OUTLINES OF TESTS,
SYLLABIANDCOURSESOF READINGS

CHOICE-BASED CREDIT SYSTEM

FOR

B.Sc.(Hons.)inARTIFICIALINTELLIGENCEANDDATASCIENCE

(SEMESTERSYSTEM)

Third Year (Vth &VIth Semester)

[Session 2023-24]

MATA GUJRI COLLEGESRIFATEHGARHSAHIB

(AN AUTONOMOUS COLLEGE)

AFFILIATEDTOPUNJABIUNIVERSITY, PATIALA

B.Sc.(Hons.) in ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
Third Year - Fifth Semester Examinations
Session 2023-24

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	External	Internal		
BSCHAI-501	CC	Computer Graphics	3	1	0	75	25	100	4
BSCHAI - 501(P)		Software Lab – IX	0	0	4	50	--	50	2
BSCHAI-502	CC	Machine Learning	3	1	0	75	25	100	4
BSCHAI-502(P)		Software Lab – X	0	0	4	50	--	50	2
BSCHAI-503	DSE	DSE - II*	4	0	4	75	25	100	6
BSCHAI-504	CC	Computer Networks	5	0	2	75	25	100	6
		Total	**17**	**3**	**16**	**400**	**100**	**500**	**28**

*** Discipline Specific Elective II:**

1.	BSCHAI-503 DSE1	Big Data Analysis and Data Visualization
2.	BSCHAI-503 DSE2	Internet of Things

The breakup of marks for the continuous assessment for theory paper will be as under

I	Two tests will be conducted during the semester. Both the tests will be considered for assessment.	:	50% of the marks allotted for continuous assessment
II	Assignment/Presentations	:	20% of the marks allotted for continuous assessment
III	Class participation & behavior	:	10% of the marks allotted for continuous assessment
IV	Attendance	:	20% of the marks allotted for continuous assessment

Course Code: BSCHAI-501

Computer Graphics

Maximum Marks: 100 Time: 3hours

Theory: 75Marks Pass Marks: 35%

Internal Assessment: 25Marks

Course Objectives:

1. This course will introduce students to all aspects of computer graphics including hardware, software and applications.
2. It will help students to apply graphics programming techniques to design, and create computer graphics.

Course Learning Outcomes:

1. Introducing the basic concepts used in computer graphics.
2. Enables to implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
3. Familiarize the importance of viewing and projections.

(A) INSTRUCTIONSFORTHEPAPERSETTER

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III. Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabusuniformlyandwillcarry3marksinall.

(B) INSTRUCTIONSFORTHE CANDIDATES

Candidates are required to attempt two questions each from UNIT-I and UNIT-II.UNIT-III is Compulsory.

UNIT-I

Functioning of Input devices: Keyboard, Touch panel, Light pens, Graphic tablets, Joysticks, Data glove, Image scanner, Mouse.

Functioning of Output devices: Impact and non impact printers, such as line printer, dot matrix, laser, ink-jet, electrostatic, flatbed and drum plotters.

Functioning of Video Display Devices: Refresh cathode ray tube, raster scan displays, random scan displays, color CRT monitors, DVST, flat-panel displays, virtual reality, raster scan systems, Frame buffer and video controller.

Scan conversion algorithms: For line, circle and ellipse, Bresenham's & Mid- point algorithms, area filling techniques.

UNIT-II

2-Dimensional Graphics: 2-dimensional Geometric transformations(translation, Scaling, Rotation, Reflection, Shearing), Viewing transformation, 2D clipping algorithms (Cohen Sutherland and Liang Barsky's line clipping algorithms), polygon and text clipping.

3-dimensional Graphics: Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Composite transformations, Mathematics of Projections (parallel & perspective), 3-D viewing transformations and clipping.

Text Books:

1. D. Hearn and M.P. Baker, "Computer Graphics", PHI New Delhi; Second Edition.

References:

1. J.D. Foley, A.V. Dam, S.K. Feiner, J.F. Hughes,. R.L Phillips, "Introduction to Computer Graphics", Addison-Wesley Publishing company, N.Y.; Second Edition.
2 . R.A. Plastock and G. Kalley, "Computer Graphics", McGraw Hill.

Teaching Plan:

Week	Content
1-2	**Functioning of Input devices:** Keyboard, Touch panel, Light pens, Graphic tablets, Joysticks, Data glove, Image scanner, Mouse.
3-4	**Functioning of Output devices:** Impact and non impact printers, such as line printer, dot matrix, laser, ink-jet, electrostatic, flatbed and drum plotters.
5-6	**Functioning of Video Display Devices:** Refresh cathode ray tube, raster scan displays, random scan displays, color CRT monitors, DVST, flat-panel displays, virtual reality, raster scan systems, Frame buffer and video controller.
7-8	**Scan conversion algorithms**: For line, circle and ellipse, Bresenham's & Mid- point algorithms, area filling techniques.
9-10	**2-Dimensional Graphics:** 2-dimensional Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Viewing transformation.
11-12	2D clipping algorithms (Cohen Sutherland and Liang Barsky's line clipping algorithms), polygon and text clipping.
13-14	**3-dimensional Graphics:** Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Composite transformations, Mathematics of Projections (parallel & perspective), 3-D viewing transformations and clipping.

Course Code: BSCHAI -501(P)

Software Lab – IX

Maximum Marks: 50 Time: 3hours

External Examination: 50Marks Pass Marks: 35%

Practical Sessions to be conducted: 40-50Hrs.

This laboratory course will comprise as exercises to supplement what is learnt under paper BSCHAI-501.

The breakup of marks for the practical will be as under

I.	Lab Record(Internal Assessment)	10Marks
II.	Viva Voce(External Evaluation)	20Marks
III.	Program Development and Execution(External Evaluation)	20Marks

Course Code: BSCHAI-502

Machine Learning

Maximum Marks: 100 Time:3hours

Theory: 75Marks PassMarks:35%

Internal Assessment: 25Marks

Course Objectives:

- Provide understanding of techniques and mathematical concepts used in machine learning to facilitate further study in this area.
- Provide understanding to evaluate performance of machine learning algorithms.

Course Learning Outcomes:

Upon Completion of the course, Students will be able to

- Practice software implementation of different concepts and algorithms covered in the course python ML library.

(A)INSTRUCTIONSFORTHEPAPERSETTER

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III. Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabusuniformlyandwillcarry3marksinall.

(B)INSTRUCTIONSFORTHE CANDIDATES

Candidates are required to attempt two questions each from UNIT-I and UNIT-II.UNIT-III is Compulsory.

UNIT-I

Introduction: Applications, Types of Machine learning Systems- Supervised, Unsupervised, Batch, Online, Reinforcement, Decision boundaries, Challenges of Machine Learning Supervised Learning: Training, Testing and Validation data, Data Cleaning-Handling Text and categorical attributes, Transformers, Feature Scaling, Linear Regression, Polynomial Regression, Logistic Regression, Cost Function, Gradient Descent-Batch, Stochastic, Mini-batch, Learning Curves, Support Vector Machines (SVM)- Linear and Non-Linear Classification

UNIT-II

Dimensionality Reduction: Curse of dimensionality, Approaches- Projection, Manifold Learning, PCAPrincipal Components, Explained variance ration, choosing number of dimensions. Unsupervised Learning: Clustering- K-Means, Hierarchical, Objective function Neural Networks: Model Representation, Back propagation algorithm, Gradient Checking, Binary and Multiclass classification

Text Books:

1. Yuxi (Hayden) Liu, “Python Machine Learning By Example”, Packt
2. Allen Downey, Jeffrey Elkner and Chris Meyers, “How to Think Like a Computer Scientist, Learning with Python”, Green Tea Press Wellesley, Massachusetts

Reference Books:

1. David Longbow, "Machine Learning: A Beginners Guide to the Fundamentals of Machine Learning", Paperback
2. Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", Paperback

Teaching Plan:

Week	Content
1-2	Introduction: Applications, Types of Machine learning Systems- Supervised, Unsupervised, Batch, Online, Reinforcement, Decision boundaries
3-4	Challenges of Machine Learning Supervised Learning: Training, Testing and Validation data, Data Cleaning
5-6	Data Cleaning-Handling Text and categorical attributes, Transformers, Feature Scaling, Linear Regression, Polynomial Regression, Logistic Regression, Cost Function,
7-8	Gradient Descent-Batch, Stochastic, Mini-batch, Learning Curves, Support Vector Machines (SVM)- Linear and Non-Linear Classification
9-10	Dimensionality Reduction: Curse of dimensionality, Approaches- Projection, Manifold Learning, PCA Principal Components
11-12	Variance ration, choosing number of dimensions. Unsupervised Learning: Clustering-K-Means, Hierarchical, Objective function
13-14	Neural Networks: Model Representation, Back propagation algorithm, Gradient Checking, Binary and Multiclass classification

Course Code: BSCHAI-502(P)

Software Lab – X

Maximum Marks: 50 Time:3hours

External Examination: 50Marks Pass Marks: 35%

Practical Sessions to be conducted: 40-50Hrs.

This course will mainly comprise of exercises on the basis of the following theory paper BSCHAI-502.

The breakup of marks for the practical will be as under

I.	Lab Record(Internal Assessment)	10Marks
II.	Viva Voce(External Evaluation)	20Marks
III.	Program Development and Execution(External Evaluation)	20Marks

Course Code: BSCHAI-503 DSE1

Big Data Analysis and Data Visualization

Maximum Marks: 100 Time:3hours

Theory: 75Marks PassMarks:35%

Internal Assessment: 25Marks

Course Objectives:

- To understand the various types of data, apply and evaluate the principles of data visualization.
- Acquire skills to apply visualization techniques to a problem and its associated dataset.
- To apply structured approach to create effective visualizations.

Course Learning Outcomes:

Upon Completion of the course, Students will be able to,

- Identify the data types and its associated visualization mechanisms.
- Apply the various scalar and vector visualization techniques to create suitable visualization for real life applications

(A)INSTRUCTIONSFORTHEPAPERSETTER

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III. Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

(B)INSTRUCTIONSFORTHE CANDIDATES

Candidates are required to attempt two questions each from UNIT-I and UNIT-II.UNIT-III is Compulsory.

UNIT-I

Data Gathering and Preparation: Data formats, parsing and transformation, Scalability and real-time issues, Data Cleaning: Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation

Exploratory Analysts: Descriptive and comparative statistics, Clustering and association, hypothesis Generation Visualization: Designing visualizations, Time series, Geo-located data, Correlations and connections, Hierarchies and networks, interactivity

UNIT-II

Big Data Technology: Definition, Evolution Of Big Data, Characteristics Of Big Data , Challenges, Application Domains ,Big Data Life Cycle, Big Data Analytics - Methodology , Core Deliverables Fundamental of Big Data Types, Big data Technology Components, Big Data Architecture, Models for Big Data.

Big Data Tools: Hadoop: Introduction to Hadoop Ecosystem, HDFS, Map- Reduceprogramming, Spark, PIG, JAQL, Understanding Text Analytics and Big Data, Predictive Analysis of Big Data, Role of Data Analyst

Reference Books:

1. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, Wiley Blackwell.
2. Anil Mabeshwari, Data Analytics Make Accessible, Orilley Publications.
3. A. Croll and B. Yoskovitz Lean Analytics: Use Data to Build a Better Startup Faster, OreilleyPublications,st Edition.

Teaching Plan:

Week	Content
1-2	Data Gathering and Preparation: Data formats, parsing and transformation, Scalability and real-time issues, Data Cleaning: Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation
3-4	Exploratory Analysts: Descriptive and comparative statistics, Clustering and association, hypothesis Generation
5-6	Visualization: Designing visualizations, Time series, Geo-located data,Correlationsand connections, Hierarchies and networks, interactivity
7-8	Big Data Technology: Definition, Evolution Of Big Data, Characteristics Of Big Data , Challenges, Application Domains ,Big Data Life Cycle
9-10	Big Data Analytics - Methodology , Core Deliverables Fundamental of Big Data Types, Big data Technology Components, Big Data Architecture, Models for Big Data.
11-12	Big Data Tools: Hadoop: Introduction to Hadoop Ecosystem, HDFS, Map-Reduceprogramming
13-14	Spark, PIG, JAQL, Understanding Text Analytics and Big Data, PredictiveAnalysis of Big Data, Role of Data Analyst

Course Code: BSCHAI-503 DSE2
Internet of Things

Maximum Marks: 100 Time:3hours

Theory: 75Marks Pass Marks: 35%

Internal Assessment: 25Marks

Course Objectives:

- The course enables student to understand the basics of Internet of things and protocols.
- It introduces some of the application areas where Internet of Things can be applied.

Course Learning Outcomes:

- The purpose of this course is to impart knowledge on IoT Architecture and various protocols, study their implementations

(A)INSTRUCTIONSFORTHEPAPERSETTER

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III. Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

(B)INSTRUCTIONSFORTHE CANDIDATES

Candidates are required to attempt two questions each from UNIT-I and UNIT-II.UNIT-III is Compulsory.

UNIT-I

Iot - What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.

Iot Protocols - Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards - Network layer – APS layer – Security.

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT.

UNIT-II

Iot Architecture - IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity: An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.

Web of Things - Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence.

Iot Applications - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.

Text Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press.

Reference Books:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-onApproach)", 1st Edition, VPT.
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", Apress Publications.
3. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media.

Teaching Plan:

Week	Content
1-2	**Iot** - What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.
3-4	**Iot Protocols** - Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards - Network layer – APS layer – Security.
5-6	**M2M to IoT**-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example,
7-8	Differing Characteristics. Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT.
9-10	**Iot Architecture** - IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity: An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.
11-12	**Web of Things** - Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence
13-14	**Iot Applications** - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.

Course Code: BSCHAI-504
Computer Networks

Maximum Marks: 100 Time: 3hours

Theory: 75Marks Pass Marks: 35%

Internal Assessment: 25Marks

Course Objectives:

- Build an understanding of the fundamental concepts of computer networking
- Familiarize the students with the reference models.

Course Learning Outcomes:

- The purpose of this course is to impart knowledge of networking concepts and approaches.

(A)INSTRUCTIONSFORTHEPAPERSETTER

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III. Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

(B)INSTRUCTIONSFORTHE CANDIDATES

Candidates are required to attempt two questions each from UNIT-I and UNIT-II.UNIT-III is Compulsory.

Unit I

Computer Networks: Uses of Computer Network, Structure of Computer Network: Point-to-point structure, Broadcast structure. Classification of networks-LAN, MAN and WAN,
Line Configuration: Topologies, full Duplex, and Half Duplex.
Reference models: OSI model, Layers of OSI Model, TCP/IP model, Comparison of TCP/IP and OSI models
Medium Access Sub layer: Static and dynamic channel allocation, Multiple access protocols-ALOHA, CSMA,CSMA/CD, Collision Free protocol
Internet protocols: How networks differ, internetworking devices, concatenated virtual circuits, connectionless inter-networking.

Unit II

Data Link Layer: Design issues, Services to network layer, Framing, Error control, Flow control, Elementary data link protocols-unrestricted simplex protocol, simplex stop and wait protocol, simplex protocol for a noisy channel. **Network layer:** Design issues, Services to the transport layer, Routing algorithms-Static/ non-adaptive and dynamic/adaptive algorithms. Congestion control algorithms –the leaky bucket algorithm, the token bucket algorithm. **Transport layer:** design issues, connection management-addressing, establishing and releasing connection, transport layer protocols-TCP, UDP. **Application layer:** The DNS Name Space, Electronic Mail, The World Wide Web

Network security: Security Attacks and Preventions, **Cryptography:** principles, public key encryption and digital signatures.

TextBook:

1. Andrew S. Tanenbaum, "Computer Networks", Third Edition, PHI Publications.

References:

1. Data & Computer Communications by William Stallings, Pearson Education.
2. D.E. Corner, "Computer Networks and Internets', Second Edition, Addison-Wesley Publication
3. Computer Networks by Forouzan, Tata McGrawhill Publications.

Teaching Plan:

Week	Content
1-2	**Computer Networks:** Uses of Computer Network, Structure of Computer Network: Point-to-point structure, Broadcast structure. Classification of networks-LAN, MAN and WAN, **Line Configuration:** Topologies, full Duplex, and Half Duplex.
3-4	**Line Configuration:** Topologies, full Duplex, and Half Duplex. **Reference models:** OSI \model, Layers of OSI Model,
5-6	**Comparison of TCP/IP** and OSI models **Medium Access Sub layer:** Static and dynamic channel allocation
7-8	**Multiple access protocols: ALOHA,** CSMA, CSMA/CD, Collision Free protocol, **Internet protocols:** How networks differ, internetworking devices, concatenated virtual circuits, connectionless inter-networking.
9-10	**Data Link Layer:** Design issues, Services to network layer, Framing, Error control, Flow control, Elementary data link protocols-unrestricted simplex protocol, simplex stop and wait protocol, simplex protocol for a noisy channel.
11-12	**Network layer:** Design issues, Services to the transport layer, Routing algorithms-Static/ non-adaptive and dynamic/adaptive algorithms. Congestion control algorithms –the leaky bucket algorithm, the token bucket algorithm.
13-14	**Transport layer:** design issues, connection management-addressing, establishing and releasing connection, transport layer protocols-TCP, UDP. **Application layer:** The DNS Name Space, Electronic Mail, The World Wide Web, **Network security:** Security Attacks and Preventions **Cryptography**:cryptographicprinciples,public-keyalgorithms(RSA),digitalsignatures

B.Sc.(Hons.) ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
Third Year - Sixth Semester Examinations
Session 2023-24

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
			L	T	P	External	Internal		
BSCHAI-601	CC	Web Development Technologies	3	1	0	75	25	100	4
BSCHAI-601(P)		Software Lab – VIII	0	0	4	50	--	50	2
BSCHAI-602	DSE	DSE – III*	3	1	0	75	25	100	4
BSCHAI-602(P)		Software Lab – IX	0	0	4	50	--	50	2
BSCHAI-603	GE	GE-III**	4	0	0	--	100	100	4
BSCHAI-604	SEC	SEC –II	0	0	4	75	25	100	2
		Total	**10**	**2**	**13**	**325**	**375**	**500**	**18**

***Discipline Specific Elective III:**

1.	BSCHAI-602 E1	Digital Image Processing
2.	BSCHAI-602 E2	Natural Language Processing

****General Elective III:**

1.	BSCHAI-603 E1	Quantitative and Logical Aptitude
2.	BSCHAI-603 E2	Personality Development with Presentation & Communication Skills.

Skill Enhancement Course II:

1.	BSCHAI-604 SEC1	Neural Networks
2.	BSCHAI-604 SEC2	Web Mining

Course Code: BSCHAI-601

Web Development Technologies

Maximum Marks: 100 Maximum Time: 3 Hrs.
Internal Assessment: 25
External Examination: 75
Minimum Pass Marks: 35% Lectures to be delivered: 45-55

Course Objective:

- The objective of the course is to enable the students to understand and build web applications quickly and efficiently with the help of Python.

Course Outcomes:

- Create client side and server side basic web applications.
- Build an HTTP server using the core modules in Django/Flask/Express.js
- Interface to a PostGreSQL/MySQL/SQLite database and a web service.

(A)INSTRUCTIONSFORTHEPAPERSETTER

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III. Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

(B)INSTRUCTIONSFORTHE CANDIDATES

Candidates are required to attempt two questions each from UNIT-I and UNIT-II.UNIT-III is Compulsory.

UNIT- I

Introduction to HTML: HTML tags and attributes, paired and unpaired tags, Text-formatting tags, Lists.Tables and its attributes.Hyperlinks: Creating external and internal links, using images as links. Forms: Introduction, form elements, Input elements, different control types created with input elements, button elements, text area element,drop downlists, action attributes and method attributes.
CSS: Elements of styles, linking a stylesheet to an HTML Documents, In-Line Styles, External style sheets, Internal style sheets. CSS properties.
Java Script: Syntax, Comments, Statements, data types, variable declaration, scope of variables, Expressions and Operators, getting inputs, output functions. Sequence control statements: decision taking statements, iterative (looping) statements, break and continue. Arrays, Functions, Events in JS, DOM.

UNIT- II

Web Development: Introduction to client/server architecture, servers, browsers, WWW, HTTP, FTP, client side and server side programming languages. MVC frameworks. Introduction with Django and Flaskframeworks, Installing and setting up Django environment, Installing packages globally using pip, exporting and importing modules.
Django framework: Creating a Django project, creating and deploy Django apps. Django project layout and MVC architecture: model, views and templates. redirecting URLs, handling get and post requests, creating and handling JSON file formats, user authentication using auth, working with sessions, working with AJAX, implementing API routing, deploying application.
Database Queries: Understand basic Structured Query Language (SQL), introduction to compatible database models PostGreSQL, SQLite, MySQL. Setting up database connectivity, working with Django ORM.

Textbooks:

1. Laura Lemay, Mastering HTML,CSS & JavaScript Web Publishing, BPB Publication

2. Mastering Django ,Nigel George, December 2016, Packt Publishing, ISBN: 9781787281141

References:

1. Thomas Powell, The Complete Reference HTML & CSS, TMH 5 th edition.
2. Learning Django Web Development, Sanjeev Jaiswal and Ratan Kumar,Packt Publishing Limited,ISBN: 9781783984404

Teaching Plan

Week-I	Web Development: Introduction to client/server architecture, servers, browsers, WWW, HTTP, FTP, client side and server side programming languages
Week-II	Introduction with Django and Flask frameworks, understanding basics of Django, Django Features, benefits of using Django and Flask
Week-III	Django process model. Installing and setting up Django environment, Installing packages globally using pip, exporting and importing modules
Week-IV	Python basics and programming constructs
Week-V	Python data structures:list,dictionary, tuple, set. python functions, OOPs, models in Python, python for web modules.
Week-VI	Creating a Django project, creating and deploy Django apps. Django project layout and MVC architecture: model, views and templates.
Week-VII	Redirecting URLs, handling get and post requests.
Week-VIII	Creating and handling JSON file formats, user authentication using auth, working with sessions, working with AJAX,
Week-IX	implementing API routing, deploying application.
Week-X	Understand basic Structured Query Language (SQL), introduction to compatible database models PostGreSQL, SQLite, MySQL.
Week-XI	Setting up database connectivity, working with Django ORM
Week-XII	Revision of Syllabus

Course Code: BSCHAI-601(P)

Software Lab – VIII

Maximum Marks: 50 Time: 3hours

External Examination: 50Marks PassMarks:35%

Practical Sessions to be conducted: 40-50Hrs.

This course will mainly comprise of exercises on the basis of the following theory paper BSCHAI-601.

The breakup of marks for the practical will be as under

I.	Lab Record(Internal Assessment)	10Marks
II.	Viva Voce(External Evaluation)	20Marks
III.	Program Development and Execution(External Evaluation)	20Marks

Course Code: BSCHAI-602 E1

Digital Image Processing

Maximum Marks: 100 Time: 3hours

Theory: 75Marks Pass Marks: 35%

Internal Assessment: 25Marks

Course Objectives:

- To Understand various image compression techniques

Course Outcomes: After undergoing this course, the students will be able to:

- Understand the basic concepts of DIP.
- Improve the quality of digital images.

(A)INSTRUCTIONSFORTHEPAPERSETTER

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III. Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

(B)INSTRUCTIONSFORTHE CANDIDATES

Candidates are required to attempt two questions each from UNIT-I and UNIT-II.UNIT-III is Compulsory.

UNIT-I

Introduction to the DIP areas and applications; Components of Digital Image Processing; Elements of Visual Perception; Image Sensing and Acquisition; Image Sampling and Quantization; Relationships between pixels; color models.

Spatial Domain: Gray level transformations; Histogram processing; Basics of Spatial Filtering; Smoothing and Sharpening Spatial Filtering Frequency Domain: Introduction to Fourier Transform; Smoothing and Sharpening frequency domain filters; Ideal, Butterworth and Gaussian filters

UNIT-II

Noise models; Mean Filters; Order Statistics; Adaptive filters; Band reject Filters; Band pass Filters; Notch Filters; Optimum Notch Filtering; Inverse Filtering; Wiener filtering

Feature Extraction: Contour and shape dependent feature extraction, Extraction of textural features Segmentation: Detection of Discontinuities; Edge Linking and Boundary detection; Region based segmentation; Morphological processing- erosion and dilation.

Text Books:

1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education.

2. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd.

Reference Books:

3. Willliam K Pratt, “Digital Image Processing”, John Willey.

4. Nick Efford, “Digital Image Processing a practical introduction using Java”, Third Edition, Pearson Education

5. R.C. Gonzalez, R.E. Woods, and S. L. Eddins “Digital Image Processing using MATLAB”, Pearson Prentice-Halls

Teaching Plan:

Week	Content
1-2	Introduction to the DIP areas and applications; Components of Digital Image Processing; Elements of Visual Perception;
3-4	Image Sampling and Quantization; Relationships between pixels; color models. Spatial Domain: Gray level transformations
5-6	Histogram processing; Basics of Spatial Filtering; Smoothing and Sharpening Spatial Filtering Frequency
7-8	Introduction to Fourier Transform; Smoothing and Sharpening frequency domain filters; Ideal, Butterworth and Gaussian filters
9-10	Noise models; Mean Filters; Order Statistics; Adaptive filters; Band reject Filters; Band pass Filters; Notch Filters; Optimum Notch Filtering; Inverse Filtering; Wiener filtering
11-12	Feature Extraction: Contour and shape dependent feature extraction, Extraction of textural features Segmentation: Detection of Discontinuities;
13-14	Edge Linking and Boundary detection; Region based segmentation; Morphological processing-erosion and dilation.

Course Code: BSCHAI-602 E2

Natural Language Processing

Maximum Marks: 100 Time:3hours

Theory:75Marks PassMarks:35%

Internal Assessment: 25Marks

Course Objective:

The Course provides the models, methods, and algorithms of statistical Natural Language Processing (NLP) for common NLP tasks, such as speech recognition, machine translation, spam filtering, text classification and spell checking.

Course Learning Outcomes:

Upon Completion of the course, Students will be able to,

- Understand the linguistic phenomena and to explore the linguistic features relevant to each NLP task.
- Apply the methods to solve real life NLP problems

A)INSTRUCTIONS FOR THE PAPERSETTER

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III. Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry 12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

(B)INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions each from UNIT-I and UNIT-II. UNIT-III is Compulsory

UNIT - I

Introduction: Application of NLP. Phases of NLP. Approaches to N LP. Heuristic based NLP, Machine Learning for NLP, Deep learning for NLP. Build NLP pipeline. NLP libraries.

Word Level Analysis: Role of language models. Simple N-gram models. Evaluating language models. Part of Speech Tagging & Sequence Labeling- rule based POS tagging, Stochastic and Transformation based Tagging, Hidden Markov Model (Viterbi Algorithms)

Syntatic Analysis: Context- Free Grammars. Grammar rules for English. Dependency Grammar. Probabilistic CFG.

UNIT-II

Semantics and Progmatics: Meaning Representation. Lexical Ambiguity.
Word Sense Disambiguation using Supervised, Dictionary and Thesaurus approaches.
Discourse Analysis and Lexical Resources: Discourse Segmentation.
Coherence- Reference Phenomena, Anaphora resolution, Coreference Resolution.
Machine Translation: Need of MT. Basic issue in MT. Approaches to MT- Direct MT, Rule- Based MT, Knowledge Based MT, Statistical MT. Translation involving Indian Languages

Text Books:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press.

Reference Books:

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall.

2. James Allen, "Natural Language Understanding", 2nd edition, Benjamin /Cummings publishing company.

Teaching Plan:

Week	Content
1-2	Introduction: Application of NLP. Phases of NLP. Approaches to N LP. Heuristic based NLP, Machine Learning for NLP, Deep learning for NLP. Build NLP pipeline. NLP libraries.
3-4	Word Level Analysis: Role of language models. Simple N-gram models. Evaluating language models. Part of Speech Tagging & Sequence Labeling- rule based POS tagging, Stochastic and Transformation based Tagging, Hidden Markov Model (Viterbi Algorithms)
5-6	Syntatic Analysis: Context- Free Grammars. Grammar rules for English. Dependency Grammar. Probabilistic CFG.
7-8	Semantics and Progmatics: Meaning Representation. Lexical Ambiguity. Word Sense Disambiguation using Supervised, Dictionary and Thesaurus approaches.
9-10	Discourse Analysis and Lexical Resources: Discourse Segmentation. Coherence- Reference Phenomena, Anaphora resolution, Coreference Resolution.
11-12	Machine Translation: Need of MT. Basic issue in MT. Approaches to MT
13-14	Direct MT, Rule- Based MT, Knowledge Based MT, Statistical MT. Translation involving Indian Languages

Course Code: BSCHAI-602 (P)

Software Lab – IX

This course will mainly comprise of exercises on the basis of the following theory paper BSCHAI-602 E2 (Suggested Tools – Python/JAVA)

Or BSCHAI-602 E1

The breakup of marks for the practical will be as under

I.	Lab Record(Internal Assessment)	10Marks
II.	Viva Voce(External Evaluation)	20Marks
III.	Program Development and Execution(External Evaluation)	20Marks

Course Code: BSCHAI-603 E1

Quantitative and Logical Aptitude

Maximum Marks: 100 Time: 3hours

Pass Marks: 35%

Internal:100 Marks

Course Objectives:

- To Understand Logical reasoning techniques.

Course Outcomes:

- Students will be able to apply Logical reasoning and mathematical analysis methodologies to understand and solve problems.

Unit-I

Verbal Reasoning: Number series, Letter & symbol series, Logical Reasoning problems, Alphabet test, Blood relations, Direction sense test, Input output, Coding-decoding, Number Ranking Non-verbal Reasoning: Making series/analogy, Classification, Series test, Odd figures.

Unit-II

Quantitative aptitude: whole numbers problems, Problems on Trains, Numbers and Ages, Percentage Problems, Boats and Streams, Ratio & Proportion, Square roots, Averages, Interest, Heights and Distances, Time and distance, Series, Time & Work.

Text Books:

1.R.S Aggarwal, “Quantitative aptitude”.

References Books:

1.R. S Aggarwal , “Verbal and non-verbal Reasoning

Teaching Plan:

Week	Content
1-2	Verbal Reasoning: Number series, Letter & symbol series
3-4	Logical Reasoning problems, Alphabet test, Blood relations, Direction sense test,
5-6	Coding-decoding, Number Ranking Non-verbal Reasoning: Making series/analogy
7-8	Classification, Series test, Odd figures.
9-10	Quantitative aptitude: whole numbers problems, Problems on Trains
11-12	Numbers and Ages, Percentage Problems, Boats and Streams, Ratio & Proportion,
13-14	Averages, Interest, Heights and Distances, Time and distance, Series, Time & Work.

Course Code: BSCHAI-603 E2

Personality Development with Presentation & Communication Skills

Maximum Marks: 100 Time:3hours
PassMarks:35%

Internal Assessment: 100 Marks

Objective: The course is aimed at developing Leadership styles and communication skills that are necessary for successful business decisions.

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

Sr. No.	Course Outcomes
1.	Acquaint with different aspects of personality and role of soft skills in personality development.
2.	Understand psychology and success, self-awareness, goals and obstacles, positive thinking, and self-motivation
3.	Boost the confidence and present their thoughts eloquently.
4.	Communicate effectively as a individual and team
5.	Face interviews with confidence.

UNIT-I

Introduction to Personality, Personality Development, Types of personality, Dynamics of Personality, Personality Traits, Influences on Personality, Personality Analysis through body language and Individual habits, Physical Aspects of personality, Emotional Stability, Self- awareness, Mind and mental development, Mental Blocks. Communication–Meaning, Definition, Nature and Scope of Communication, Importance of Communication. Communication Process; Principles of Communication; Types of Communication – Interpersonal Communication - Gateway to effective interpersonal Communication.

UNIT – II

Barriers to Communication- Linguistic Barriers, Psychological Barriers, Interpersonal Barriers, Cultural Barriers, Physical Barriers, Organizational Barriers. Soft Skills: Listening, Speaking, Reading and Writing Skills. Interview: meaning and types of interview, Tips for facing the interview, Group Discussion. Body Language, Presentation Skills. Personal Skills: Emotional Intelligence, Emotion Management, Tolerance of Change, Taking Criticism, Self-Confidence, Adaptability, Resilience, Assertiveness, Self Assessment.

Recommended Texts:

1. Introduction to Psychology by Atkinson and Hilgard s, Edward E. Smith , Geoffrey Loftus.
2. Personality Development by Rajiv K. Mishra , Rupa & Co.
3. Rajendra Pal Korahill, *"Essentials of Business Communication*", Sultan Chand & Sons, New Delhi, 2006.

4. Ramesh, MS, & C. C Pattanshetti, *"Business Communication"*, R.Chand & Co, New Delhi, 2003.

Instructions

The external paper will carry 60 marks and would be of three hours duration. The question paper will be divided into three groups, i.e., I, II, III. Group I comprise of 10 short questions from entire syllabus. Group II comprises of 4 questions from part I of the syllabus and Group III comprises of 4 questions from part II of the syllabus. Candidates will be required to attempt all 10 questions from group I carrying 2 marks each and two questions each from group II & III. Each question in group II & III carries 10 marks.

Course Code: BSCHAI-604 SEC1

Neural Networks

Maximum Marks: 100 Time:3hours

Theory: 75Marks PassMarks:35%

Internal Assessment: 25Marks

Course Objective:

- Able to understand the Architecture of different neural networks.
- Understand a wide variety of learning algorithm

Course Outcomes: After undergoing this course, the students will be able to:

- Able to implement learning models for real life applications.
- Able to implement different concepts and algorithms for practical applications

(A)INSTRUCTIONS FOR THE PAPERSETTER

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III. Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry 12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

(B)INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions each from UNIT-I and UNIT-II. UNIT-III is Compulsory

UNIT-I

Biological Neuron – Artificial Neural Model - Types of activation functions – Architecture: Feedforward and Feedback – Learning Process: Error Correction Learning – Memory Based Learning – Competitive Learning - Boltzman Learning – Supervised and Unsupervised Learning – Learning Tasks: Pattern Space – Weight Space – Pattern Association – Pattern Recognition – Function Approximation – Control – Filtering - Beamforming – Memory – Adaptation - Statistical Learning Theory – Single Layer Perception

Perception Learning Algorithm – Perception Convergence Theorem – Least Mean Square Learning Algorithm – Multilayer Perception – Back Propagation Algorithm – XOR problem – Limitations of Back Propagation Algorithm.

UNIT-II

Networks Applications: XOR Problem – Image Classification. SUPPORT VECTOR MACHINES: Optimal Hyperplane for Linearly Separable Patterns and Non separable Patterns – Support Vector - insensitive Loss Function – Support Vector Machine for Pattern Recognition – XOR Problem - Machines for Nonlinear Regression

Competitive learning neural networks: Components of CL network pattern clustering and feature mapping network, ART networks, Features of ART models, character recognition using ART network.

Applications of ANN : Pattern classification – Recognition of Olympic games symbols, Recognition of printed Characters.

Text Books:

1. Nunes Da Silva I, Artificial Neural Networks A Practical Course", SPRINGER, ISBN - 9783319431611

2. Satish Kumar, "Neural Networks: A Classroom Approach", Tata McGraw-Hill Publishing Company Limited, New Delhi

Reference Books:

1. Simon Haykin, "Neural Networks: A Comprehensive Foundation", 2ed., Addison Wesley Longman (Singapore) Private Limited, Delhi.

Teaching Plan:

Week	Content
1-2	Biological Neuron – Artificial Neural Model - Types of activation functions – Architecture: Feedforward and Feedback –
3-4	Learning Process: Error Correction Learning – Memory Based Learning –
5-6	Competitive Learning - Boltzman Learning – Supervised and Unsupervised Learning – Learning Tasks: Pattern Space – Weight Space – Pattern Association – Pattern Recognition – Function Approximation – Control – Filtering - Beamforming – Memory – Adaptation - Statistical Learning Theory – Single Layer Perception
7-8	Networks Applications: XOR Problem – Image Classification. SUPPORT VECTOR MACHINES: Optimal Hyperplane for Linearly Separable Patterns and Non separable Patterns
9-10	Support Vector Machine for Pattern Recognition – XOR Problem - Machines for Nonlinear Regression, Competitive learning neural networks: Components of CL network pattern clustering and feature mapping network,
11-12	ART networks, Features of ART models, character recognition using ART network.
13-14	Applications of ANN: Pattern classification – Recognition of Olympic games symbols, Recognition of printed Characters.

Course Code: BSCHAI-604 SEC2

Web Mining

Maximum Marks: 100 Time:3hours

Theory: 75Marks PassMarks:35%

Internal Assessment: 25Marks

Course Objective:

- To learn various techniques to mine the Web and other information networks
- To mine Social networks and Social media

Course Outcomes: After undergoing this course, the students will be able to:

- To learn how to extract knowledge from web scale datasets by various techniques.
- To Understand emerging areas in the ever evolving Web

A) INSTRUCTIONS FOR THE PAPERSETTER

The question paper will consist of three sections UNIT-I, UNIT-II, and UNIT-III. Each of UNIT-I and UNIT-II will have four questions from the respective Units of the syllabus and each question will carry 12 marks. UNIT-III will have 9 short answer type questions which will cover the entire syllabus uniformly and will carry 3 marks in all.

(B)INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions each from UNIT-I and UNIT-II. UNIT-III is Compulsory

UNIT-I

INTRODUCTION TO WEB DATA MINING : Need, Importance, Applications of Web Data mining. Capturing-users web activities, Client side v/s middleware v/s server side-data and usage logging. Web Mining and its types, Web Usage Mining, Web Structure Mining, Web Content Mining

WEB USAGE MINING: Learning from Browser, Server Logs, Identifying frequent item sets, pattern identification, representing patterns in form of relations/Graphs. Understanding web application or website- Usage, Heat maps. Using statistical tools for usage analysis and machine learning for prospective improvements.

UNIT-II

WEB STRUCTURE MINING: Understanding link structure of the web, Static v/s dynamic linking, representing the link structure as graphs, identifying most / least used links, paths, Categorizing links based on required attributes, Clustering links based on required attributes. Web as a graph, identifying nodes, edges, in-degree, outdegree, HITS Algorithm Page Rank algorithm

WEB CONTENT MINING: Storing web content as text, database, various document types, generating meta-information of web documents, labelling,-tagging, identifying feature sets. Representing web documents, Vector Space Model.TF-IDF, web-page summarization,

tokenization, n-gram analysis, Categorizing web pages based on required attributes, Clustering web pages based on required attributes.

Text Books:

1. Bing Liu, Web Data Mining: Exploring Hyperlinks, Content, and Usage Data, 2nd Edition, Springer
2. SoumenChakrabarti, Mining the Web, Morgan-Kaufmann, first edition.

Reference Books:

3. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press, 1sted

Teaching Plan:

Week	Content
1-2	INTRODUCTION TO WEB DATA MINING : Need, Importance, Applications of Web Data mining. Capturing-users web activities, Client side v/s middleware v/s server side-data and usage logging
3-4	Web Mining and its types, Web Usage Mining, Web Structure Mining, Web Content Mining WEB USAGE MINING: Learning from Browser, Server Logs, Identifying frequent item sets, pattern identification,
5-6	representing patterns in form of relations/Graphs. Understanding web application or website-Usage, Heat maps. Using statistical tools for usage analysis and machine learning for prospective improvements.
7-8	WEB STRUCTURE MINING: Understanding link structure of the web, Static v/s dynamic linking, representing the link structure as graphs, identifying most / least used links, paths, Categorizing links based on required attributes
9-10	Clustering links based on required attributes. Web as a graph, identifying nodes, edges, in-degree, out degree, HITS Algorithm Page Rank algorithm

11-12	WEB CONTENT MINING: Storing web content as text, database, various document types, generating meta-information of web documents, labelling,-tagging, identifying feature sets. Representing web documents
13-14	Vector Space Model.TF-IDF, web-page summarization, tokenization, n-gram analysis, Categorizing web pages based on required attributes, Clustering web pages based on required attributes.