammar (by Raymond Murphy) CUP.

Course Outcomes:

The completion of this course enables students to:

1. Identify common errors in language and rectify them.
2. Develop and expand writing skills through controlled and guided activities.
3. Develop coherence, cohesion and competence in written discourse through intelligible pronunciation.
4. Develop the ability to handle the interview process confidently and learn the subtle nuances of an effective group discourse.
5. Communicate contextually in specific and professional situations with courtesy.

PRACTICAL (Marks: 15)

Course Contents:-

1. Reading dialogues (5 Marks)
2. Rapid reading (5 Marks)
3. Project File (5 Marks)

B.Sc. (Artificial Intelligence & Data Science)

Semester – I

Compulsory Course

ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ

Credit & Marks Distribution, Eligibility and Pre-Requisites of the Course

Course title & Code	Total Teaching Hours	Credits	Credit distribution			Total Marks 100		Time Allowed in Exam	Eligibility criteria	Pre-requisite of the course (if any)
			Lecture	Tutorial	Practical	Theory	Internal Assessment			
ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ **BHPB-1101**	60	4	4	0	0	75	25	3 Hours	Class 12th pass in any stream	Studied Punjabi up to 10th Standard

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective	**ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)**
▪ ਵਿਦਿਆਰਥੀਆਂ ਵਿਚ ਸਾਹਿਤਕ ਰੁਚੀਆਂ ਪੈਦਾ ਕਰਨਾ। ▪ ਆਲੋਚਨਾਤਮਕ ਰੁਚੀਆਂ ਵਿਕਸਤ ਕਰਨਾ। ▪ ਮਾਤ ਭਾਸ਼ਾ ਦੀ ਸਮਝ ਨੂੰ ਵਿਕਸਤ ਕਰਨਾ।	▪ ਉਸ ਵਿਚ ਸਾਹਿਤ ਰੁਚੀਆਂ ਵਿਕਸਤ ਹੋਣਗੀਆਂ। ▪ ਉਸ ਵਿਚ ਸਾਹਿਤ ਸਿਰਜਣਾ ਦੀ ਸੰਭਾਵਨਾ ਵਧੇਗੀ। ▪ ਉਸ ਵਿਚ ਕਿਸੇ ਵੀ ਵਿਸ਼ੇ ਦਾ ਗਹਿਨ ਅਧਿਐਨ ਕਰਨ ਦਾ ਬੋਧ ਹੋਵੇਗਾ। ▪ ਉਹ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੇ ਨਿਕਾਸ ਤੇ ਵਿਕਾਸ ਬਾਰੇ ਗਿਆਨ ਹਾਸਲ ਕਰਨਗੇ

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ। ਪਹਿਲੇ ਭਾਗ ਵਿਚ 1.5-1.5 (ਡੇਢ-ਡੇਢ) ਅੰਕ ਦੇ ਅਤਿ-ਸੰਖੇਪ (Objective Type) 10 ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜੋ ਕਿ ਸਾਰੇ ਸਿਲੇਬਸ ਵਿਚੋਂ ਹੋਣਗੇ। ਸਿਲੇਬਸ ਦੇ ਬਾਕੀ ਚਾਰ ਭਾਗਾਂ ਵਿਚ 02-02 ਲੇਖ ਨੁਮਾ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰੇਕ ਭਾਗ ਵਿਚੋਂ 01-01 ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੋਵੇਗਾ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 15 ਅੰਕ ਹੋਣਗੇ। ਪੇਪਰ ਸੈੱਟਰ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 25 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵੱਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਥਿਊਰੀ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ 75+25= 100 ਹਨ।

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਸਾਹਿਤ ਦੇ ਰੰਗ, ਡਾ. ਮਹਿਲ ਸਿੰਘ (ਸੰਪਾ.), ਰਵੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
ਭਾਗ ਪਹਿਲਾ - ਕਵਿਤਾ ਅਤੇ ਕਹਾਣੀ, ਡਾ. ਮਹਿਲ ਸਿੰਘ ਅਤੇ ਡਾ. ਆਤਮ ਰੰਧਾਵਾ (ਸਹਿ ਸੰਪਾ.)
(ਕਵਿਤਾ ਭਾਗ ਵਿਚੋਂ ਪ੍ਰਸੰਗ ਸਹਿਤ ਵਿਆਖਿਆ/ਵਿਸ਼ਾ-ਵਸਤੂ। ਕਹਾਣੀ ਭਾਗ ਵਿਚੋਂ ਸਾਰ/ਵਿਸ਼ਾ-ਵਸਤੂ)

ਭਾਗ-ਦੂਜਾ

ਪੰਜਾਬ ਦੇ ਮਹਾਨ ਕਲਾਕਾਰ (ਸੰਪਾ. ਬਲਵੰਤ ਗਾਰਗੀ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।
(ਅੰਮ੍ਰਿਤਾ ਸ਼ੇਰਗਿੱਲ ਤੋਂ ਭਾਈ ਸਮੁੰਦ ਸਿੰਘ ਤਕ)
(ਵਿਸ਼ਾ-ਵਸਤੂ/ਸਾਰ/ਨਾਇਕ ਬਿੰਬ)

ਭਾਗ-ਤੀਜਾ

(ੳ) ਪੈਰ੍ਹਾ ਰਚਨਾ (ਤਿੰਨਾਂ ਵਿਚੋਂ ਇਕ)
(ਅ) ਪੈਰ੍ਹਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ

ਭਾਗ-ਚੌਥਾ

(ੳ) ਭਾਸ਼ਾ ਵੰਨਗੀਆਂ: ਭਾਸ਼ਾ ਦਾ ਟਕਸਾਲੀ ਰੂਪ, ਭਾਸ਼ਾ ਅਤੇ ਉਪ-ਭਾਸ਼ਾ ਵਿਚਲਾ ਅੰਤਰ, ਪੰਜਾਬੀ ਉਪ-ਭਾਸ਼ਾਵਾਂ ਦੇ ਪਛਾਣ-ਚਿੰਨ੍ਹ।
(ਅ) ਪੰਜਾਬੀ ਭਾਸ਼ਾ: ਨਿਕਾਸ ਤੇ ਵਿਕਾਸ।

B.Sc. (Artificial Intelligence & Data Science)
Semester – I
Compulsory Course
ਮੁਢਲੀ ਪੰਜਾਬੀ
(In Lieu of Compulsory Punjabi)

Credit & Marks Distribution, Eligibility and Pre-Requisites of the Course

Course title &Code	Total Teaching Hours	Credits	Credit distribution			Total Marks 100		Time Allowed in Exam	Eligibility criteria	Pre-requisite of the course (if any)
			Lecture	Tutorial	Practical	Theory	Internal Assessment			
ਮੁਢਲੀ ਪੰਜਾਬੀ **BPBI-1102**	60	4	4	0	0	75	25	3 Hours	Class 12th pass in any stream	NOT Studied Punjabi up to 10th Standard

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective	**ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)**
• ਵਿਦਿਆਰਥੀ ਨੂੰ ਗੁਰਮੁਖੀ ਲਿਪੀ ਤੋਂ ਜਾਣੂ ਕਰਾਉਣਾ। • ਵਿਦਿਆਰਥੀ ਨੂੰ ਸ਼ੁੱਧ ਪੰਜਾਬੀ ਪੜ੍ਹਨਾ-ਲਿਖਣਾ ਸਿਖਾਉਣਾ। • ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀਆਂ ਵਿਆਕਰਨਕ ਬਾਰੀਕੀਆਂ ਤੋਂ ਜਾਣੂ ਕਰਾਉਣਾ। • ਸ਼ੁੱਧ ਸੰਚਾਰ ਨੂੰ ਵਿਕਸਤ ਕਰਨਾ।	• ਵਿਦਿਆਰਥੀ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਤੇ ਗੁਰਮੁਖੀ ਲਿਪੀ ਦੀ ਸਿਖਲਾਈ ਵਿਚ ਮੁਹਾਰਤ ਹਾਸਲ ਕਰਨਗੇ। • ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਵਿਚ ਮੁਹਾਰਨੀ, ਲਗਾਂ-ਮਾਤਰਾਂ, ਸਵਰ ਅਤੇ ਵਿਅੰਜਨ ਅੱਖਰਾਂ ਦੀ ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ ਸੰਬੰਧੀ ਸਮਝ ਵਿਕਸਿਤ ਹੋਵੇਗੀ। • ਪੰਜਾਬੀ ਸ਼ਬਦ-ਜੋੜਾਂ ਦੀ ਜਾਣਕਾਰੀ ਹਾਸਲ ਕਰਕੇ ਉਹ ਸ਼ੁੱਧ ਪੰਜਾਬੀ ਲਿਖਣ-ਪੜ੍ਹਨ ਦੇ ਸਮਰੱਥ ਹੋਣਗੇ। • ਉਹ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੇ ਸ਼ੁੱਧ ਰੂਪਾਂ ਦੀ ਜਾਣਕਾਰੀ ਹਾਸਲ ਕਰਨਗੇ।

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ। ਪਹਿਲੇ ਭਾਗ ਵਿਚ 01-01 ਅੰਕ ਦੇ ਅਤਿ-ਸੰਖੇਪ ਉੱਤਰ ਵਾਲੇ (Objective Type) 11 ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜੋ ਕਿ ਸਾਰੇ ਸਿਲੇਬਸ ਵਿਚੋਂ ਹੋਣਗੇ। ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਦੂਸਰੇ ਭਾਗ ਵਿਚ, ਸਿਲੇਬਸ ਦੇ ਪਹਿਲੇ ਭਾਗ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿੰਨਾਂ ਵਿਚੋਂ ਕੋਈ ਦੋ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 8-8 ਅੰਕ ਹੋਣਗੇ। ਇਸੇ ਤਰ੍ਹਾਂ ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਤੀਸਰੇ ਭਾਗ ਵਿਚ ਤਿੰਨ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜਿੰਨਾਂ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 8-8 ਅੰਕ ਹੋਣਗੇ। ਭਾਗ ਚੌਥੇ ਵਿਚ ਪੰਜ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿੰਨਾਂ ਵਿਚੋਂ ਚਾਰ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 4-4 ਅੰਕ ਹੋਣਗੇ। ਭਾਗ ਪੰਜਵੇਂ ਵਿਚ ਦਸ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿੰਨਾਂ ਵਿਚੋਂ 8 ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਲਾਜ਼ਮੀ ਹੋਣਗੇ। ਹਰ ਪ੍ਰਸ਼ਨ ਦੇ 2-2 ਅੰਕ ਹੋਣਗੇ।
ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 25 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵੱਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਥਿਊਰੀ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ 75+25 = 100 ਹਨ।

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

(ੳ) ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਤੇ ਗੁਰਮੁਖੀ ਲਿਪੀ: ਨਾਮਕਰਣ ਤੇ ਸੰਖੇਪ ਜਾਣ-ਪਛਾਣ: ਗੁਰਮੁਖੀ ਵਰਣਮਾਲਾ, ਅੱਖਰ ਕ੍ਰਮ, ਸਵਰ ਵਾਹਕ (ੳ, ਅ, ੲ), ਲਗਾਂ-ਮਾਤਰਾਂ, ਪੈਰ ਵਿਚ ਬਿੰਦੀ ਵਾਲੇ ਵਰਨ, ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਨ, ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ
(ਅ) ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ

ਭਾਗ-ਦੂਜਾ

ਗੁਰਮੁਖੀ ਆਰਥੋਗਰਾਫੀ ਅਤੇ ਉਚਾਰਨ: ਸਵਰ, ਵਿਅੰਜਨ: ਮੁਢਲੀ ਜਾਣ-ਪਛਾਣ ਅਤੇ ਉਚਾਰਨ, ਮੁਹਾਰਨੀ, ਲਗਾਂ-ਮਾਤਰਾਂ ਦੀ ਪਛਾਣ

ਭਾਗ-ਤੀਜਾ

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਜੋੜ: ਮੁਕਤਾ (ਦੋ ਅੱਖਰਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਤਿੰਨ ਅੱਖਰਾਂ ਵਾਲੇ ਸ਼ਬਦ), ਸਿਹਾਰੀ ਵਾਲੇ ਸ਼ਬਦ, ਬਿਹਾਰੀ ਵਾਲੇ ਸ਼ਬਦ, ਔਂਕੜ ਵਾਲੇ ਸ਼ਬਦ, ਦੁਲੈਂਕੜ ਵਾਲੇ ਸ਼ਬਦ, ਲਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਦੁਲਾਵਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਹੋੜੇ ਵਾਲੇ ਸ਼ਬਦ, ਕਨੌੜੇ ਵਾਲੇ ਸ਼ਬਦ, ਲਗਾਖਰ (ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ) ਵਾਲੇ ਸ਼ਬਦ

ਭਾਗ-ਚੌਥਾ

ਸ਼ੁੱਧ-ਅਸ਼ੁੱਧ ਸ਼ਬਦ

B.Sc. (Artificial Intelligence & Data Science)
Semester – I

PUNJAB HISTORY & CULTURE (From Earliest Times to C 320)(Special Paper in lieu of Punjabi compulsory)

(For those students who are not domicile of Punjab)
Course Code: BPHC-1104

Credit Hours (per week): 04
L- T- P
4-0-0
Time: 3 Hours
Total Marks: 100
Theory: 75
Internal Assessment: 25

Instructions for the Paper Setters:
Question paper should consist of two sections—Section A and Section B. The paper setter must ensure that questions in Section–A do not cover more than one point, and questions in Section–B should cover at least 50 per cent of the theme.

Section–A: The examiner will set 15 objective type questions out of which the candidate shall attempt any 10 questions, each carrying 1½ marks. The total weightage of this section will be 15 marks. Answer to each question should be in approximately one to two sentences.

Section–B: The examiner will set 8 questions, two from each Unit. The candidate will attempt 4 questions selecting one from each Unit in about 1000 words. Each question will carry 15 marks. The total weightage of this section will be 60 marks.
Note: **The examiner is to set the question paper in two languages: English & Hindi.**

Course Objectives: The main objective of this course is to educate the history and culture of the Ancient Punjab to the students who are not domicile of the Punjab. It aims to familiarize these students with the physical features of ancient Punjab and its impact on its history and culture. It also provides them information about the different sources to construct the history and culture of the ancient Punjab. The course intends to provide knowledge of social, economic, religious life of the Harappan civilization, Indo-Aryans, teachings and impact of Jainism and Buddhism in the Punjab.

Unit-I

1. Physical features of the Punjab and impact on history.
2. Sources of the ancient history of Punjab.

Unit-II

3. Harappan Civilization: Town planning; social, economic and religious life of the Indus Valley People.
4. The Indo-Aryans: Original home and settlement in Punjab.

Unit-III

5. Social, Religious and Economic life during Rig Vedic Age.
6. Social, Religious and Economic life during later Vedic Age.

Unit-IV

7. Teachings and impact of Buddhism.
8. Jainism in the Punjab.

Suggested Readings:-

a. L. Joshi (ed), *History and Culture of the Punjab*, Art-I, Patiala, 1989 (3rd edition)

b. L.M. Joshi and Fauja Singh (ed*), History of Punjab*, Vol. I, Patiala 1977.

c. Budha Parkash, *Glimpses of Ancient Punjab*, Patiala, 1983.

d. B.N. Sharma, *Life in Northern India*, Delhi. 1966.

Course Outcomes:

On Completing the Course, the Students will be able to :

CO-1 Learn the history and culture of the Ancient Punjab.
CO-2 Study the physical features of ancient Punjab.
CO-3 Understand about the sources of the history of the Punjab.
CO-4 Analyse the social, economic, religious life of the Harappan civilization and Vedic-Aryans.
CO-5 Learn the teachings and impact of Jainism and Buddhism in the Punjab

B.Sc. (Artificial Intelligence & Data Science)
Semester – I
BAIDS-114P (Practical)
LAB I: Computational Problem-Solving Using Python
Skill Enhancement Course (SEC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
0	**0**	**4**

Practical Marks: 75

Internal Assessment Marks:25

Course Objectives:

Enable the student to

1.	Understand the basics of python programming concepts.
2.	Develop programs using object-oriented features, graphical user interfaces and image processing
3.	Understand the high-performance programs designed to build up the real proficiency.

Course Outcomes:

Students will be able to

CO-1.	Describe the Control statement, String, List, and Dictionaries in Python.
CO-2.	Understand the different types of function and File handling operations.
CO-3.	Interpret Object oriented programming in Python
CO-4.	Build the interactive python application using GUI.
CO-5.	Develop a multithreading and network application.

B.Sc. (Artificial Intelligence & Data Science) Semester – I

BAIDS-115P (Practical)
Lab II: MS Office 2010/Open Office
Skill Enhancement Course (SEC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
0	**0**	**4**

Practical Marks: 75

Internal Assessment Marks:25

Course Objectives:

Enable the student to

1.	To be proficient in office automation applications.
2.	Handle the word processing software.
3.	Understand that in In Today's commercial world, automation helps the users with a sophisticated set of commands to format, edit, and print text documents.
4.	Use it as valuable and important tools in the creation of applications such as newsletters, brochures, charts, presentation, documents, drawings and graphic images.

MS Office 2010/Open Office

MS–Word 2010:

1. Introduction to Parts of Word Window
2. Creating New Documents, Saving Documents, Opening an Existing documents, insert a second document into an open document, Editing and formatting in document.
3. Page Setup
4. Headers and Footers
5. Creating a Table Using the Table Menu and table formatting
6. Borders and Shading
7. Spell Checking
8. Mail Merge

MS Power Point 2010:

1. Power point elements Templates, Wizards, Views, Exploring Power Point Menu
2. Working with Dialog Boxes, Adding Text, Adding Title, Moving Text Area, Resizing Text Boxes
3. Adding Art, Starting a New Slide, Starting Slide Show, Saving presentation.
4. Printing Slides
5. Views (View slide sorter view, notes view, outlines view)

6. Formatting and enhancing text formatting

7. Creating Graphs (Displaying slide show and adding multi–media)

MS Excel 2010:

1. Spreadsheet Components: The Excel Environment Excel Window Components Enhanced ScreenTips , Examining Excel Window Components
2. Getting Help The Excel Help Window , Getting Help with Using Excel
3. Navigating a Worksheet Navigation Methods , Navigating a Worksheet
4. Entering and Editing Data, Editing Cell Contents Using AutoFill
5. Entering and Editing Formulas, Creating a Basic Formula
6. Working with Pictures Add an Image to a Worksheet
7. Saving and Updating Workbooks
8. Entering a SUM Function , AutoSum , AVERAGE Function , MIN MAX Function COUNT and COUNTA.

Course Outcomes:

The student will be able to

CO-1.	Use word processors, spreadsheets, presentation software.
CO-2.	Describe the features and functions of the categories of application software.
CO-3.	Understand the dynamics of an office environment.
CO-4.	Demonstrate the ability to apply application software in an office environment.

B.Sc. (Artificial Intelligence & Data Science)
Semester – I
Course Code: ZDA111
Course Title- Drug Abuse: Problem, Management and Prevention
PROBLEM OF DRUG ABUSE
(Compulsory for all Under Graduate Classes)

Credit hrs./wk.:2

Time: 3 Hours Max. Marks: 50

Instructions for the Paper Setters:

1) There will be a total of 9 questions of which 5 are to be attempted.
2) Question 1 is compulsory and having 10 short answer type questions (1 mark each).
3) The remaining 8 questions (10 marks each) shall include 2 questions from each unit. Candidates shall be required to attempt 4 questions, one from each unit. Preferably, the question should not be split into more than two sub-parts.

Course Objectives- The course aims to:

CO-1.	Generate the awareness against drug abuse.
CO-2.	Describe a variety of models and theories of addiction and other problems related to substance abuse.
CO-3.	Describe the behavioral, psychological, physical health and social impact of psychoactive substances.
CO-4.	Provide culturally relevant formal and informal education programs that raise awareness and support for substance abuse prevention and the recovery process.
CO-5.	Describe factors that increase likelihood for an individual, community or group to be at risk of substance use disorders.

UNIT–I

- **Meaning of Drug Abuse**

Meaning of drug abuse
Nature and Extent of Drug Abuse: State and National Scenario

UNIT-II

- **Consequences of Drug Abuse for**

Individual: Education, Employment, Income.
Family : Violence.
Society : Crime.
Nation : Law and Order problem.

UNIT-III

- **Management of Drug Abuse**

Medical Management: Medication for treatment of different types of drug abuses.
Medication to reduce withdrawal effects.

UNIT-IV

- Psychiatric Management: Counseling, Behavioral and Cognitive therapy.
- Social Management: Family, Group therapy and Environmental Intervention.

References:

1. Ahuja, Ram (2003), Social Problems in India, Rawat Publication, Jaipur.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. The Drug Crime Connection. Beverly Hills: Sage Publications. 23
4. Jasjit Kaur Randhawa & Samreet Randhawa, "Drug Abuse-Problem, Management & Prevention", KLS, ISBN No. 978-81-936570-6-5, (2018).
5. Jasjit Kaur Randhawa & Samreet Randhawa, "Drug Abuse Problem, Management & Prevention", KLS, ISBN No. 978-81-936570-8-9, (2019).
6. Jasjit Kaur Randhawa & Samreet Randhawa, "voZrI d[otos'A^(BPky'oh) ;wZf;nk, gqpzXB ns/o'eEkw", KLS, ISBN No. 978-81-936570-7-1, (2018).
7. Jasjit Kaur Randhawa, "Drug Abuse -Management & Prevention", KLS, ISBN No. 978-93-81278-80-2, (2018).
8. Kapoor. T. (1985) Drug epidemic among Indian Youth, New Delhi: Mittal Pub.
9. Modi, Ishwar and Modi, Shalini (1997) Drugs: Addiction and Prevention, Jaipur: Rawat Publication.
10. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
11. Rama Gandotra & Jasjit Kaur Randhawa, "voZrI d[otos'A^(BPky'oh) gqpzXB ns/ o'eEkw", KLS, ISBN No. 978-93-81278-87-1, (2018).
12. Sain, Bhim 1991, Drug Addiction Alcoholism, Smoking obscenity New Delhi: Mittal Publications.
13. Sandhu, Ranvinder Singh, 2009, Drug Addiction in Punjab: A Sociological Study. Amritsar. Guru Nanak Dev University.
14. Singh, C. P. 2000. Alcohol and Dependence among Industrial Workers: Delhi: Shipra.
15. Sussman, S and Ames, S.L. (2008). Drug Abuse: Concepts, Prevention and Cessation, Cambridge University Press.
16. World Drug Report 2010, United Nations office of Drug and Crime.
17. World Drug Report 2011, United Nations office of Drug and Crime.

Course Outcomes:

The students will be able:

CO-1.	To describe issues of cultural identity, ethnic background, age and gender in prevention, treatment and recovery.
CO-2.	To describe warning sign, symptoms, and the course of substance use disorders.
CO-3.	To describe principles and philosophy of prevention, treatment and recovery.
CO-4.	To describe current and evidenced-based approaches practiced in the field of drug addiction.

B.Sc. (Artificial Intelligence & Data Science) Semester – II

SN	Course Code	Course Name	Distribution of The Marks				Lectures Per week			Credit Distribution			Total Credit L+T+P	Page No.
			Theory	Internal Assessment	Practical	Total	L	T	P	L	T	P		
Discipline Specific Course(DSC)														
1	BAIDS-121	AI & Machine Learning	75	25	0	100	5	1	0	3	1	0	4	22-23
2	BAIDS-122	Data Warehousing & Data Mining	75	25	0	100	5	1	0	3	1	0	4	24-25
3	BAIDS-123	Data Structures	75	25	0	100	5	1	0	3	1	0	4	26-27
Ability Enhancement Course (AEC)														
4	BCSE-1222	Communication Skills in English	60	25	15	100	4	0	2	3	0	1	4	28-29
5	BHPB-1201/ BPBI-1202/ BPHC-1204	Punjabi/ Basic Punjabi (Mudhli Punjabi) (Compulsory)/ Punjab History & Culture	75	25	0	100	6	0	0	4	0	0	4	30 31 32-33
Skill Enhancement Course(SEC)														
6	BAIDS-124P	LAB I: Data Structures Implementation using Python	0	25	75	100	0	0	6	0	0	4	4	34-35
7	BAIDS-125P	Lab II: Data Mining Algorithm implementation	0	25	75	100	0	0	6	0	0	4	4	36
Value Added Course(VAC)														
8	ZDA121	*Drug Abuse: Problem, Management and Prevention(Compulsory paper)	-	-	-	50	3	0	0	2	0	0	2	37-38
												Total Credit=30		

B.Sc. (Artificial Intelligence & Data Science)
Semester – II
BAIDS-121: AI & Machine Learning
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1. The main objective of this course is to introduce the field of artificial intelligence and machine learning.
2. This course covers in detail the topics of knowledge representation, game playing and expert systems.
3. Besides this, it also incorporated the state of art techniques of machine learning, i.e. supervised and non- supervised techniques which are quite useful nowadays for the classification and regression purposes.

UNIT-I

Introduction to Artificial Intelligence: Applications of AI and its importance.

Knowledge representation: Definition & importance of Knowledge, Knowledge acquisition and manipulation, Issues in knowledge representation, Knowledge representation methods - propositional logic and first order predicate logic, resolution principle, Horn's clauses, semantic networks, partitioned semantic nets, frames, scripts and conceptual dependencies.

Game playing: MiniMax search procedure, Reducing alternatives using Alpha-Beta pruning method examples.

UNIT-II

Expert systems: Introduction, Examples, Characteristics architecture, People involved and their role in building an expert systems, Case studies of expert systems, MYCIN and DENDRAL; features of knowledge acquisition systems : MOLE and SALT.

Introduction to Machine Learning: Introduction to Machine learning, Types: supervised learning and unsupervised learning, Applications of machine learning.

Basic Concepts of Learning Models and its performance Evaluation: Dimensionality reduction using Principal component analysis, a general view of feature extraction, Feature ranking, Validation techniques, Confusion matrix and its related performance parameters.

UNIT-III

Supervised Learning algorithms: Back propagation neural network, Radial basis function neural network, Bayesian Network, Naive Bayes classifiers, Decision tree, Linear regression, Logistic regression.

Unsupervised Learning Algorithms: K-means Clustering, Hierarchical clustering

UNIT-IV

SVM& Ensemble Machine Learning models: Support Vector Machine (SVM), Fundamental concept of Ensemble Machine Learning techniques such as Bagging, Boosting.

Reinforcement Learning: Introduction to Reinforcement learning and its types.

References:

1. Rich Elaine and Knight Kevin Shiva Shankar B Nair, "Artificial Intelligence", Third Edition, Tata-McGraw Hill.
2. Stuart Russell and Peter Norvig, "Artificial intelligence a modern approach", Pearson.
3. Dan W. Patterson: Introduction to Artificial Intelligence and Expert Systems, Pearson Education.
4. E. Alpaydin, "Introduction to Machine Learning" Edition 2nd, MIT Press , 2009.

Course Outcomes (COs):

On the completion of this course, the students will

CO-1.	Obtain the knowledge of different areas where artificial intelligence has acquired an important place.
CO-2.	Understand the different methods involved in knowledge representation and game playing.
CO-3.	Understand the concept of expert system which are capable of emulating the decision-making ability of a human expert.
CO-4.	Understand the various supervised and non-supervised techniques helpful in the construction of learning models.
CO-5.	Understand the different performance evaluation measures helpful in appraising the developed learning models.

B.Sc. (Artificial Intelligence & Data Science)
Semester – II
BAIDS-122: Data Warehousing & Data Mining
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

COURSE OBJECTIVES:

1.	Be familiar with mathematical foundations of data mining tools.
2.	Understand and implement classical models and algorithms in data warehouses and data mining
3.	Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
4.	Master data mining techniques in various applications like social, scientific and environmental context.
5.	Develop skills in selecting the appropriate data mining algorithm for solving practical problems

UNIT-I

Data Warehousing: Concepts of Data Warehousing, Difference between operational database systems and Data warehousing, Need of a separate Data Warehouse. Multidimensional Data Model.

Data Warehousing Architecture: Steps for Design and Construction of Data-Warehouses, Three-Tier Data Warehouse Architecture, Characteristics of Data Warehousing Data, Data Marts,

UNIT-II

Types of OLAP Servers: ROLAP, MOLAP, HOLAP; Difference between Online Transaction Processing and Online Analytical Processing

UNIT-III

Data Warehouse Implementation: Efficient Computation of Data Cubes, Indexing OLAP Data, Efficient Processing of OLAP Queries, Metadata Repository, Data Warehouse Back-End Tools and Utilities

UNIT-IV

Data Mining Basic Concepts; Data Mining Techniques: Predictive Modelling, Database Segmentation. Data Mining Query Languages, Applications and Trends in Data Mining.

References:

1. Han, Kamber*"Data Mining: Concepts and Techniques"* Morgan Kaufmann.
2. RomezElmasri, ShamkantB.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.

Course Outcomes:

C0-1	Understand the functionality of the various data mining and data warehousing component Knowledge.
C0-2	Understand and Appreciate the strengths and limitations of various data mining and data warehousing models
C0-3	Apply, Create and Explain the analysing techniques of various data
C0-4	Analyse and Describe different methodologies used in data mining and data ware housing.
C0-5	Evaluate and Analyse and Compare different approaches of data ware housing and data mining with various technologies.

B.Sc. (Artificial Intelligence & Data Science)
Semester – II
BAIDS-123: Data Structures
Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. Medium of Examination is English Language.
2. There will be five sections.
3. Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.
4. Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.

Course Objectives:

1.	The main objective of this course is to help students to understand the concept of organizing and managing data in computer's memory.
2.	Therefore, this course introduces different data structure techniques along with their representation in computer's memory.

UNIT – I

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations. Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching. Hash Table Representation: hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT – II

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

UNIT-III

Graphs: Graph Implementation Methods. Graph Traversal Methods. Sorting: Heap Sort,
External Sorting- Model for external sorting, Merge Sort.

UNIT-IV

Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

References:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Educ
3. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.

Course Outcomes:

After the course completion, the students will be able to

CO-1.	Understand the concept of algorithm complexity and will acquire knowledge about mathematical notations which can be used to measure the algorithm's complexity.
CO-2.	Comprehend different data structure techniques, such as array, stacks, queue, linked
CO-3.	Apply linear search and binary search techniques in real word applications to identify the particular element.
CO-4.	Get knowledge about different sorting algorithms along with their time complexities.
CO-5.	List, trees, and graphs, along with the operations performed on them.
CO-6.	Understand the memory representation of the above-mentioned data structures.

B.Sc. (Artificial Intelligence & Data Science)
Semester – II
COMMUNICATION SKILLS IN ENGLISH
Code: BCSE-1222

L	T	P	Credits
3	0	1	4

Time: 3 Hours **Max. Marks: 100**
Theory: 60
Practical: 15
Internal Assessment: 25

Suggested Pattern of Question Paper:
The question paper will be divided into two sections. Section A will consist of Twelve(12) questions of One(1) mark each. Section B will consist of Six questions of Eight(8) marks each. There will be internal choice wherever possible.

Section A

1. Do as directed
Tenses and Change of voice

(12X1=12Marks)

Section B

1. **Listening Skills**: Barriers to listening; effective listening skills; feedback skills.
2. **Speaking and Conversational Skills:** Components of a meaningful and easy conversation; understanding the cue and making appropriate responses; forms of polite speech; asking and providing information on general topics.
3. Drafting of a short speech on a given topic.
4. Transcoding (given dialogue to prose or given prose to dialogue).
5. Taking notes on a speech/lecture/telephonic conversations .
6. Translation from Vernacular (Punjabi/ Hindi) to English (Paragraph)

(6X8=48 Marks)

Course Objectives:
I: To develop competence in oral and visual communication.
II: To inculcate innovative and critical thinking among the students.
III: To enable them to grasp the application of communication theories.
IV: To acquire knowledge of the latest technology related to communication skills.
V: To provide knowledge of multifarious opportunities in the field of this programme.

Course Contents:
1. Listening Skills: Barriers to listening; effective listening skills; feedback skills, attending telephone calls; note taking.
Activities:
a) Listening exercises – Listening to conversation, speech/ lecture and taking notes.
2. Speaking and Conversational Skills: Components of a meaningful and easy conversation; understanding the cue and making appropriate responses; forms of polite speech; asking and providing information on general topics, situation based Conversation in English; essentials of Spoken English

Activities:

a) Conversation; dialogue and speech
b) Oral description or explanation of a common object, situation or concept.
c) Interviews and group discussion

Recommended Books:

1. *Oxford Guide to Effective Writing and Speaking* by John Seely.
2. *The Written Word* by Vandana R Singh, Oxford University Press
3. *Murphy's English Grammar* (by Raymond Murphy) CUP

Course Outcomes:

The completion of this course enables students to:

1. Identify common errors in language and rectify them.
2. Develop and expand Oral skills through controlled and guided activities.
3. Develop coherence, cohesion and competence in oral discourse through intelligible pronunciation.
4. Develop the ability to handle the interview process confidently and learn the subtle nuances of an effective group discourse.
5. Communicate contextually in specific and professional situations with courtesy.

PRACTICAL (Marks: 15)

Course Contents:-

1. Oral Presentation. (5 Marks)
2. Group Discussion. (5 Marks)
3. Mock Interview (5 Marks)

B.Sc. (Artificial Intelligence & Data Science)

Semester – II

Compulsory Course

ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ

Credit & Marks Distribution, Eligibility and Pre-Requisites of the Course

Course title & Code	Total Teaching Hours	Credits	Credit distribution			Total Marks 100		Time Allowed in Exam	Eligibility criteria	Pre-requisite of the course (if any)
			Lecture	Tutorial	Practical	Theory	Internal Assessment			
ਲਾਜ਼ਮੀ ਪੰਜਾਬੀ **BHPB-1201**	60	4	4	0	0	75	25	3 Hours	Class 12th pass in any stream	--

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective	**ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)**
▪ ਵਿਦਿਆਰਥੀਆਂ ਵਿਚ ਸਾਹਿਤਕ ਰੁਚੀਆਂ ਪੈਦਾ ਕਰਨਾ। ▪ ਆਲੋਚਨਾਤਮਕ ਰੁਚੀਆਂ ਨੂੰ ਵਿਕਸਤ ਕਰਨਾ। ▪ ਵਿਦਿਆਰਥੀ ਨੂੰ ਦਫ਼ਤਰੀ ਅਤੇ ਘਰੇਲੂ ਚਿੱਠੀ ਪੱਤਰ ਤੋਂ ਜਾਣੂ ਕਰਵਾਉਣਾ। ▪ ਭਾਸ਼ਾਈ ਗਿਆਨ ਵਿਚ ਵਾਧਾ ਕਰਨਾ।	▪ ਉਸ ਅੰਦਰ ਸਾਹਿਤਕ ਰੁਚੀਆਂ ਪ੍ਰਫੁਲਿੱਤ ਹੋਣਗੀਆਂ। ▪ ਉਸ ਅੰਦਰ ਸਾਹਿਤ ਸਿਰਜਣਾ ਦੀ ਸੰਭਾਵਨਾ ਵਧੇਗੀ। ▪ ਵਿਦਿਆਰਥੀ ਚਿੱਠੀ-ਪੱਤਰ ਦੀ ਲਿਖਣ ਸ਼ੈਲੀ ਤੋਂ ਜਾਣੂ ਹੋਵੇਗਾ। ▪ ਉਹ ਭਾਸ਼ਾਈ ਬਣਤਰ ਤੋਂ ਜਾਣੂ ਹੋਵੇਗਾ।

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ। ਪਹਿਲੇ ਭਾਗ ਵਿਚ 1.5-1.5 (ਡੇਢ-ਡੇਢ) ਅੰਕ ਦੇ ਅਤਿ-ਸੰਖੇਪ (Objective Type) 10 ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜੋ ਕਿ ਸਾਰੇ ਸਿਲੇਬਸ ਵਿਚੋਂ ਹੋਣਗੇ। ਸਿਲੇਬਸ ਦੇ ਬਾਕੀ ਚਾਰ ਭਾਗਾਂ ਵਿਚ 02-02 ਲੇਖ ਨੁਮਾ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰੇਕ ਭਾਗ ਵਿਚੋਂ 01-01 ਪ੍ਰਸ਼ਨ ਕਰਨਾ ਲਾਜ਼ਮੀ ਹੋਵੇਗਾ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 15 ਅੰਕ ਹੋਣਗੇ। ਪੇਪਰ ਸੈੱਟਰ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 25 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵੱਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਥਿਊਰੀ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ 75+25= 100 ਹਨ।

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਸਾਹਿਤ ਦੇ ਰੰਗ, ਡਾ. ਮਹਿਲ ਸਿੰਘ (ਸੰਪਾ.), ਰਵੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।

ਭਾਗ ਦੂਜਾ - ਵਾਰਤਕ ਅਤੇ ਰੇਖਾ-ਚਿੱਤਰ, ਡਾ. ਪਰਮਿੰਦਰ ਸਿੰਘ, ਡਾ. ਭੁਪਿੰਦਰ ਸਿੰਘ ਅਤੇ ਡਾ.ਕੁਲਦੀਪ ਸਿੰਘ ਢਿੱਲੋਂ (ਸਹਿ ਸੰਪਾ.)

(ਵਾਰਤਕ ਭਾਗ ਵਿਚੋਂ ਸਾਰ/ਵਿਸ਼ਾ-ਵਸਤੂ। ਰੇਖਾ-ਚਿੱਤਰ ਭਾਗ ਵਿਚੋਂ ਸਾਰ/ਨਾਇਕ ਬਿੰਬ)

ਭਾਗ-ਦੂਜਾ

ਪੰਜਾਬ ਦੇ ਮਹਾਨ ਕਲਾਕਾਰ (ਸੰਪਾ. ਬਲਵੰਤ ਗਾਰਗੀ)

ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।

(ਸਤੀਸ਼ ਗੁਜਰਾਲ ਤੋਂ ਸੁਰਿੰਦਰ ਕੌਰ ਤਕ)

(ਵਿਸ਼ਾ-ਵਸਤੂ/ਸਾਰ/ਨਾਇਕ ਬਿੰਬ)

ਭਾਗ-ਤੀਜਾ

(ੳ) ਦਫ਼ਤਰੀ ਚਿੱਠੀ ਪੱਤਰ

(ਅ) ਮੁਹਾਵਰੇ ਅਤੇ ਅਖਾਣ

ਭਾਗ-ਚੌਥਾ

(ੳ) ਸ਼ਬਦ-ਬਣਤਰ ਅਤੇ ਸ਼ਬਦ-ਰਚਨਾ - ਪਰਿਭਾਸ਼ਾ ਅਤੇ ਮੁੱਢਲੇ ਸੰਕਲਪ

(ਅ) ਸ਼ਬਦ-ਸ਼੍ਰੇਣੀਆਂ

B.Sc. (Artificial Intelligence & Data Science) Semester – II

Compulsory Course

ਮੁਢਲੀ ਪੰਜਾਬੀ

(In Lieu of Compulsory Punjabi)

Credit & Marks Distribution, Eligibility and Pre-Requisites of the Course

Course title & Code	Total Teaching Hours	Credits	Credit distribution			Total Marks 100		Time Allowed in Exam	Eligibility criteria	Pre-requisite of the course (if any)
			Lecture	Tutorial	Practical	Theory	Internal Assessment			
ਮੁਢਲੀ ਪੰਜਾਬੀ **BPBI-1202**	60	4	4	0	0	75	25	3 Hours	Class 12th pass in any stream	

ਕੋਰਸ ਦਾ ਉਦੇਸ਼ Course Objective	**ਪਾਠ-ਕ੍ਰਮ ਨਤੀਜੇ Course Outcomes (COs)**
• ਵਿਦਿਆਰਥੀ ਅੰਦਰ ਸ਼ਬਦ ਬਣਤਰ ਦੀ ਸਮਝ ਵਿਕਸਤ ਕਰਨਾ। • ਵਿਦਿਆਰਥੀ ਨੂੰ ਸ਼ਬਦ ਪ੍ਰਕਾਰ ਬਾਰੇ ਜਾਣਕਾਰੀ ਪ੍ਰਦਾਨ ਕਰਨਾ। • ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੇ ਵਿਆਕਰਨਕ ਪ੍ਰਬੰਧ ਸੰਬੰਧੀ ਗਿਆਨ ਕਰਾਉਣਾ। • ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ ਦੁਆਰਾ ਪੰਜਾਬੀ ਸ਼ਬਦ ਭੰਡਾਰ ਵਧਾਉਣਾ।	• ਉਹ ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ ਦੀ ਜਾਣਕਾਰੀ ਹਾਸਲ ਕਰਕੇ ਭਾਸ਼ਾਈ ਗਿਆਨ ਨੂੰ ਵਿਕਸਿਤ ਕਰਨਗੇ। • ਪੰਜਾਬੀ ਸ਼ਬਦ-ਰਚਨਾ ਸੰਬੰਧੀ ਮੁਹਾਰਤ ਹਾਸਲ ਕਰਨਗੇ। • ਵਿਦਿਆਰਥੀ ਸ਼ਬਦਾਂ ਦੀਆਂ ਭਿੰਨ-ਭਿੰਨ ਕਿਸਮਾਂ ਤੋਂ ਜਾਣੂ ਹੋਵੇਗਾ। • ਵਿਦਿਆਰਥੀਆਂ 'ਚ ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ ਭੰਡਾਰ 'ਚ ਵਾਧਾ ਹੋਵੇਗਾ।

ਅੰਕ-ਵੰਡ ਅਤੇ ਪ੍ਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

ਸਿਲੇਬਸ ਦੇ ਚਾਰ ਭਾਗ ਹਨ ਪਰ ਪ੍ਰਸ਼ਨ-ਪੱਤਰ ਦੇ ਪੰਜ ਭਾਗ ਹੋਣਗੇ। ਪਹਿਲੇ ਭਾਗ ਵਿਚ 01-01 ਅੰਕ ਦੇ ਅਤਿ-ਸੰਖੇਪ ਉੱਤਰ ਵਾਲੇ (Objective Type) 11 ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜੋ ਕਿ ਸਾਰੇ ਸਿਲੇਬਸ ਵਿਚੋਂ ਹੋਣਗੇ। ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਦੂਸਰੇ ਭਾਗ ਵਿਚ, ਸਿਲੇਬਸ ਦੇ ਪਹਿਲੇ ਭਾਗ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿੰਨਾਂ ਵਿਚੋਂ ਕੋਈ ਦੋ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 8-8 ਅੰਕ ਹੋਣਗੇ। ਇਸੇ ਤਰ੍ਹਾਂ ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਤੀਸਰੇ ਭਾਗ ਵਿਚ ਤਿੰਨ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ ਜਿੰਨਾਂ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 8-8 ਅੰਕ ਹੋਣਗੇ। ਭਾਗ ਚੌਥੇ ਵਿਚ ਪੰਜ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿੰਨਾਂ ਵਿਚੋਂ ਚਾਰ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 4-4 ਅੰਕ ਹੋਣਗੇ। ਭਾਗ ਪੰਜਵੇਂ ਵਿਚ ਤਿੰਨ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿੰਨਾਂ ਵਿਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਲਾਜ਼ਮੀ ਹੋਣਗੇ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ 8-8 ਅੰਕ ਹੋਣਗੇ।

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 25 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵੱਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਥਿਊਰੀ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁੱਲ ਅੰਕ 75+25 = 100 ਹਨ।

ਪਾਠ-ਕ੍ਰਮ

ਭਾਗ-ਪਹਿਲਾ

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ: ਧਾਤੂ, ਵਧੇਤਰ (ਅਗੇਤਰ, ਮਧੇਤਰ, ਪਿਛੇਤਰ), ਪੰਜਾਬੀ ਕੋਸ਼ਗਤ ਸ਼ਬਦ ਅਤੇ ਵਿਆਕਰਨਕ ਸ਼ਬਦ

ਭਾਗ-ਦੂਜਾ

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਪ੍ਰਕਾਰ:

(ੳ) ਸੰਯੁਕਤ ਸ਼ਬਦ, ਸਮਾਸੀ ਸ਼ਬਦ, ਦੋਜਾਤੀ ਸ਼ਬਦ, ਦੋਹਰੇ/ਦੁਹਰੁਕਤੀ ਸ਼ਬਦ ਅਤੇ ਮਿਸ਼ਰਤ ਸ਼ਬਦ

(ਅ) ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ

ਭਾਗ-ਤੀਜਾ

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਰਚਨਾ: ਇਕ-ਵਚਨ/ਬਹੁ-ਵਚਨ, ਲਿੰਗ-ਪੁਲਿੰਗ, ਬਹੁਅਰਥਕ ਸ਼ਬਦ, ਸਮਾਨਅਰਥਕ ਸ਼ਬਦ, ਬਹੁਤੇ ਸ਼ਬਦਾਂ ਲਈ ਇਕ ਸ਼ਬਦ, ਸ਼ਬਦ ਜੁੱਟ, ਵਿਰੋਧਅਰਥਕ ਸ਼ਬਦ, ਸਮਨਾਮੀ ਸ਼ਬਦ

ਭਾਗ-ਚੌਥਾ

ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ

ਖਾਣ-ਪੀਣ, ਸਾਕਾਦਾਰੀ, ਰੁੱਤਾਂ, ਮਹੀਨਿਆਂ, ਗਿਣਤੀ, ਮੌਸਮ, ਬਜ਼ਾਰ, ਵਪਾਰ, ਧੰਦਿਆਂ ਨਾਲ ਸੰਬੰਧਿਤ

B.Sc. (Artificial Intelligence & Data Science)
Semester – II

PUNJAB HISTORY & CULTURE (C 321 TO 1000 A.D.)

(Special Paper in lieu of Punjabi compulsory)
(For those students who are not domicile of Punjab)
Course Code: BPHC-1204

Credit Hours (per week): 04
L- T- P
04-0-0

Time: 3 Hours **Total. Marks: 100**
Theory: 75
Internal Assessment: 25

Instructions for the Paper Setters:
Question paper should consist of two sections—Section A and Section B. The paper setter must ensure that questions in Section–A do not cover more than one point, and questions in Section–B should cover at least 50 per cent of the theme.

Section–A: The examiner will set 15 objective type questions out of which the candidate shall attempt any 10 questions, each carrying 1½ marks. The total weightage of this section will be 15 marks. Answer to each question should be in approximately one to two sentences.

Section–B: The examiner will set 8 questions, two from each Unit. The candidate will attempt 4 questions selecting one from each Unit in about 1000 words. Each question will carry 15 marks. The total weightage of this section will be 60 marks

Note: **The examiner is to set the question paper in two languages: English & Hindi.**

Course Objectives: The main objective of this course is to educate the students who are not domicile of the Punjab about the history and culture of the Ancient Punjab. It is to provide them knowledge about the social, economic, religious, cultural and political life of the peopleof the Punjab during the rule of various dynasties such as The Mauryans, The Khushans, The Guptas, The Vardhanas and other ancient ruling dynasties of the period under study.

Unit-I

1. The Punjab under Chandragupta Maurya and Ashoka.
2. The Kushans and their Contribution to the Punjab.

Unit-II

3. The Punjab under the Gupta Emperors.

4. The Punjab under the Vardhana Emperors

Unit-III

5. Political Developments 7th Century to 1000 A.D.

6. Socio-cultural History of Punjab from 7th Century to 1000 A.D.

Unit-IV

7. Development of languages and Literature.

8. Development of art & Architecture.

Suggested Readings:-

- L. Joshi (ed.*), History and Culture of the Punjab*, Part-I, Patiala, 1989 (3rdedition).
- L.M. Joshi and Fauja Singh (ed), *History of Punjab,* Vol.I, Patiala 1977.
- Budha Parkash, *Glimpses of Ancient Punjab*, Patiala, 1983.
- B.N. Sharma, *Life in Northern India*, Delhi. 1966.

Course Outcomes:

On completing the course, the students will be able to:

CO-1 Understand the history and culture of the Punjab in Ancient Period.
CO-2 Analyse social, economic, religious, cultural and political life of Ancient Indian dynasties.
CO-3 Study about the political developments from 7^{th} century to 1000AD.
CO-4 Understand socio-cultural history of the Punjab from 7^{th} century to 1000 AD.
CO-5 Analyse language, literature, art and architecture of Ancient Punjab.

B.Sc. (Artificial Intelligence & Data Science)
Semester – II
BAIDS-124P
LAB I: Data Structures Implementation using Python
Skill Enhancement Course (SEC)

Time: 3 Hrs. **Total Marks: 100**

Practical Marks: 75

Internal Assessment Marks:25

Credits		
L	**T**	**P**
0	**0**	**4**

Course Objectives:

1.	The main objective of this practical lab is to make the students to be able to implement the programs utilizing different data structure techniques to organize and manage data in computer's memory.
2.	The students will gain an understanding of different approaches available for searching and sorting the data and further be able to identify the methods requiring minimum time to perform the pre-mentioned tasks.

Data Structures Implementation using Python

1. Binary Search in Python
2. Linear Search in Python
3. Bubble Sort in Python
4. Insertion Sort in Python
5. Heap Sort in Python
6. Merge Sort in Python
7. Python program to create a Circular Linked List of N nodes and count the number of nodes
8. Python program to create a Circular Linked List of n nodes and display it in reverse order
9. Python program to create and display a Circular Linked List
10. Python program to delete a node from the beginning of the Circular Linked List
11. Python program to delete a node from the end of the Circular Linked List
12. Python program to delete a node from the middle of the Circular Linked List
13. Python program to find the maximum and minimum value node from a circular linked list

14. Python program to insert a new node at the beginning of the Circular Linked List
15. Python program to insert a new node at the end of the Circular Linked List
16. Python program to insert a new node at the middle of the Circular Linked List
17. Python program to remove duplicate elements from a Circular Linked List
18. Python program to search an element in a Circular Linked List
19. Python program to sort the elements of the Circular Linked List
20. Python program to convert a given binary tree to doubly linked list
21. Python program to create a doubly linked list from a ternary tree
22. Python program to create a doubly linked list of n nodes and count the number of nodes
23. Python program to create a doubly linked list of n nodes and display it in reverse order
24. Python program to create and display a doubly linked list
25. Python program to delete a new node from the beginning of the doubly linked list
26. Python program to delete a new node from the end of the doubly linked list
27. Python program to delete a new node from the middle of the doubly linked list
28. Python program to find the maximum and minimum value node from a doubly linked list
29. Python program to insert a new node at the beginning of the Doubly Linked list
30. Python program to insert a new node at the end of the Doubly Linked List

Course Outcomes:

After the completion of this course, students will be able

CO-1.	To implement the real world applications by making use of linear data structure, such as, arrays, stacks, queues, linked lists, trees and graphs, to handle the data stored in computer's memory.
CO-2.	To perform the implementation using non-linear data structure, such as, trees and graphs.
CO-3.	To perform traversing, insertion, and deletion operations on the above-mentioned data structures.
CO-4.	To perform the search operations by making use of suitable search technique.
CO-5.	To sort the data by using different sorting techniques and can also assess the time requirement of the available sorting techniques.

B.Sc. (Artificial Intelligence & Data Science)
Semester – II
BAIDS-125P
Lab II: Data Mining Algorithms implementation
Skill Enhancement Course (SEC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
0	**0**	**4**

Practical Marks: 75

Internal Assessment Marks:25

Course objectives

1.	Be familiar with mathematical data mining tools & implement them practically.
2.	Understand and implementation of classical models and algorithms in SQL.
3.	Characterization, pattern recognition, rule mining, classification and clustering.
4.	Master data mining techniques in various applications like social, scientific and environmental context.
5.	Develop skills in selecting the appropriate data mining algorithm for solving practical problems

Data Mining Algorithms

1. C4.5 Algorithm
2. K-mean Algorithm
3. Support Vector Machines
4. Apriori Algorithm
5. Expectation-Maximization Algorithm
6. PageRank Algorithm
7. Adaboost Algorithm
8. kNN Algorithm
9. Naive Bayes Algorithm
10. CART Algorithm

Course Outcomes:

C0-1	Understand the functionality of the various data mining and data warehousing languages.
C0-2	Understand the strengths and limitations of various data mining and data warehousing models & their implementations.
C0-3	Apply, Create and Explain the analysing techniques of various data in SQL,PL/SQL.
C0-4	Analyse and Describe different methodologies used in data mining and data ware housing in various software.

B.Sc. (Artificial Intelligence & Data Science)

Semester – II

Course Code: ZDA121

Course Title-DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTIONDRUG ABUSE: MANAGEMENT AND PREVENTION

(Compulsory for all Under Graduate Classes)

Credit hrs/wk.:2

Time: 3 Hours Max. Marks: 50

Instructions for the Paper Setters:

1) There will be a total of 9 questions of which 5 are to be attempted.
2) Question 1 is compulsory and having 10 short answer type questions (1 mark each).
3) The remaining 8 questions (10 marks each) shall include 2 questions from each unit. Candidates shall be required to attempt 4 questions, one from each unit. Preferably, the question should not be split into more than two sub-parts.

Course Objectives:

The course aim is to

CO-1.	Describe the role of family in the prevention of drug abuse.
CO-2.	Describe the role of school and teachers in the prevention of drug abuse.
CO-3.	Emphasize the role of media and educational and awareness program.
CO-4.	Provide knowhow about various legislation and Acts against drug abuse.

UNIT-I

- **Prevention of Drug abuse**

Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.

UNIT-II

- School: Counseling, Teacher as role-model.
- Parent-teacher-Health Professional Coordination, Random testing on students.

UNIT-III

- **Controlling Drug Abuse**

Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program

UNIT-IV

- Legislation: NDPS act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

References:

1. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
2. Gandotra, R. and Randhawa, J.K. 2018. voZrI d[otos'A (BPky'oh) gqpzXB ns o'eEkw. Kasturi Lal & Sons, Educational Publishers, Amritsar- Jalandhar.
3. Inciardi, J.A. 1981. The Drug Crime Connection. Beverly Hills: Sage Publications.
4. Modi, Ishwar and Modi, Shalini (1997) Drugs: Addiction and Prevention, Jaipur: Rawat Publication.
5. Randhawa, J.K. and Randhawa, Samreet 2018. Drug Abuse-Management and Prevention. Kasturi Lal & Sons, Educational Publishers, Amritsar- Jalandhar.
6. Sain, Bhim 1991, Drug Addiction Alcoholism, Smoking obscenity New Delhi: Mittal Publications.
7. Sandhu, Ranvinder Singh, 2009, Drug Addiction in Punjab: A Sociological Study. Amritsar: Guru Nanak Dev University.
8. Singh, C. P. 2000. Alcohol and Dependence among Industrial Workers: Delhi: Shipra.
9. World Drug Report 2011, United Nations office of Drug and Crime.
10. World Drug Report 2010, United Nations office of Drug and Crime

Course Outcomes:

The students will be able to:

CO-1.	Understand the importance of family and its role in drug abuse prevention.
CO-2.	Understand the role of support system especially in schools and inter-relationships between students, parents and teachers.
CO-3.	Understand impact of media on substance abuse prevention.
CO-4.	Understand the role of awareness drives, campaigns etc. in drug abuse management.
CO-5	Learn about the Legislations and Acts governing drug trafficking and Abuse in India.

B.Sc. (Artificial Intelligence & Data Science)-III

SN	Course Code	Course Name	Distribution of The Marks				Lectures Per week			Credit Distribution			Total Credit L+T+P	Page No.
			Theory	Internal Assessment	Practical	Total	L	T	P	L	T	P		
Discipline Specific Course(DSC)														
1	BAIDS-231	Web Technologies	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**40-41**
2	BAIDS-232	Introduction to Neural Networks	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**42-43**
3	BAIDS-233	Java Programming	**75**	**25**	**0**	**100**	**5**	**1**	**0**	**3**	**1**	**0**	**4**	**44-45**
Skill Enhancement Course(SEC)														
4	BAIDS-234P	LAB I: Web Technologies	**0**	**13**	**37**	**50**	**0**	**0**	**6**	**0**	**0**	**2**	**2**	**46**
5	BAIDS-235P	Lab II: Java Programming	**0**	**13**	**37**	**50**	**0**	**0**	**6**	**0**	**0**	**2**	**2**	**47**
Value Added Course(VAC)														
6	ESL 221	*Environmental Studies – I (Compulsory)	-	-	-	**50**	**3**	**0**	**0**	**2**	**0**	**0**	**2**	**48-50**
												Total Credit=18		

Note *Marks of Paper EVS will not be included in Grand Total.

B.Sc. (Artificial Intelligence & Data Science)
Semester – III

BAIDS-231: Web Technologies

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	Gain knowledge about the principles of web environment.
2.	Principles related to web design and transform these theories into practice.
3.	Ability to design static and dynamic web pages.
4.	Learn the web languages: HTML, Javascript and CSS.
5.	Learn the concepts of domain, web space and website publishing.
6.	Many leading websites and projects are based on PHP and Oracle. So, it provides opportUNITy for the students to get placed in IT companies.

UNIT-I

Introduction to Web Development

Webpage, Website, Static Website, Dynamic Website, Web Servers, Web Browsers

Introduction to HTML/DHTML

HTML Basics, HTML Elements (Tags), Structure of HTML Program, Attributes, Headings, Paragraphs, Formatting, Links, Images, Tables, Lists, Forms, Frames, Where to put Tables, Lists, Images, Forms, CSS in DHTML, Implementation of Web Pages using CSS.

UNIT-II

Introduction to JavaScript:

How & Where to put the JavaScript Code, JavaScript Statements, Comments, Variables, Operators, Control Statements, Loops, Popup Boxes, Functions.

UNIT-III

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (DBMS as reference), executing simple queries, handling results, Handling sessions and cookies.

UNIT-IV

Jquery: Syntax , selectors ,Events, effects, Jquery CSS Classes.

Purchasing a Domain Name & Web Space

Domain Name & Web Space, Getting a Domain Name & Web Space (Purchase or Free), Uploading the Website to Remote Server.

References:

1. Web Enabled Commercial Application Development HTML (Ivan Bayross)
2. JavaScript, a Beginner's Guide John Pollock, Third Edition
3. PHP and MYSQL web development, by Luke Welling, Laura Thomson,4th Edition, Addison-Wesley Professional,2008.
4. PHP 5.1 for Beginners by Ivan Bayross, Sharanam Shah, Shroff/X-Team,2010.
5. PHP: The Complete Reference by Steven Holzner, McGraw Hill Education,2017.

Course Outcomes (Cos):

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

CO-1.	Gain knowledge of HTML and CSS code and using this knowledge, they are able to create websites.
CO-2.	Learn to write code using java script.
CO-3.	Able to create online forms.
CO-4.	Learn how to publish website to the web.
CO-5.	This course will provide understanding about database connectivity used for fetching data from servers
CO-6.	Students can also become freelancer website designers/developers after learning this course.

B.Sc. (Artificial Intelligence & Data Science)

Semester – III

BAIDS-232: Introduction to Neural Networks

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	Enable students to understand important concepts and theories of artificial neural networks (ANNs)
2.	Enable students to understand how ANN can be designed and trained
3.	Enable students to calculate simple examples of ANNs.
4.	Give students an appreciation of some of the limitations and possibilities of ANNs.

UNIT-I

Basics of Neural Networks: Fundamental concept, Model of an Artificial Neuron, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks Neural Network Architectures, Learning Rules and Various types of Activation Functions, Knowledge representation.

UNIT-II

Supervised Learning: Perceptron learning, Linear Separability, Adaptive Linear Neuron (ADALINE), Multiple Adaptive Linear Neuron (MADALINE), Back Propagation algorithm, XOR problem, Applications of Back-propagation.

UNIT-III

Associative Memory Networks: Introduction, Training algorithms for Pattern association, Hebb rule, outer product rule, Autoassociative memory network, Bidirectional Associative networks, Hopfield Network

UNIT-IV

Un–supervised Learning: Kohonen Self Organization Feature maps, ART fundamentals, Adaptive Resonance Theory 1(ART1), Adaptive Resonance Theory 2(ART2)

References:

1. Gallant S.L., Neural Networks Learning & Expert Systems, MIT Press, 1993.

2. Haykin S., Neural Networks: A Comprehensive Foundation, Pearson Education Inc.,Second Edition, 2003.

3.[FS] Freeman J.A., Skapura D.M., Neural Network Algorithms, Applications and Programming Techniques, Addison-Wesley Publications, 1992.

Course Outcomes:

At the end of this course the student shall be able to:

CO-1.	Describe various types of ANNs
CO-2.	Explain how ANNs can be trained.
CO-3.	Carry out simple simulations of ANNs.
CO-4.	Understand how ANNs can be design

B.Sc. (Artificial Intelligence & Data Science)

Semester – III

BAIDS-233: JAVA PROGRAMMING

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

At the end of this course, the students will know:

1.	To become familiar with the features of Java Language
2.	To discover how to write Java code according to Object-Oriented Programming principles.
3.	To become comfortable with concepts such as Classes, Objects, Inheritance, Polymorphism and Interfaces
4.	To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.
5.	To understand the importance of Classes & objects along with constructors, Arrays and Vectors.

UNIT –I

Basic concepts of Java Programming and Applications of Java programming. Introduction to Java, JVM, Features of java, JDK Environment & tools like (java, javac, applet viewer, javadoc, jdb)

Object Oriented Programming Concepts: Overview of Programming, Paradigm, Classes, Abstraction, Encapsulation, Inheritance, Polymorphism, Applications of AI in Java.

Java Programming Fundamentals : Structure of java program , Data types ,Variables, Operators , Keywords ,Naming Convention ,Decision Making (if,switch) ,Looping(for, while),Type Casting.

UNIT-II

Classes and Objects: Creating Classes and objects, Memory allocation for objects, Constructor, Implementation of Inheritance (Simple, Multilevel, Hierarchical),

Implementation of Polymorphism (Method Overloading, Method Overriding), Nested and Inner classes

Arrays String and Vector: Arrays, Creating an array, Types of Array (One Dimensional arrays, Two Dimensional array), Strings, String – Arrays, String Methods, String Buffer class, Vectors, Wrapper classes.

UNIT-III

Interface and Packages: Interfaces, Packages Concept, Creating user defined packages, Java Built in packages (Java.lang->math, Java.util->Random, Date, Hash Table)

Modifiers and Access Control: static, synchronized, final, Default, public, private, protected, Abstract classes and methods,

Multithreading: Creating Threads using Different methods, Thread Priorities, Thread Synchronization, Inter process thread Communication.

UNIT-IV

Exception Handling: Exception types, using try catch and Multiple catch, Nested try, throw, throws and finally, Creating User defined Exceptions.

File Handling: Byte Stream, character stream , file IO Basics , File Operations (Creating file, Reading, file(Character, byte), Writing File (Character, byte).

References:

1. The Complete Reference – JAVA 2 by Ptrick Naughton & Herbert Schildt TMH

Publications.

2. The Java Tutorial Continued by Compione, Walrath, Huml SUN JAVA Tutorial Team,

Addison Wessley,2007.

3. Java2 Black Book Steven Holzner OT Dreamtech Press, www.idgbooksindia.com, 2007.

4. “Introduction to Java Programming”, Y. Daniel Mliang, Pearsons Publications.

5. Programming with JAVA - E Balgurusamy

6. JAVA: How to Programme- Paul Deital and Harvey Deital

Course Outcomes:

Students will be able to:

CO-1.	Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
CO-2.	Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem
CO-3.	Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
CO-4.	Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
CO-5.	Identify and describe common abstract user interface components to design GUI in Java using Applet & AWT along with response to events.

B.Sc. (Artificial Intelligence & Data Science)

Semester – III

BAIDS-234P: LAB I: Web Technologies

Time: 3 Hrs. **Total Marks: 50**

Practical Marks: 37

Internal Assessment Marks:13

Credits		
L	**T**	**P**
0	**0**	**2**

Course Objectives:

1.	Provides in-depth knowledge of various web languages: HTML and DHTML.
2.	Allow students to build and publish web pages.
3.	Many leading websites and projects are based on PHP and Oracle. So, it provides opportunity for the students to get placed in IT companies.

Web Technologies

Course Outcomes (Cos):

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

CO-1.	Learn how to create and insert tables in HTML.
CO-2.	Learn to apply various formatting Styles.
CO-3.	Hands on practice to develop web pages using HTML and DHTML, and publish website using Dreamweaver.
CO-4.	Understanding about database connectivity used for fetching data from servers
CO-5.	Become freelancer website designers/developers after learning this course.

B.Sc. (Artificial Intelligence & Data Science)

Semester – III

BAIDS-235P: Lab II Java Programming

Time: 3 Hrs. **Total Marks: 50**

Credits		
L	**T**	**P**
0	**0**	**2**

Practical Marks: 37

Internal Assessment Marks:13

Course Objectives:

1.	To introduce the object-oriented programming concepts.
2.	To understand object-oriented programming concepts and apply them in solving problems.
3.	To introduce the principals of inheritance and polymorphism and demonstrate how they relate to design of abstract class.
4.	To introduce the implementation of packages and interfaces.
5.	To introduce the concept of exception handling and multithreading.

Programming Laboratory based on Java Programming.

Course Outcomes:

At the end of this course the student shall be able to:

CO-1.	Understand the concept of OOPs as well as the purpose and uses principal of inheritance, polymorphism in encapsulation and method overloading.
CO-2.	Identify classes, objects, members of a class and the relationship among them. needed for a specific problem.
CO-3.	Create a java applications programs using sound oops practices.
CO-4.	Develop programs using the java collection API as well as the java standard class library.
CO-5.	Develop and understand exception handling.

B.Sc. (Artificial Intelligence & Data Science)

Semester – III

Course code: ESL–221

Course Title: ENVIRONMENTAL STUDIES–I (COMPULSORY)

Credit Hours (Per Week): 2

Total Hours: 30

Maximum Marks: 50

Instructions for Paper Setters: The question paper will consist of three sections. Candidate will be required to attempt all the sections. Each UNIT of the syllabus should be given equal weightage of marks. Paper to be set in English, Punjabi and Hindi.

Section–A: (16 Marks): It will consist of five short answer type questions. Candidates will be required to attempt four questions, each question carrying four marks. Answer to any of the questions should not exceed two pages.

Section–B: (24 Marks): It will consist of five questions. Candidates will be required to attempt four questions, each question carrying six marks. Answer to any of the questions should not exceed four pages.

Section–C: (10 Marks): It will consist of two questions. Candidate will be required to attempt one question (carrying ten marks) only. Answer to the question should not exceed 5 pages.

Course Objectives:

CO-1	The main goal of Environmental studies is to create the environmental awareness to create a safe, green and sustainable environment.
CO-2	To make students aware about the importance of ecosystem, types of ecosystem, energy flow in an ecosystem, ecological succession, food chain and food web.
CO-3	To make students aware of water conservation, global warming, consumerism and waste products. and, also about the environmental protection acts.
CO-4	Role of National Service Scheme (NSS). Health and hygiene.

UNIT -I

The Multidisciplinary Nature of Environmental Studies: Definition, components, scope and importance of environment/environmental studies, Need for public awareness.

Natural Resources: Definition, types, use, overexploitation, benefits, case studies (if any) and associated problems of following natural resources: Forest Resources, Water Resources, Mineral Resources, Food Resources, Energy Resources, Land Recourses *etc.*

Roleof an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT -II

Ecosystem:

General introduction, types (Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems *viz.* ponds, streams, lakes, rivers, oceans, estuaries),Structure and functions of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids.

UNIT-III

Social Issues and Environment: Sustainable development,Urban problems related to energy, Water conservation, rain water harvesting. Resettlement and rehabilitation of people; its problems and concerns. Case studies.Environmental ethics: Issues and possible solutions.Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents andholocause. Case studies.Wasteland reclamation.

Environmental Protection Act: Air (prevention and Control of Pollution) Act.Water (prevention and Control of Pollution) Act.Wildlife Protection Act.Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

UNIT-IV

National Service Scheme

Introduction and Basic Concepts of NSS: History, philosophy, aims & objectives ofNSS; Emblem, flag, motto, song, badge *etc.;* Organizational structure, roles and responsibilities of various NSS functionaries.

Health, Hygiene & Sanitation: Definition, needs and scope of health education; Food and Nutrition; Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan); National Health Programme; Reproductive health.

Suggested Books:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.
2. Bharucha, E. 2013 . Textbook of Environmental Studies, Universities Press, Hyderabad.

3. Basu, M., Xavier, S. 2016. Fundamentals of Environmental Studies, Cambridge University Press, India
3. Down to Earth, Centre for Science and Environment, New Delhi.
4. Jadhav, H. and Bhosale, V. M. 1995. Environmental Protection and Laws. Himalaya Pub.
5. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
6. Kaushik, A. and Kaushik, C. P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
7. Mahapatra, R., Jeevan, S.S. and Das, S. 2017. Environment Reader for Universities, Centre for Science and Environment, New Delhi.
8. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.
9. Raven, P.H., Hassenzahl, D.M. and Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.
10. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.
11. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex, Amritsar
12. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.
13. Saroj A., Kaur R., Walia H., Kaur T, 2021. Environmental Studies - A Holistic Approach, KLS Publishers.

Suggested Websites:

1. https://nss.gov.in
2. https://moef.gov.in
3. http://punenvis.nic.in
4. https://www.unep.org

Course Outcomes:

CO-1	To learn about the sustainable environment.
CO-2	To gain the knowledge ecosystem and its functioning.
CO-3	To know about the water conservation programs like rain water harvesting and water shedding and to gain knowledge of environmental (air, water and pollution) protections acts.
CO-4	To know about the role and importance of NSS– a volunteer organization, in making up a better environment and to maintain better health and hygiene.

B.Sc. (AI & Data Science) Semester – IV

SN	Course Code	Course Name	Distribution of The Marks				Lectures Per week			Credit Distribution			Total Credit L+T+P	Page No.
			Theory	Internal Assessment	Practical	Total	L	T	P	L	T	P		
Discipline Specific Course(DSC)														
1	BAIDS-241	Natural Language Processing	75	25	0	100	5	1	0	3	1	0	4	52-53
2	BAIDS-242	R Programming	75	25	0	100	5	1	0	3	1	0	4	54-55
3	BAIDS-243	Software Engineering	75	25	0	100	5	1	0	3	1	0	4	56-57
Skill Enhancement Course(SEC)														
4	BAIDS-244P	LAB I: R Programming	0	13	37	50	0	0	6	0	0	2	2	58
5	BAIDS-245P	Minor Project	0	25	75	100	0	0	12	0	0	4	4	59
Value Added Course(VAC)														
6	ESL-222	* Environmental Studies – II Compulsory)	-	-	-	50	2	0	0	2	0	0	2	60-63
													Total Credit=20	

Note:

1. All the students are required to undergo **'Industrial Training'** for 6 weeks in IT Companies after 4th semester final examinations. Final degree to the students will be awarded subject to their successfully completing the 'Industrial Training'.
2. **'Industrial Training'** will be evaluated as satisfactory / unsatisfactory internally by the department.
3. Last date for submission of training Report within 1 Week after coming from training.
4. Marks of Paper EVS will not be included in Grand Total.

B.Sc. (Artificial Intelligence & Data Science)

Semester – IV

BAIDS-241: Natural Language Processing

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. Medium of Examination is English Language.
2. There will be five sections.
3. Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.
4. Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.

Course Objectives:

1.	Understand approaches to syntax and semantics in NLP.
2.	To provide understanding of various NLP tasks and NLP abstractions such as Morphological analysis, POS tagging etc.
3.	To provide knowledge of different approaches/algorithms for carrying out NLP tasks.
4.	Understand machine learning techniques used in NLP

UNIT I

Introduction to NLP, brief history

NLP applications: Speech to Text(STT), Text to Speech(TTS), Story Understanding, NL Generation, QA system, Machine Translation, Text Summarization, Text classification, Sentiment Analysis, Grammar/Spell Checkers etc., challenges/Open Problems, NLP abstraction levels, Natural Language (NL) Characteristics and NL computing approaches/techniques and steps.

UNIT II

Language Modeling and Part of Speech Tagging: Unigram Language Model, Bigram, Trigram, N-gram, Advanced smoothing for language modeling, Empirical Comparison of

Smoothing Techniques, Applications of Language Modeling, Natural Language Generation, Parts of Speech Tagging, Morphology, Named Entity Recognition

Words and Word Forms: Bag of words, skip-gram, Continuous Bag-Of-Words, Embedding representations for words Lexical Semantics, Word Sense Disambiguation, Knowledge Based and Supervised Word Sense Disambiguation

UNIT III

Text Analysis, Summarization and Extraction: Sentiment Mining, Text Classification, Text Summarization, Information Extraction, Named Entity Recognition, Relation Extraction, Question Answering in Multilingual Setting; NLP in Information Retrieval, Cross-Lingual IR.

UNIT IV

Machine Translation: Need of MT, Problems of Machine Translation, MT Approaches, Direct Machine Translations, Rule-Based Machine Translation, Knowledge Based MT System, Statistical Machine Translation (SMT), Parameter learning in SMT (IBM models) using EM), Encoder-decoder architecture, Neural Machine TranslationText Processing Challenges, Overview of Language Scripts and their representation on Machines using Character Sets, Language, Corpus and Application Dependence issues

References:

1. Allen, James, **Natural Language Understanding**, *Second Edition, Benjamin/Cumming, 1995.*
2. Charniack, Eugene, **Statistical Language Learning**, *MIT Press, 1993.*
3. Jurafsky, Dan and Martin, James, **Speech and Language Processing**, *Second Edition, Prentice Hall, 2008.*
4. Manning, Christopher and Heinrich, Schutze, **Foundations of Statistical Natural Language Processing**, *MIT Press, 1999.*
5. Radford, Andrew et. al., **Linguistics, An Introduction**, *Cambridge University Press, 1999.*

Course Outcomes

CO-1.	Students will get idea about know-hows, issues and challenge in Natural Language Processing and NLP applications
CO-2.	Understand the mathematical and linguistic foundations underlying approaches to NLP
CO-3.	Students will also be introduced to various grammar formalisms, which they can apply in different fields of study

B.Sc. (Artificial Intelligence & Data Science)

Semester – IV

BAIDS-242: R PROGRAMMING

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	The basics of statistical computing and data analysis.
2.	How to use R for analytical programming.
3.	How to implement data structure in R.
4.	R loop functions and debugging tools.
5.	Object-oriented programming concepts in R.
6.	Data visualization in R.
7.	How to perform error handling.
8.	Writing custom R functions.

UNIT-I

Introduction to R: Introduction to R, Installation of R interpreter, overview of R, features of R, R character set, R words, constants, operators, precedence and associativity of the operators, R working environment as a displayer, R as a calculator, R as a data manipulator, R objects and their data types.

UNIT-II

R programming environment: Programming in R using, Sequence, Selection iteration and Case logic structures. User-defined functions in R, Recursion, Basic data structures in R (vector, factor, list, data frame, matrix, array).

UNIT-III

R factors: Understanding factors, Modifying factors, Factors in Data frames. Data frames in R: Creating data frame, Operations on data frames, Accessing data frames, Creating data frames, from various sources

Data visualization in R: Plot() function and line plot, pie chart / 3D pie chart, Scatter plot, Box plot.

UNIT-IV

Stringr package: Important functions in stringr, Regular expressions.

Dplyr package: Load data into dataframe, Viewing the data, selecting columns, selecting rows, Reordering the rows, Pipe operator, Group operations.

References:

1. The art of Programming through R by Anil BikashChowdhury
2. The art of R programming by Norman Matloff, , No Starch Press, Sanfrancisco.
3. Statistical Programming in R by Srinivasa,Siddesh,Shetty and Sowmya, Oxford Higher Education

Course Outcomes:

At the end of this course the student shall be able to

1.	Explain critical R programming concepts.
2.	Demonstrate how to install and configure RStudio.
3.	Apply OOP concepts in R programming.
4.	Explain the use of data structure and loop functions.
5.	Analyse data and generate reports based on the data.
6.	Apply various concepts to write programs in R.

B.Sc. (Artificial Intelligence & Data Science)

Semester – IV

BAIDS-243: **Software Engineering**

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	Give the basic knowledge in Software Engineering process, focusing on the different process models.
2.	To inculcate in students' different concepts of software engineering principles.
3.	To produce efficient, reliable, robust and cost- effective software solutions.
4.	Ability to develop, maintain and evaluate large-scale software systems.

UNIT – I

Introduction to Software: Definition, Software characteristics, Software components, Software Applications.

Introduction to Software Engineering: Definition, Software Engineering Paradigms, waterfall method, prototyping, interactive Enhancement, The Spiral model, Fourth Generation Technique.

UNIT – II

Software Metrics: Role of Metrics and measurement, Metrics for software productivity and quality, Measurement software, size–oriented metrics, function oriented metrics, Metrics for software quality.

Software Requirement Specification (SRS): Problem analysis, structuring information, Data flow diagram and data dictionary, structured analysis, Characteristics and component of (SRS).

UNIT – III

Planning a Software Project: Cost estimation, uncertainties in cost estimation, Single variable model, COCOMO model, On software size estimation, Project scheduling and milestones, Software & Personal Planning, Rayleigh curve, Personal Plan, Quality Assurance Plan, Verification & Validation (V & V), inspection & review.

System Design: Design Objectives, Design Principles, problem, Partitioning, Abstraction, Top Down and Bottom–up techniques, Structure Design, Structure Charts, Design Methodology, Design Review, Automated Cross Checking, Matrix, total number of modular, number of parameters.

UNIT – IV

Detailed Design: Module specification, Specifying functional module, specifying data abstraction, PDL and Logic/Algorithm Design.

Coding: Coding by Top–down and Bottom–up, Structured Programming, Information Hiding, Programming style, Internal Documentation.

Testing: Level of testing, Test cases and test criteria, Functional Testing, Structural Testing.

References:

1. Software Engineering, Roger S. Pressman.
2. Integrated Approach to Software Engineering, Pankaj Jalote
3. Software Engineering by Rajib Mall.
4. Software Engineering by Ian Sommerville.

Course Outcomes:

On completion of this course student will be able to:

CO-1.	Decompose the given project in various phases of a lifecycle.
CO-2.	Choose appropriate process model depending on the user requirements.
CO-3.	Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
CO-4.	Know various processes used in all the phases of the product.
CO-5.	Apply the knowledge, techniques, and skills in the development of a software product.

B.Sc. (Artificial Intelligence & Data Science)

Semester – IV

BAIDS-244P: Lab I: R Programming

Time: 3 Hrs. **Total Marks: 50**

Credits		
L	**T**	**P**
0	**0**	**2**

Practical Marks: 37

Internal Assessment Marks:13

Course Objectives:

1.	Understand and implement functions that support linear modelling, non-linear modelling, classical statistics, classifications, clustering and more.
2.	Learn how to develop the program in R Programming. Learn how to develop an open-source scripting language for predictive analytics and data visualization.

Programs based on R Language

Course Outcomes:

CO-1.	Show the installation of the R Programming Environment.
CO-2.	Utilize R Data types for developing programs and learn all the basics of R-Programming (Data types, Variables, and Operators.
CO-3.	Implementation of R-loops with different examples, learn the basics of functions in R and implement with example.
CO-4.	Join columns and rows in a data frame using bind functions, developing packages, data frames, and string manipulation functions.

B.Sc. (Artificial Intelligence & Data Science)

Semester – IV

BAIDS-245P: MINOR PROJECT

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
0	**0**	**4**

Practical Marks: 75

Internal Assessment Marks:25

Course Objectives:

1.	Understand the web technologies to create adaptive web pages for the web application.
2.	Use of CSS to implement a variety of presentation effects in the web application.
3.	Know the concept and implementation of cookies as well as related privacy concerns.
4.	Develop a sophisticated web application that employs the MVC architecture.

Minor Project: Software Module based on Web Technology/Database/ Programming Language.

General Instructions:

1. The Software Module of the Minor Project shall be submitted to the College/Institute till 10^{th} November.
2. The minor project shall be developed in groups, consisting of at most two students in a group.
3. The evaluation of the Minor Project (Software Module) shall be done by one external examiner appointed by the University and one internal examiner from college (as per other practical examination)

Course Outcomes (COs):

After the completion of this course, the students will be able

CO-1.	Integrate frontend and backend web technologies in distributed systems.
CO-2.	Facilitate interface between frontend and backend of a web application
CO-3.	Debug, test and deploy web applications on different web servers.
CO-4.	Migrate the web applications to the other platforms like .Net technologies.
CO-5.	To develop and deploy real time web applications in web servers and in the cloud and extend this knowledge to .Net platforms.

B.Sc. (Artificial Intelligence & Data Science)

Semester – IV

Course Code: ESL–222

Course Title: ENVIRONMENTAL STUDIES–II (COMPULSORY)

Credit Hours (Per Week): 2

Total Hours : 30

Maximum Marks : 50

Instructions for Paper Setters: The question paper will consist of three sections. Candidate will be required to attempt all the sections. Each UNIT of the syllabus should be given equal weightage of marks. Paper to be set in English, Punjabi and Hindi.

Section–A: (16 Marks): It will consist of five short answer type questions. Candidates will be required to attempt four questions, each question carrying four marks. Answer to any of the questions should not exceed two pages.

Section–B: (24 Marks): It will consist of five questions. Candidates will be required to attempt four questions, each question carrying six marks. Answer to any of the questions should not exceed four pages.

Section–C: (10 Marks): It will consist of two questions. Candidate will be required to attempt one question (carrying ten marks) only. Answer to the question should not exceed 5 pages.

Course Objectives:

CO-1	To study the concept of Biodiversity – role, importance, values and its conservation. Hot spots and threats to biodiversity.
CO-2	To create awareness regarding environmental pollution, its causes and effects and preventive measure to control the different types of pollution.
CO-3	To make students aware of growing human population – causes and concern. Family welfare programs. Road safety (Traffic) rules.
CO-4	To know about entrepreneurship development and civil/self defense.

UNIT-I

Biodiversity and its Conservation:

- Definition: Genetic, species and ecosystem diversity.

- Biogeographical classification of India.
- Value of Biodiversity: Consumptive use; productive use, social, ethical, aesthetic and optionvalues.
- Biodiversity of global, National and local levels.
- India as mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to Biodiversity: Habitat loss, poaching of wild life, man wildlife conflicts. Threatened and endemic species of India.
- Endangered species, vulnerable species, and rare species.
- Conservation of Biodiversity: In situ and Ex-situ conservation of biodiversity. National Parks, Wild life sanctuaries, Biosphere reserve, Project Tiger, Project Elephant.

UNIT-II

Environmental Pollution:

Environmental Pollution: Concepts and Types

- Definition, causes, effects and control measures of:

a) Air Pollution

b) Water Pollution

c) Soil Pollution

d) Marine Pollution

e) Noise Pollution

f) Thermal Pollution

g) Nuclear Hazards

h) Electronic Waste

- Concepts of hazards waste & human health risks.
- Solid Waste Management: Causes, effects and control measures of municipal, biomedical and e-waste
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster Management: Floods, Earthquake, Cyclone and Landslides.

UNIT-III

Human Population and the Environment

- Human population growth: impacts on environment.
- Population explosion-Family welfare programme.
- Environment and human health: Concept of health and disease, common communicable and non communicable diseases, public awareness
- Human rights.
- Value education.
- Women and child welfare.
- Role of information technology in environment and human health.
- Environment movments in India: Chipko movement, Silent valley movement and other case studies.
- Road Safety Rules & Regulations**:** Use of Safety Devices while Driving, Do's and Don'tswhile Driving, Role of Citizens or Public Participation, Responsibilities of Public underMotor Vehicle Act, 1988, General Traffic Signs.
- Accident & First Aid**:** First Aid to Road Accident Victims, Calling Patrolling Police &Ambulance.

UNIT-IV

National Service Scheme:

- **Entrepreneurship Development:** Definition & Meaning; Qualities of good entrepreneur; Steps/ ways in opening an enterprise; Role of financial and support service Institutions.
- **Civil/Self Defense:** Civil defense services, aims and objectives of civil defense; Needs for self-defense training.

Field Visits:

- Visit to a local area to document environmental assets–river/forest/grassland/hill/mountain.
- Visit to a local polluted site–Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems–pond, river, hill slopes etc.
- Contribution of the student to NSS/any other social cause for service of society.
- Visit to Museum/Science City
- Municipal solid waste management and handling.

Note: In this section the students will be required to visit and write on the environment of an area/ ecosystem/vi1lage industry/disaster/mine/dam/agriculture field/waste management/hospital etc. with its salient features, limitations, their implications and suggestion for improvement.

References/Books:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.
2. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
3. Down to Earth, Centre for Science and Environment, New Delhi.
4. Jadhav, H. & Bhosale, V. M. 1995. Environmental Protection and Laws. Himalaya Pub.
5. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, PearsonEducation (Singapore) Pte. Ltd., Delhi.
6. Kaushik, A. & Kaushik, C. P. 2004. Perspective in Environmental Studies,New Age International (P) Ltd, New Delhi.
7. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.
8. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.
9. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex,Amritsar
10. Asthana, D.K. 2006. Text Book of Environmental Studies, S. Chand Publishing.
11. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.
12. Basu, M., Xavier, S. 2016. Fundamentals of Environmental Studies, Cambridge University Press, India.
13. Mahapatra, R., Jeevan, SS, Das S. 2017. Environment Reader for Universities, Centre for Science and Environment, New Delhi.

Course Outcomes:

CO-1	To know about the meaning of Biodiversity and its role in environment.
CO-2	To know about the causes of different forms of pollution and their control measures.
CO-3	To know about the causes and challenges of growing human population. Women and child welfare programs.
CO-4	To know the development of entrepreneurship and techniques of civil/self defense.

B.Sc. (Artificial Intelligence & Data Science)

Semester – V

S N	Course Code	Course Name	Distribution of The Marks				Lectures Per week			Credit Distribution			Total Credit L+T+P	Page No.
			Theory	Internal Assessment	Practical	Total	L	T	P	L	T	P		
Discipline Specific Course(DSC)														
1	BAIDS-351	Inferential Statistics	75	25	-	100	5	1	0	3	1	0	4	65-66
2	BAIDS-352	Hadoop	75	25	-	100	5	1	0	3	1	0	4	67-68
3	BAIDS-353	Operating System	75	25	-	100	5	1	0	3	1	0	4	69-70
4	BAIDS-354	Deep Learning	75	25	-	100	5	1	0	3	1	0	4	71-72
Skill Enhancement Course(SEC)														
5	BAIDS-355P	LAB I: Based on Hadoop	-	13	37	50	0	0	6	0	0	2	2	73
6	BAIDS-356P	Lab II: Based on Deep Learning	-	13	37	50	0	0	6	0	0	2	2	74
												Total Credits=24		

B.Sc (Artificial intelligence &Data Science)

Semester-V

BAIDS-351: Inferential Statistics

Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	To understand the concept of estimation theory
2.	To introduce the concept of testing of hypothesis
3.	To introduce the concept of non-parametric tests

UNIT -I

Estimation theory: Parameter space, Sample space, Point estimation, Requirement of a good estimator, Consistency, Unbiasedness, Efficiency, Sufficiency, Minimum variance unbiased estimators.

UNIT -II

Method of Estimation: Maximum likelihood, Least squares and minimum variance, Properties of maximum likelihood estimators, Interval Estimation: Confidence interval and confidence limits for the parameters of normal distribution, Confidence intervals for large samples.

UNIT-III

Test of Hypotheses: Principles of test of significance: Null and alternative hypotheses, Simple and composite, Type I and type II errors, One-sided and two-sided tests, Tests of significance, Levels of significance, Test statistics, Critical values, p-values, The use of chi-square tests for goodness of fit and for independence, Contingency tables.

UNIT -IV

Nonparametric Tests: Advantages and disadvantages, Comparison of parametric and non-parametric test. Nonparametric tests: Mann Whitney U test, Wilcoxon Signed Rank test, Kruskals-Wallis test.

References:

1. Hogg, R. V. and Tanis, E. A. (2019). Probability and statistical inference. (9th ed.), Prentice Hall.

2. Roussas, G. G. (2003). Introduction to probability and statistical inference, Academic Press.

3. Stapleton, J. H. (2008). Models for probability and statistical inference: theory and applications. Wiley-Interscience.

Course outcomes (Cos):

On the completion of this course, the students will

CO-1	Acquire knowledge about important inferential aspects such as point estimation, test of hypotheses and associated concepts.
CO-2	Acquire knowledge about different types of tests.
CO-3	Learn about non-parametric method and some of the important non-parametric tests.

B.Sc. (AI & Data Science)

SEMESTER-V

BAIDS-352: Hadoop

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	Understand Hadoop Distributed File System and examine MapReduce Programming.
2.	Analyze the need and importance of fundamental concepts and principles of Big Data.
3.	Provide an overview of Apache Flume and Hive

UNIT-I

Introduction to Big Data: Defining Big data, Characteristics of Big Data, Need of Big Data, Challenges with Big Data, Overview of Big Data analytics process.

Introduction to Hadoop: What is apache Hadoop, Features of Hadoop, Historical perspective, Hadoop Ecosystem, RDBMS versus Hadoop.

UNIT -II

Hadoop Administration: Installation and Setup of Hadoop environment on windows, Creating and configuring Hadoop cluster, Name node and Data node etc.

Components of Hadoop: HDFS, Working of MapReduce, Yarn, Daemons, Node Manager.

UNIT-III

HDFS (Hadoop Distributed File System): HDFS Concepts, The Structure of HDFS, Command line interface to HDFS, HDFS read and write operations, Hadoop File systems Interfaces, Java Interface to hadoop,Various hadoop commands.

Apache Flume: Introduction, Applications and features, Architecture, Installation and Configuration, Data Ingest, Flume agent, source, sinks etc.

UNIT -IV

Hive: Introduction and Application of Apache Hive, Architecture, Installation and configuration, Data types and operators, HiveQL ,Various database and table operations in hivel, Hive Services, Hive Metastore, Comparison with Traditional Databases.

References:

1. Tom White, “Hadoop: The Definitive Guide”, O’Reilly, 4thEdition, 2015.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015
3. Berman, J.J., Principles of Big Data: Preparing, Sharing and Analyzing Complex Information, Morgan Kaufmann, 2014
4. Donald Miner, Adam Shook, “Map Reduce Design Pattern”, O’Reilly, 2012

Course Outcomes:

At the end of this course the student shall be able to:

1.	Identify Big Data and its Business Implications.
2.	List the components of Hadoop and Hadoop Eco-System
3.	Access and Process Data on Distributed File System
4.	Manage Job Execution in Hadoop Environment
5.	Organizing data stores using apache flume
6.	Handling and applying queries using Apache Hive

B.Sc. (Artificial intelligence &Data Science)

Semester-V

BAIDS-353: Operating System

Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	To understand what a process is and how processes are synchronized and scheduled.
2.	To understand the services provided by and the design of an operating system.
3.	To understand the structure and organization of the file system.
4.	To understand different approaches to memory management.
5.	Students should be able to use system calls for managing processes, memory and the file system.
6.	To study LINUX /UNIX architecture.

UNIT – I

Introduction: Definition, Evolution of Operating System, Functions of Operating System, Types of Operating Systems

Processes: Process concepts, Process states, Process control block, Process Scheduling, operation on processes, Cooperating processes, Threads.

UNIT -II

CPU–Scheduling: Basic concepts, CPU-I/O burst cycle, Preemptive scheduling, Dispatcher, scheduling criteria, scheduling algorithms (FCFS, SJF, Priority, RR), algorithm evaluation.
Deadlocks: Definition, Necessary condition for deadlock, Deadlock Prevention, Mutual exclusion, Hold and wait, No pre–emption, circular wait ,Banker's algorithms, Recovery from deadlock, semaphores.

UNIT – III

Memory Management: Concept of Relocation, Swapping, backing storage, swap time, MFT, MFT job scheduling, region size selection, memory fragmentation, MVT, MVT job scheduling compaction, paging, segmentation.

UNIT -IV

Virtual Memory: Overlays, demand paging, page fault, performance of demand paging, page replacement, page replacement algorithm, FIFO, Optimal page replacement, Thrashing.
Device Management: I/O and device management physical characteristics, FCFS, SSTF, SCAN, CSCAN.
File Management: File Concept, Access Methods, Directory Structure, File System Structure, Allocation Methods, and Free-Space Management

Case study: LINUX Operating System.

At the end of this course the student shall be able to

1.	Learn about operating systems, functions of operating systems, system calls.
2.	Learn about process coordination and process scheduling algorithms.
3.	Learn about memory management, critical section and deadlock handling algorithms.
4.	Learn about file management and disk scheduling algorithms.
5.	Able to implement various algorithms required for management, scheduling, allocation and communication used in Operating System.
6.	Describe and analyze the memory management and its allocation policies.
7.	To understand the structure and organization of LINUX operating system.

References:

1. "Operating System Concepts", Fourth Edition by Silberschatz Galvin Addison Wesley, 1996.
2. "Operating Systems: A Design Oriented Approach" by Crowley, Published by Tata McGraw Hill, 2001.
3. "Operating Systems" Second Edition by Dietel, Addison Wesley, 2017.
4. Madnick & Donovan: Operating System, McGraw Hill, 1978.
5. A.C. Shaw: Logic Design of Operating System, Prentice Hall, 1988.

B.Sc. (Artificial Intelligence & Data Science)

Semester – V

BAIDS-354: Deep Learning

Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	The objective of this course is to provide basic understanding of the concepts of Deep Learning.
2.	It also provide the understanding of Convolutional Neural Networks and Recurrent Neural Networks
3.	The course will make students familiar with the various applications of Deep Learning

UNIT-I

Feedforward neural networks: Pattern classification using perceptron, Multilayer feedforward neural networks, Backpropagation learning, Empirical risk minimization, Gradient-based Learning, Hidden Units, Architecture Design, Computational Graphs, Regularization.

UNIT-II

Deep neural networks (DNNs): Difficulty of training DNNs, Greedy layerwise training, Optimization for training DNNs, Regularization methods (dropout, batch normalization) .

Convolution neural networks (CNNs): Introduction, convolution, pooling, Basic Convolution Function, Convolution Algorithm, Deep CNNs.

UNIT-III

Sequence modeling: Recurrent neural networks (RNNs), Sequence modeling using RNNs, Long Short Term Memory (LSTM), Bidirectional LSTMs, Bidirectional RNNs, Gated RNN Architecture.

UNIT-IV

Deep Generative models: Boltzmann Machines, Restrictive Boltzmann Machines (RBMs), Stacking RBMs, Deep Boltzmann Machines
Applications: Applications in vision, speech and natural language processing

References:

1. Ian Goodfellow and Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016.
2. Aurelien Geron, Hands on Machine Learning with Scikit Learn, Keras& Tensor Flow, O'Reilly.
3. Patterson J. and Gibson A., Deep Learning: A Practitioner's Approach, O'Reilly (2017) 1st ed.
4. S. Haykin, Neural Networks and Learning Machines , Prentice Hall of India, 2010

Course Outcomes (COs):
On the completion of this course, the students will

CO-1.	Understand the fundamentals of deep learning
CO-2.	Know the main techniques in deep learning
CO-3.	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.

B.Sc. (Artificial Intelligence & Data Science)

Semester – V

BAIDS-355P (Practical)

LAB I: Based on Hadoop

Time: 3 Hrs. **Total Marks: 50**

Practical Marks: 37

Internal Assessment Marks:13

Credits		
L	**T**	**P**
0	**0**	**2**

Course Objectives:

Enable the student to

1.	Understand the basics of hadoop programming concepts.
2.	Setting paths and configuring hadoop, flume and hive
3.	Performing basics to complex tasks in HDFS.

In Hadoop practical Lab, students will implement the following experiments:

1. Hadoop Implementation of file management tasks, such as Adding files and directories, retrieving files and Deleting files.
2. Run a basic word count Map reduce program to understand map reduce paradigm: To count words in a given file, to view the output file, and to calculate the execution time.
3. Implementation of K-means clustering using Map Reduce.
4. Implement and Perform Streaming Data Analysis using flume for data capture
5. Various Database operations in Hive

Course Outcomes:

Students will be able to

CO-1.	Understanding the application of hadoop in big data analytics.
CO-2.	Performing loading and storing of data using flume.
CO-3.	Performing various database operations using Apache Hive.

B.Sc. (Artificial Intelligence & Data Science)

Semester – V

BAIDS-356P (Practical)

LAB II: Based on Deep Learning

Time: 3 Hrs. **Total Marks: 50**

Practical Marks: 37

Internal Assessment Marks:13

Credits		
L	**T**	**P**
0	**0**	**2**

Course Objectives:

Enable the student to

1.	The objective of this course is to provide basic understanding of the concepts of Deep Learning.
2.	It also provide the understanding of Convolutional Neural Networks and Recurrent Neural Networks
3.	The course will make students familiar with the various applications of Deep Learning

Course Outcomes:

Students will be able to

CO-1.	Understand the fundamentals of deep learning
CO-2.	Know the main techniques in deep learning
CO-3.	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.

B.Sc. (Artificial Intelligence & Data Science)

Semester – VI

S N	Course Code	Course Name	Distribution of The Marks				Lectures Per week			Credit Distribution			Total Credit L+T+P	Page No.
			Theory	Internal Assessment	Practical	Total	L	T	P	L	T	P		
Discipline Specific Course (DSC)														
1	BAIDS-361	Statistical Packages	75	25	-	100	5	1	0	3	1	0	4	76-77
2	BAIDS-362	Social, Web & Mobile Analytics	75	25	-	100	5	1	0	3	1	0	4	78-79
Skill Enhancement Course (SEC)														
3	BAIDS-363P	Lab: Social, Web & Mobile Analytics, Statistical Packages.	-	13	37	50	0	0	6	0	0	2	2	80
4	BAIDS-364P	Project	-	50	150	200	0	0	24	0	0	8	8	81
										Total Credits=18				

B.Sc. (Artificial Intelligence & Data Science)
Semester – VI
BAIDS-361: Statistical Packages

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 mark each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	To provide skills for research analysis and increase employability.
2.	Help the students to understand the basic concepts of statistical packages for analysis of data.
3.	To lay a foundation for advance data analysis work and higher education.

UNIT -I

Getting started with the SPSS:
Introduction: Data Entry, Storing and Retrieving Files, Generating New Variables; Managing Data- Listing cases, replacing missing values, computing new variables, recoding variables, selecting cases, sorting cases, merging files, Graphs- Creating and editing graphs and charts; Descriptive Statistics Procedures: Frequencies, Descriptive, Explore, Cross Tabulation.

UNIT -II

Hypothesis Testing for Means: Testing of hypothesis, null and alternate hypothesis, TYPE-I, TYPE II errors, level of significance, Normal distribution, Poisson distribution, Binomial distribution, t-test, chi-square test, analysis of variance (one way anova)

UNIT -III

Statistical Measures:

Measurement of central tendency, mean, geometric mean, harmonic mean, Median, Mode, Quartile mean, decile, percentile, Dispersion, Mean deviation, Standard deviation, Standard error, Coefficient of variation, Variation, Variance, Coefficient of determinant.

UNIT -IV

Representation of Data:

Graphical representation, scattered diagram, Straight line, Least square test, Correlation coefficient, Regression coefficient.

References:

1. Performing Data Analysis using IBM SPSS, Lawrence S. Meyers, Glenn C. Gamst, A. J. Guarino, Wiley Publication
2. SPSS for Windows Step by Step A Simple Guide and Reference, Darren George and Paul Malley
3. SPSS in Simple Steps, Kiran Pandya, Smruti Bulsari, Sanjay Sinha, Dreamtech Press

Course Outcomes (Cos):

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

CO-1.	Understand basic functions of statistical software package for managing variables and generate descriptive statistics to describe the data and analyze data through graphs and charts.
CO-2.	Understand Hypothesis Testing and Representation of data.
CO-3.	Test differences in sample means.
CO-4.	Enabling students to develop a positive attitude towards statistics as an interesting and valuable subject of study.

B.Sc. (Artificial Intelligence & Data Science)

Semester – VI

BAIDS-362: Social, Web & Mobile Analytics

Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 100**

Credits		
L	**T**	**P**
3	**1**	**0**

Theory Marks: 75

Theory Internal Assessment Marks:25

Note for paper setter and students:

1. **Medium of Examination is English Language.**
2. **There will be five sections.**
3. **Section A is compulsory and will be of 15 marks consisting of 8 short answer type questions carrying 2.5 marks each covering the whole syllabus. The answer should not exceed 50 words. The students will have to attempt any 6 questions in this section.**
4. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 15 marks each from the respective unit. The students are required to attempt one question from each of these sections.**

Course Objectives:

1.	Understand analytical methods to transform social media data into marketing insight.
2.	Understand the process of informed decision making using case based method.
3.	Understand how to effectively use insights to support website design decisions.
4.	Understand analytics, campaign optimization, and mobile analytics.

UNIT-I

Introduction: Definition and History of Web Analytics, Overview in different mediums of Web analytics, Traditional Web Analytics and challenges.

Data Collection: Data collection methods in Web Analytics. Understanding the Data Landscape, Click stream Data, Outcomes Data, Research Data, and Competitive Data.

UNIT-II

Fundamental of Social Network: Concept of Social media, Benefits of social media for businesses network. KPIs.

Social Media: Social Media Analytics, Data Codes, Sentimental analysis on Social media data.

UNIT-III

Website Optimization: Concept of Website Optimization, Email Analytics and Facebook Analytics.

Google Analytics: Outcome data analysis and Web survey analysis. Metrics used in Web analysis, Pyramid Model of Web Analytics.

UNIT-IV

Mobile Analytics: Overview of Mobile Analytics, Basic key Aspects, Challenges working with Analytics, App Store Data and Feedbacks.

Analytics: Types of Analytics, Analytics for Mobile Apps, Layers of Mobile Apps, Analytics throughout Mobile App Ecosystem,

References:

5. Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media, Matthew Ganis, Avinash Kohirkar
6. Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity by Avinash Kaushik.
7. Social Media Analytics, Marshall Sponder.

Course Outcomes (COs):

On the completion of this course, the students will

CO-1.	Understand the fundamentals of social, web, and mobile analytics
CO-2.	Know the main techniques in Social, Web and Mobile Analytics
CO-3.	Identify the parameters, techniques which are more appropriate for various types of learning tasks in various domains.

B.Sc. (Artificial Intelligence & Data Science)

Semester – VI

BAIDS-363P: Lab : Based on Social, Web & Mobile Analytics, Statistical Packages

Discipline Specific Course (DSC)

Time: 3 Hrs. **Total Marks: 50**

Practical Marks: 37

Internal Assessment Marks:13

Credits		
L	**T**	**P**
0	**0**	**2**

Course Objectives:

1.	Understand analytical methods to transform social media data into marketing insight.
2.	Understand the process of informed decision making using case based method.
3.	Understand how to effectively use insights to support website design decisions.
4.	Understand analytics, campaign optimization, and mobile analytics.
5.	Make students familiar with some of the basic methods of analysis of both univariate and bivariate data.
6.	Provide a thorough theoretical base in different types of sampling distributions, non-central distributions and categorical data analysis..

Lab1: Practical based on Google Analytics, Mobile Analytics, and Statistical Packages.

Course Outcomes (COs):

On the completion of this course, the students will

CO-1.	Understand the fundamentals of social, web, and mobile analytics
CO-2.	Know the main techniques in Social, Web and Mobile Analytics
CO-3.	Identify the parameters, techniques which are more appropriate for various types of learning tasks in various domains.
CO-4.	Understand basic concepts and aspects related to research, data collection, analyses and interpretation.
CO-5.	Significance of various coefficients of correlation.
CO-6.	Understand Fitting of linear and nonlinear curve.
CO-7.	Understand the relationship between the variables/attributes in a given dataset.

B.Sc. (Artificial Intelligence & Data Science)

Semester – VI

BAIDS-364P

Project

Time: 3 Hrs. **Total Marks: 200**

Practical Marks: 150

Internal Assessment Marks:50

Credits		
L	**T**	**P**
0	**0**	**8**