Basavarajeswari Group of Institutions
ಬಳ್ಳಾರಿ ಇನ್‌ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ಟೆಕ್ನಾಲಜಿ & ಮ್ಯಾನೇಜ್‌ಮೆಂಟ್, ಬಳ್ಳಾರಿ
BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT
Autonomous Institute under Visvesvaraya Technological University, Belagavi
(Recognized by Govt. of Karnataka & AICTE, New Delhi)
"Jnana Gangotri" Campus, #873/2, Ballari-Hosapete Road, Near Allipura, Ballari-583 104 (Karnataka)

Scheme of Teaching and Evaluation for

B.E – V & VI Semester

Artificial Intelligence & Machine Learning

(2021 Scheme)

Scheme of Teaching and Evaluation for B.E Programs
With effect from the academic year 2021-22
Total Credits for B.E.: 160
Credits Distribution as per NEP 2020

SEM	HS	BS	ES	PC	PE	AEC	OE	PW	INT	SE	UHV	TOTAL
1	2	7	10	-	-	1	-	-	-	-	-	20
2	2	7	10	-	-	1	-	-	-	-	-	20
3	1	3	-	12	-	2	-	-	-	-	-	18
4	1	3	-	12	-	3	-	-	2	-	1	22
5	1	-	-	11	3	2	3	-	-	-	-	20
6	3	-	-	8	3	1	3	2	2	-	-	22
7	-	-	-	7	3	-	3	8	-	-	-	21
8	-	-	-	3	-	-	-	-	13	1	-	17
TOTAL	10	20	20	53	9	10	9	10	17	1	1	160

SN	Course Area	Credit Distribution
1	Humanities Social Sciences including Management (HS)	10
2	Basic Sciences (BS)	20
3	Engineering Sciences (ES)	20
4	Professional Core (PC)	53
5	Professional Electives (PE)	09
6	Ability Enhancement Course(AEC)	10
7	Open Electives	09
8	Project Work(Mini/Major)	10
9	Internship(INT)	17
10	Seminar (SE)	01
11	Universal Human Values(UHV)	01
12	Mandatory Non-Credit Course (MNC)	-
	Total	**160**
The above is based on the VTU guidelines and the AICTE Model Curriculum		

Scheme of Teaching and Evaluation for B.E Program

Artificial Intelligence & Machine Learning

With effect from the Academic Year 2021-22

V – Semester

SN	Couse category	Course Code	Course	BOS / Teaching Department	BOE / Paper Setting Board	Teaching Hours per Week			Credits	Duration of Exam	Marks		
						L	T	P			CIE	SEE	Total
01	PCC	21AI51	Artificial Intelligence	Concerned Department	CSE	3	0	0	3	3	50	50	100
02	PCC	21AI52	Digital Image Processing	Concerned Department	CSE	3	0	0	3	3	50	50	100
03	PCC	21CS53	Database Management System	Concerned Department	CSE	3	0	0	3	3	50	50	100
04	PE	21CS54X	Professional Elective – 1	Concerned Department	CSE	3	0	0	3	3	50	50	100
05	OE	21CS55X	Open Elective - 1	Other departments offering the course		3	0	0	3	3	50	50	100
06	PCC	21CSL56	DBMS Lab with Mini Project	Concerned Department	CSE	0	0	2	1	3	50	50	100
07	PCC	21AIL57	Artificial Intelligence Lab	Concerned Department	CSE	0	0	2	1	3	50	50	100
08	AEC	21ADA580	Advanced Aptitude	Humanities	Humanities	1	0	0	1	2	50	50	100
09	AEC	21CS58X	AEC	Concerned Department	CSE	1	0	0	1	2	50	50	100
10	HS	21ENV59	Environmental Studies	Humanities	Humanities	1	0	0	1	2	50	50	100
					Total				**20**		**500**	**500**	**1000**

Ability Enhancement Course

01	**21CS581**	**C# and .Net Framework**
02	**21CS582**	**PYTHON Programming**

Professional Elective – 1

01	**21CS541**	**Agile Technology**
02	**21CS542**	**Introduction to Data Analytics**
03	**21CS543**	**Cyber Security**

Open Elective -1

01	**21CS551**	**Introduction to Data Structures**
02	**21CS552**	**Introduction to Database Management Systems**
03	**21CS553**	**Introduction to PYTHON Programming**
04	**21CS554**	**Introduction to Operating System**

VI – Semester

SN	Couse category	Course Code	Course	BOS / Teaching Department	BOE / Paper Setting Board	Teaching Hours per Week			Credits	Duration of Exam	Marks		
						L	T	P			CIE	SEE	Total
01	HS	21CS61	Software Project Management	Humanities / Concerned Department	Humanities / CSE	3	0	0	3	3	50	50	100
02	PCC	21AI62	Machine Learning	Concerned Department	CSE	3	0	0	3	3	50	50	100
03	PCC	21AI63	Java For Mobile Applications	Concerned Department	CSE	3	0	0	3	3	50	50	100
04	PE	21CS64X	Professional Elective – 2	Concerned Department	CSE	3	0	0	3	3	50	50	100
05	OE	21CS65X	Open Elective - 2	Other departments offering the course	CSE	3	0	0	3	3	50	50	100
06	PCC	21AIL66	Machine Learning Lab	Concerned Department	CSE	0	0	2	1	3	50	50	100
07	PCC	21AIL67	Mobile Application Development Lab	Concerned Department	CSE	0	0	2	1	3	50	50	100
08	PW	21MN68	Mini Project	Concerned Department	CSE	Two contact hours / week for interaction between the faculty and students			2	3	50	50	100
09	AEC	21CS69X	AEC	Concerned Department	CSE	1	0	0	1	2	50	50	100
10	INT	21INT691	Summer Internship-II	Completed during the intervening period of IV and V semesters. Completed during the intervening period of IV and V semesters.					2	---	100	-	100
				Total					22		550	450	1000

Ability Enhancement Course

01	21CS69A	Computer Graphics USING Open GL
02	21CS69B	Mobile Application Development
03	21CS69C	Robotic Process Automation

Professional Elective – 2

01	21CS641	Cloud Computing
02	21CS642	Block Chain Technology
03	21CS643	Natural Language Processing

Open Elective -2

01	21CS651	Programming in JAVA
02	21CS652	Introduction to Data Analytics
03	21CS653	Introduction to Artificial Intelligence & Machine Learning
04	21CS654	Introduction to Cyber Security

Internship – II (21INT691):

All the students admitted to engineering programmes shall have to undergo a mandatory internship-II of 04 weeks during the intervening vacation of IV and V semesters.

All the students **TAKING FAST TRACK / SUPPLEMENTARY SEMESTER** shall have to undergo a mandatory internship-II of 04 weeks during the intervening period of V and VI semesters. Internship-II shall include Innovation/ Entrepreneurship / Societal based Internship. A Viva-voce examination (Presentation followed by question-answer session) shall be conducted during VI semester. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up / complete the internship shall be declared fail and shall have to complete during subsequent examinations after satisfying the internship requirements The internship shall be slated for CIE only and will not have SEE. The letter grade earned through CIE shall be included in the VI semester grade card.

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Scheme of Teaching and Evaluation for

B.E – V Semester

Artificial Intelligence & Machine Learning

Semester: V
Course Name: PRINCIPLES OF ARTIFICIAL INTELLIGENCE

Course Code	21AI51	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Credits	03	Exam Hours	3
Total Hours of Pedagogy	40	Total Marks	100

Pre-requisites: Knowledge of a programming language and Mathematical knowledge.

Course objectives:
1. Gain a historical perspective of AI and its foundations
2. Become familiar with basic principles of AI toward problem solving
3. Get to know approaches of inference, perception, Uncertain Knowledge and Reasoning.
4. Experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool.
5. Experiment with a machine learning model for simulation and analysis.

Module – 1 **08 Hours**

Introduction: Foundations and History of AI
Intelligent Agents: Agents and environment, Concept of Rationality, The nature of environment, The structure of agents.

Module – 2 **08 Hours**

Problem-Solving: Problem-solving agents, Example problems, Searching for Solutions Uninformed Search Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search

Module – 3 **08 Hours**

Informed Search Strategies: Heuristic functions, Greedy best first search, A*search. Heuristic Functions
Logical Agents: Knowledge–based agents, The Wumpus world, Logic, Propositional logic, Reasoning patterns in Propositional Logic

Module – 4 **08 Hours**

First Order Logic: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic.
Inference in First Order Logic: Propositional Versus First Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution

Module – 5 **08 Hours**

Uncertain Knowledge and Reasoning: Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference using Full Joint Distributions, Independence, Baye's Rule and its use. Wumpus World Revisited

Course Outcomes:
At the end of the course the student will be able to:
1. Apply knowledge of agent architecture, searching and reasoning techniques for different applications.
2. Analyse Searching and Inferencing Techniques.
3. Develop knowledge base sentences using propositional logic and first order logic
4. Demonstrating agents, searching and inferencing
5. Illustrate the application of probability in uncertain reasoning

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Artificial Intelligence	Stuart J. Russell and Peter Norvig	Pearson	3rd Edition,2015
Reference Books				
1	Introduction to Machine Learning	Elaine Rich, Kevin Knight	Tata McGraw Hill	3rd 2013
2	Artificial Intelligence Structure and strategies for complex	George F Lugar	Pearson Education	5th Edition 2011

Semester: V
Course Name: DIGITAL IMAGE PROCESSING

Course Code	21AI52	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Credits	03	Exam Hours	3
Total Hours of Pedagogy	40	Total Marks	100

Pre-requisites: Knowledge of Programming skills in C.

Course objectives:
1. Understand the fundamentals of Digital Image Processing
2. Explain the process of image transformation used in Digital Image Processing
3. Illustrate the image enhancement techniques used in Digital Image Processing
4. Describe the image restoration techniques and methods used in Digital Image Processing
5. Explain the Morphological Operations and Segmentation used in Digital Image Processing

Module – 1 **08 Hours**

Digital Image Fundamentals: Introduction to Digital Image Processing, Origins of Digital Image, Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations.

Module - 2 **08 Hours**

Spatial Domain: Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering,-Smoothing Spatial Filters, Sharpening Spatial Filters FREQUENCY DOMAIN: Preliminary Concepts, The Discrete Fourier Transform(DFT) of Two Variables, Properties of the 2-D DFT, Filtering in the Frequency Domain, Image Smoothing and Image Sharpening Using Frequency Domain Filters, and Selective Filtering

Module – 3 **08 Hours**

Restoration: Noise models, Restoration in the Presence of Noise Only using Spatial Filtering and Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, and Constrained Least Squares Filtering.

Module – 4 **08 Hours**

Color Image Processing: Color Fundamentals, Color Models, and Pseudo-color Image Processing.
Wavelets: Background, Multiresolution Expansions.
Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transforms and Some Basic Morphological Algorithms.

Module – 5 **08 Hours**

Segmentation: Introduction, classification of image segmentation algorithms, Detection of Discontinuities, Edge Detection, Hough Transforms and Shape Detection, Corner Detection and Principles of Thresholding.
Representation and Description: Representation, and Boundary descriptors.

Course Outcomes:

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

1. Understand, ascertain and describe the basics of image processing concepts through mathematical interpretation.
2. Apply image processing techniques in both the spatial and frequency (Fourier) domains.
3. Demonstrate image restoration process and its respective filters required.
4. Design image analysis techniques in the form of image segmentation and to evaluate the Methodologies for segmentation.
5. Conduct independent study and analysis of Image Enhancement techniques

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Digital Image Processing	Rafael C. Gonzalez and Richard E. Woods,	Prentice Hall	3rdEdition,2008
2	Digital Image Processing	S. Sridhar,	Oxford University Press,	2NDEdition,2008
Reference Books				
1	Digital Image Processing	S.Jayaraman, S.Esakkirajan, T.Veerakumar,	Tata McGraw Hill	2014
2	Fundamentals of Digital Image Processing-A.	A.K. Jain,	Pearson	2004

Semester: V
Course Name: DATABASE MANAGEMENT SYSTEMS

Course Code	**21CS53**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**03**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:
- Knowledge of programming
- Data structures

Course objectives:
1. Learn and practice data modeling using entity relationship and developing database design
2. Practice SQL programming through a variety of database problems.
3. Apply normalization techniques to normalize the database
4. Demonstrate the use of concurrency and transactions in database
5. Design and build database applications for real world problems.

Module – 1 **08 Hours**

Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications.
Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment.
Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, Examples

Module - 2 **08 Hours**

Mapping conceptual design into a logical design: Relational database design using ER to relational mapping
Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations.
SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database.

Module – 3 **08 Hours**

Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL.
Advanced Aggregation Features: Ranking – dense rank, partition by
Application Development: Accessing SQL From a Programming Language, An introduction to JDBC, ODBC, Embedded SQL, SQLJ, Stored procedures

Module – 4 **08 Hours**

Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. Examples on normal forms.
Normalization Algorithms: Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms

Module – 5 **08 Hours**

Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL.
Concurrency Control in Databases: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multi-version Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking.

Course Outcomes:

1. Demonstrate the basic elements of a relational database management system.
2. Design ER and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.
3. Create, populate and manage relational databases in SQL.
4. Extend normalization for the development of application software.
5. Analyse and implement transaction processing, concurrency control, and database recovery protocols in database.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Fundamentals of Database Systems	Ramez Elmasri and Shamkant B. Navathe	Pearson	7th Edition, 2017
2	Database System Concepts	Abraham Silberschatz, Henry F. Korth and S. Sudarshan	Tata McGraw Hill Education Private Limited	6th Edition
Reference Books				
1	Database management systems	Ramakrishnan, and Gehrke	McGraw Hill	3rd Edition, 2014
2	An Introduction to Database Systems	Christopher J. Date, S. Swamynathan and A. Kannan	Pearson Education	8th Edition

Semester: V
Course Name: AGILE TECHNOLOGY

Course Code	**21CS541**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:
- Knowledge of Software Engineering and Programming Language

Course objectives:
1. Explain the fundamental concepts of agile software engineering
2. Demonstrate the need to apply the principles of XP life cycle.
3. Evaluate various functionalities of XP programming.
4. Demonstrate concepts to Eliminate Waste

Module – 1 **08 Hours**

Agile: Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, **Agile Methods,** Don't Make Your Own Method, The Road to Mastery, Find a Mentor

Module - 2 **08 Hours**

Understanding XP: The XP Lifecycle, The XP Team, XP Concepts, Adopting XP: Is XP Right for Us, Go!, Assess Your Agility

Module – 3 **08 Hours**

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

Module – 4 **08 Hours**

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

Module – 5 **08 Hours**

Deliver Value: Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently,
Seek Technical Excellence: Software Doesn't Exist, Design Is for Understanding, Design Trade-offs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery

Course Outcomes:

1. Interpret the concept of agile software engineering and its advantages in software development
2. Outline XP Lifecycle, XP Concepts, Adopting XP
3. Apply the principles of XP for real time examples.
4. Evaluate on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements, Customer Tests
5. Demonstrate concepts to Eliminate Waste

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	The Art of Agile Development	James shore, Chromatic,	O'Reilly	2007
Reference Books				
1	Agile Software Development, Principles, Patterns, and Practices	Robert C. Martin	Prentice Hall	1st edition, 2002
2	Agile and Iterative Development A Manger's Guide	Craig Larman	Pearson Education	First Edition, India, 2004

Semester: V
Course Name: INTRODUCTION TO DATA ANALYTICS

Course Code	**21CS542**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:
- Basic Knowledge of DBMS
- Basic Knowledge of Microsoft Excel

Course objectives:
1. To learn various concepts and technologies of Data Analytics
2. To discuss the various OLTP system characteristics
3. To discuss the various aspects related to the Data lake and Data warehouse
4. To present the data using various Visualization tools

Module – 1 **08 Hours**

Introduction, Business Intelligence, Pattern Recognition, Data Processing Chain.
Business Intelligence Concepts and Applications: Introduction, BI for better decisions, decision types, BI tools, BI skills, BI applications.

Module – 2 **08 Hours**

Structure, objectives, introduction, online transaction processing, OLTP system characteristics, OLTP merits and demerits, need of data warehouse, characteristics of DW, main components of data warehouse, approaches for constructing a data warehouse, dimensional modeling used in DW design-facts, dimensions and attributes, types of schemas, ETI and other tools sets available in market.

Module – 3 **08 Hours**

Structure, objectives, business intelligence, BI characteristics, data quality: a real challenge, data quality best practices, structured versus unstructured, differences between structured and unstructured data, data lake, data lake versus data warehouse, main components of a data lake, modern business intelligence system, benefits and use cases of modern BI.

Module – 4 **08 Hours**

Structure, objectives, presenting data visualization, aims of data visualization, history at a glance, importance of data visualization, types of data visualization-hierarchical, tree diagram, tree map, ring chart, dendogram, temporal, bar chart, line graph, stacked graph, Gantt chart, scatter plot, stacked area chart, sparkline, network, word cloud, matrix chart, node link diagram, multi-dimensional, pie chart, histogram.

Module – 5 **08 Hours**

Introduction, decision tree problem, decision tree construction, decision tree algorithms.
Advanced data visualization- structure, objective, types of advanced data visualization-bubble chart, word cloud, geospatial heat map/ hot spot mapping, data visualization trends, introducing data visualization tools, data visualization best practices.

Course Outcomes:

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

1. Apply the BI concepts to solve real life problems.
2. Design OLTP techniques to provide business solutions
3. Apply BI techniques to design a data lake.
4. Analyze data using various data visualization techniques.
5. Analyze trends using advanced data visualization techniques.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Data Analytics	Anil Maheshwari	McGraw Hill Education	2018
2	Data Analytics: Principles, Tools and Practices	Dr.Gaurav Aroraa Chitra Lele Dr.Munish Jindal	BPB Publications	1st Edition, 2022

Semester: V
Course Name: CYBER SECURITY

Course Code	**21CS543**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:

The students should have the knowledge of:

- Awareness about the loopholes/drawbacks of the advanced technologies on which the society is dependent.
- Awareness about the crimes being done through technology.

Course objectives:

1. To familiarize the cybercrime terminologies and perspectives.
2. To illustrate the phases of cybercrime plan and different types of cybercrimes.
3. To gain the knowledge about the tools and methods used by the criminals.
4. To reveal the techniques used in phishing and identity theft.
5. To emphasize the necessary of computer and cyber forensics.

Module – 1 **08 Hours**

Introduction to Cybercrime:
Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws., Global Perspectives

Module - 2 **08 Hours**

Cyber Offenses:
How Criminals Plan Them: Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cyber cafe & cybercrimes.
Botnets: The fuel for cybercrime, Attack Vector.

Module – 3 **08 Hours**

Tools and Methods used in Cybercrime: Introduction, Proxy Servers, Anonymizers, Phishing, Password Cracking, Key Loggers and Spyways, Virus and Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS Attackes, Attacks on Wireless networks.

Module – 4 **08 Hours**

Phishing and Identity Theft: Introduction, methods of phishing, phishing, phising techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft

Module – 5 **08 Hours**

Understnading Computer Forensics: Introdcution, Historical Background of Cyberforensics, Digital Foresics Science, Need for Computer Foresics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics.

Course Outcomes:

1. Identify the various terminologies being used in cybercrime.
2. Categorize the types of cybercrimes.
3. Illustrate the tools and methods used by criminals for cybercrime.
4. Compare the various techniques used in phishing and identity theft.
5. Utilize various cyber security techniques including cyber forensics.

Suggested Learning Resources:

Text Books:

Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018)

Reference Books:

Neil Daswani, Moudy Elbayadi Big Breaches: "Cyber-security Lessons for Everyone", Feb 2021

Semester: V
Course Name: DATABASE MANAGEMENT SYSTEM LAB WITH MINI PROJECT

Course Code	21CSL56	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Credits	01	Exam Hours	03
Total Hours of Pedagogy	20	Total Marks	100

Course Objectives:
1. Create a database using fundamental SQL commands.
2. Analyze the database concepts to design a schema diagram.
3. Retrieving the data from the database.
4. Performing database operations in a procedural manner using SQL.
5. Design and develop applications like Employee, Movie management systems etc.

LIST OF EXPERIMENTS

Part A

Identify the functional requirements, then Design Develop solutions to the problems related to:

1. Aim: Discuss the various concepts on constraints and update operations.

Program: Consider the following schema for Order Database:
SALESMAN(Salesman_id, Name, City, Commission)
CUSTOMER(Customer_id, Cust_Name, City, Grade, Salesman_id)
ORDERS(Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)
Write SQL queries to

1. Count the customers with grades above Bangalore's average.
2. Find the name and numbers of all salesman who had more than one customer.
3. List all the salesman and indicate those who have and don't have customers in their cities (Use UNION operation.)
4. Create a view that finds the salesman who has the customer with the highest order of a day.
5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

Reference:
https://www.youtube.com/watch?v=AA-KL1jbMeY
https://www.youtube.com/watch?v=7S_tz1z_5bA

2. Aim: Demonstrating creation of tables, applying the nested query concepts.

Program Consider the following schema for a Cricket Database:
TEAM(tid, tname, coach, captain_pid , city)
PLAYER(pid, pname, age, tid)
STADIUM(sid, sname, pincode, city)
MATCH(mid, mdate, time, sid, team1_id, team2_id, winning_team_id, man_of_match, pid)
Write SQL queries to

1. Display the youngest player (in terms of age) Name, Team name, age in which he belongs of the tournament.
2. List the details of the stadium where the maximum number of matches were played.
3. List the details of the player who is not a captain but got the man_of _match award at least in two matches.
4. Display the Team details who won the maximum matches.
5. Display the team name where all its won matches played in the same stadium.

Reference:
https://www.youtube.com/watch?v=lBpSMeQjNqQ
https://www.youtube.com/watch?v=_yog7h4BokQ

3. Aim: Demonstrate the concepts of JOIN operations.

Program: Consider the schema for Movie Database:ACTOR(Act_id, Act_Name, Act_Gender)
DIRECTOR(Dir_id, Dir_Name, Dir_Phone)
MOVIES(Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)
MOVIE_CAST(Act_id, Mov_id, Role)
RATING(Mov_id, Rev_Stars)

Write SQL queries to

1. List the titles of all movies directed by 'Hitchcock'.
2. Find the movie names where one or more actors acted in two or more movies.
3. List all actors who acted in a movie before 2000 and also in a movie after 2015(use JOIN operation).
4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
5. Update rating of all movies directed by 'Steven Spielberg' to 5.

Reference:
https://www.youtube.com/watch?v=hSiCUNVKJAo
https://www.youtube.com/watch?v=IqQhPlJP64k

4. Aim: Introduce concepts of PLSQL and usage on the table.

Program: Consider the schema for College Database:
STUDENT(USN, SName, Address, Phone, Gender)
SEMSEC(SSID, Sem, Sec) CLASS(USN, SSID)
COURSE(Subcode, Title, Sem, Credits)
IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

Write SQL queries to

1. List all the student details studying in fourth semester 'C' section.
2. Compute the total number of male and female students in each semester and in each section.
3. Create a view of Test1 marks of student USN '1BI15CS101' in all Courses.
4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.
5. Categorize students based on the following criterion:
   If FinalIA = 17 to 20 then CAT = 'Outstanding'
   If FinalIA = 12 to 16 then CAT = 'Average'
   If FinalIA< 12 then CAT = 'Weak'
   Give these details only for 8th semester A, B, and C section students.

Reference:
https://www.youtube.com/watch?v=horURQewW9c
https://www.youtube.com/watch?v=P7-wKbKrAhk

5. **Aim:** Demonstrate the core concepts on table like procedure and trigger queries and also rank() function.

Program: Consider the schema for Voter Database:
CONSTITUENCY(cons_id, csname, csstate, no_of_voters)
PARTY(pid, pname, psymbol)
CANDIDATES(cand_id, phone_no, age, state, name, pid)
CONTEST(cons_id, cand_id)
VOTER(vid, vname, vage, vaddr, cons_id, cand_id)

Write SQL queries to

1. List the details of the candidates who are contesting from more than one constituency which are belongs to different states.
2. Display the state name having maximum number of constituencies.
3. Create a stored procedure to insert the tuple into the voter table by checking the voter age. If voter's age is at least 18 years old, then insert the tuple into the voter else display the "Not an eligible voter msg".
4. Display the constituency name, state and number of voters in each state in descending order using rank() function'
5. Create a TRIGGER to UPDATE the count of "Number_of_voters" of the respective constituency in "CONSTITUENCY" table, AFTER inserting a tuple into the "VOTERS" table.

Reference:
https://www.youtube.com/watch?v=MSbzErdcb6g
https://www.youtube.com/watch?v=QFj-hZi8MKk

Part B

Mini Project: For any problem selected, make sure that the application should have five or more tables. Indicative areas include: Organization, health care, Ecommerce etc. Demonstrate by using front-end tools with reports

Course outcomes:

1. Apply fundamentals of SQL commands to construct a database.
2. Analyze and Design database schema for a given problem domain.
3. Design and implement various databases (Ex. Cricket, Movies etc.)
4. Evaluate nested queries for data manipulation.
5. Design, Develop and Evaluate mini project using modern tools(Like Oracle, MySQL, NetBeans, Eclipse, Apache Tomcat)

Semester: V
Course Name: ARTIFICIAL INTELLIGENCE LAB

Course Code	**21AIL57**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**0:0:2**	SEE Marks	**50**
Credits	**01**	Exam Hours	**03**
Total Hours of Pedagogy	**20**	Total Marks	**100**

Course Objectives:
1. Explain different search methods to solve different AI problems
2. Understand the application of heuristic approach to solve problems
3. Demonstrate forward and backward chaining problem solving techniques.
4. Understand the game playing strategies
5. Describe FOPL and its applications

LIST OF EXPERIMENTS

PART A

Practicing Problems in Python (Students can be encouraged to practice good number of practice problems, some practice problems are listed here)

1. (a) Write a python program to print the multiplication table for the given number
   (b) Write a python program to check whether the given number is prime or not?
   (c) Write a python program to find factorial of the given number?
2. (a) Write a python program to implement List operations (Nested List, Length, Concatenation, Membership, Iteration, Indexing and Slicing)
   (b) Write a python program to implement List methods (Add, Append, and Extend& Delete).
3. Write a python program to implement simple Chabot with minimum 10 conversations
4. Write a python program to Illustrate Different Set Operations
5. (a) Write a python program to implement a function that counts the number of times a string (s1) occurs in another string(s2)
   (b)Write a program to illustrate Dictionary operations ([], in, traversal)and methods: keys (),values(),items()

Part B

AI Problems to be implemented in Python

1. Implement and Demonstrate Depth First Search Algorithm on Water Jug Problem
2. Implement and Demonstrate Best First Search Algorithm on any AI problem
3. Implement AO* Search algorithm.
4. Solve 8-Queens Problem with suitable assumptions
5. Implementation of TSP using heuristic approach
6. Implementation of the problem solving strategies: either using Forward Chaining or Backward Chaining
7. Implement resolution principle on FOPL related problems
8. Implement any Game and demonstrate the Game playing strategies

Course outcomes:

The student will be able to:-

1. Implement DFS and BFS algorithms to solve AI problems
2. Design and Develop applications using heuristic search method.
3. Implement forward and backward chaining problem solving techniques.
4. Demonstrate game using game playing strategies
5. Solve AI problems using suitable search strategies

Semester: V
Course Name: ADVANCED APTITUDE

Course Code	**21ADA580**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**1:0:0**	SEE Marks	**50**
Credits	**01**	Exam Hours	**02**
Total Hours of Pedagogy	**15**	Total Marks	**100**

Pre-requisites:
1. Fundamentals of Mathematics
2. Basic knowledge of Reasoning

Module – 1: Numerical Ability Based **03 Hours**

Simplifications, Squares and Square Roots, Cubes and Cube roots, BODMAS Rule, LCM, HCF, Fractions and Decimals

Module – 2: Percentage Based **03 Hours**

Percentages, Profit and Loss, Discounts, Simple Interest and Compound Interest

Module – 3: Time Based **03 Hours**

Time and Work, Pipes and Cisterns, Time and Distance, Trains, Boats and Streams

Module – 4: Ratio Based **03 Hours**

Ratio-proportion, Partnership, Averages and Ages

Module – 5: Logical and Analytical Based **03 Hours**

Seating Arrangement, Series, Analogy, Odd man out and Blood Relations

Course Outcomes:

At the end of course students will be able to
1. Analyze and solve questions based on logical thinking and critical reasoning.
2. Analyze and solve quantitative aptitude problems
3. Solve aptitude problems using fast track techniques
4. Solve puzzle based questions
5. Analyze and solve problems on numerical computation and numerical estimation

Semester V
Course Name: ENVIRONMENTAL STUDIES

Course Code	**21ENV59**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**1:0:0**	SEE Marks	**50**
Credits	**01**	Exam Hours	**01**

Pre-requisites: Water supply and treatment engineering.

Course objectives:
1. Understand and evaluate the global scale of environmental problems
2. Reflect critically on their roles, responsibilities, and identities as citizens, consumers and environmental actors in a complex, interconnected world

Module – 1 **08 Hours (RBT Levels: L1, L2, L3)**

Ecosystems (Structure and Function): Forest, Desert, Wetlands, Riverine, Oceanic and Lake. **Biodiversity:** Types, Threats and Conservation of biodiversity. Forest Wealth, and Deforestation**.**
Teaching-Learning Process: Chalk & Talk, PPT presentation, NPTEL materials, YouTube videos.

Module – 2 **08 Hours (RBT Levels: L1, L2, L3)**

Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind. **Natural Resource Management (Concept and case-studies**): Disaster Management, Sustainable Mining, Cloud Seeding, and Carbon Trading.
Teaching-Learning Process: Chalk & Talk, PPT presentation, NPTEL materials, YouTube videos.

Module – 3 **08 Hours (RBT Levels: L1, L2, L3)**

Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts,): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution. Waste Management & Public Health Aspects: Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge.
Teaching-Learning Process: Chalk & Talk, PPT presentation, NPTEL materials, YouTube videos.

Module – 4 **08 Hours (RBT Levels: L1, L2, L3)**

Global Environmental Concerns (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology**.**
Teaching-Learning Process: Chalk & Talk, PPT presentation, NPTEL materials, YouTube videos.

Module – 5 **08 Hours (RBT Levels: L1, L2, L3)**

Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications): G.IS. & Remote Sensing. Environment Impact Assessment. Environmental Management Systems.
Teaching-Learning Process: Chalk & Talk, PPT presentation, NPTEL materials, you tube videos.

Course Outcomes:
1. **Understand** the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale. Estimate runoff and develop unit hydrographs.
2. **Develop** critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
3. **Demonstrate** ecology knowledge of a complex relationship between biotic and a biotic component**.**
4. **Apply** their ecological knowledge to illustrate and graph a problem.
5. **Describe** the realities that managers face when dealing with complex issues.

Assessment Details

CIE:

	Components	Number	Weightage	Max. Marks
(i)	Tests (A)	3*	60%	30
(ii)	Alternate Assessment Tools (AAT) (B)	3-4	40%	20
	Total Marks			**50**

Final CIE Marks = (A) + (B)

The following are the Alternate Assessment Tools and not limited to: Quiz, Assignments, Presentations, Paper Publications, MOOCs, Industrial Visits and Report Writing, Open Book, Self E-Learning with Certifications and other cooperative and problem-based learning.

SEE: Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 01 hours) 1. The question paper will have fifty questions. Each question is set for 01 marks. 2. There will be 10 questions from each module. Each of the 10 questions under a module, should have a mix of topics under that module. The students have to answer 50 multiple choice questions.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
	Textbooks			
1	Environmental Studies	S M Prakash	Pristine Publishing House, Mangalore	3rd Edition, 2018
2	Environmental Studies	Benny Joseph	Tata Mc Graw-Hill, 2nd Edition	2012
3	Environmental Studies – From Crisis to Cure R	Rajagopalan	Oxford Publisher	2005
	Reference			
1	Principals of Environmental Science and Engineering	Raman Sivakumar	Cengage learning, Singapur	2nd Edition, 2005
2	Environmental Science - working with the Earth	G.Tyler Miller Jr.	Thomson Brooks /Cole	11th Edition, 2006
3	Text Book of Environmental and Ecology	Pratiba Sing, Anoop Singh & Piyush Malaviya	Acme Learning Pvt. Ltd. New Delhi.	1st Edition

Semester: V
Course Name: C# AND .NET FRAMEWORK

Course Code	**21CS581**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**1:0:0**	SEE Marks	**50**
Credits	**01**	Exam Hours	**3**
Total Hours of Pedagogy	**15**	Total Marks	**100**

Pre-requisites: Any Object oriented programming

Course objectives:
1. Inspect Visual Studio programming environment and toolset designed to build applications for Microsoft Windows
2. Understand Object Oriented Programming concepts in C# programming language.
3. Interpret Interfaces and define custom interfaces for application.
4. Build custom collections and generics in C#
5. Construct events and query data using query expressions

Module – 1 **03 Hours**

Introducing Microsoft Visual C# and Microsoft Visual Studio 2015: Welcome to C#, Working with variables, operators and expressions, Writing methods and applying scope, Using decision statements, Using compound assignment and iteration statements, Managing errors and exceptions

Module - 2 **03 Hours**

Understanding the C# object model: Creating and Managing classes and objects, Understanding values and references, Creating value types with enumerations and structures, Using arrays

Module – 3 **03 Hours**

Understanding parameter arrays, Working with inheritance, Creating interfaces and defining abstract classes, Using garbage collection and resource management

Module – 4 **03 Hours**

Defining Extensible Types with C#: Implementing properties to access fields, Using indexers, Introducing generics, Using collections

Module – 5 **03 Hours**

Enumerating Collections, Decoupling application logic and handling events, Querying in-memory data by using query expressions, Operator overloading

Course Outcomes:
1. Build applications on Visual Studio .NET platform by understanding the syntax and semantics of C#
2. Demonstrate Object Oriented Programming concepts in C# programming language
3. Design custom interfaces for applications and leverage the available built-in interfaces in building complex applications.
4. Illustrate the use of generics and collections in C#
5. Compose queries to query in-memory data and define own operator behavior

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Microsoft Visual C# Step by Step	John Sharp	PHI Learning Pvt. Ltd	8th Edition, 2016
Reference Books				
1	C# 6 and .NET Core 1.0	Christian Nagel	Wiley India Pvt. Ltd	1st Edition 2016
2	Essential C# 6.0	Mark Michaelis	Pearson Education India	5th Edition, 2016
3	Prof C# 5.0 and the .NET 4.5 Framework	Andrew Troelsen	Apress and Dreamtech Press	6th Edition, 2012.

Semester: V
Course Name: PYTHON PROGRAMMING

Course Code	**21CS582**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**1:0:0**	SEE Marks	**50**
Credits	**01**	Exam Hours	**03**
Total Hours of Pedagogy	**15**	Total Marks	**100**

Pre-requisites:
- Basic Knowledge of Programming

Course objectives:
1. Interpret the basic syntax and semantics of several expressions and functions.
2. Demonstrate the concepts of Iterations and files applied in real world scenario
3. Illustrate the python programs using Strings and Dictionaries.
4. Extend the importance of object oriented programming in python.
5. Implement inheritance concepts to solve real world problems

Module – 1 **03 Hours**

Python Basics: Variables, expressions and statements, Conditional execution, Functions

Module - 2 **03 Hours**

Iteration: While statement, Infinite Loops, definite loops, Loop patterns
Strings: String traversal, String Slices, in operator, String methods Format operator
Files: Persistence, Opening, reading from text files, using try, except and open, writing to text files

Module – 3 **03 Hours**

Lists: List Operations, slices, methods, lists and functions, list and strings, objects and value, Aliasing, List arguments
Dictionaries: Dictionary as a set of counters, Dictionaries and files, Looping and Dictionaries, Advanced text parsing

Module – 4 **03 Hours**

Tuples: Comparing tuples, Tuple assignment, Dictionaries and tuples, Sequences, List comprehension
Regular Expressions: Character matching in regular expressions, extracting data using regular expressions, Combining searching and extracting, Escape character

Module – 5 **03 Hours**

Classes and objects: Programmer-defined types, Attributes, Instances as return value, Objects are mutable, Copying
Classes and functions: Pure functions, modifiers, prototyping versus planning
Classes and methods: Object oriented features, init method, str method, operator overloading, type-based dispatch, polymorphism, Interface and implementation

Course Outcomes:
1. Understand Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Implement Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
4. Interpret the concepts of Object-Oriented Programming as used in Python.
5. Implement python data structures to solve real world problems.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Python for Everybody: Exploring Data Using Python 3	Charles R. Severance	Create Space Independent Publishing Platform	1st Edition, 2016
2	Think Python: How to Think Like a Computer Scientist	Allen B. Downey	Green Tea Press	2nd Edition, 2015
Reference Books				
1	Introduction to Computer Science Using Python	Charles Dierbach	CRC Press /Taylor & Francis	1st Edition,2018
2	Programming Python	Mark Lutz	O'Reilly Media	4th Edition, 2011
3	Core Python Applications Programming	Wesley J Chun	Pearson Education India	3rd Edition, 2015

Semester: V
Course Name: INTRODUCTION TO DATA STRUCTURES

Course Code	**21CS551**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:
- Should have a basic knowledge of C Programming.

Course objectives:
1. Explain the fundamentals of data structures and their applications to solve real life problems.
2. Demonstrate the working of linear and nonlinear data structures.
3. Write solutions to problems using linear data structures and nonlinear data structures.
4. Apply different data structures to solve given problem.
5. Develop skills to apply appropriate data structures in problem solving.

Module – 1 **08 Hours**

Introduction:
Introduction to Data Structures, Types of data structures, data structure operations.
Arrays: one-dimensional arrays, two dimensional arrays, initializing one dimensional and two dimensional arrays, operations on arrays.
Structures and Unions: Declaring structures, structure initialization, Introduction to unions
Functions: Built-in functions and user defined functions.

Module - 2 **08 Hours**

Linear Data Structures-Stacks and Queues:
Introduction, Stack representation in Memory, Stack Operations, Stack Implementation, Applications of Stack, Recursion.
Introduction to Queues-Basic concept, Logical representation of Queues, Queue Operations and its types, Queue Implementation, Applications of Queue.

Module – 3 **08 Hours**

Linear Data Structures-Linked List:
Introduction to Pointers: Pointer concepts, accessing variables through pointers, Dynamic memory allocation.
Introduction to Linked list, Logical representation of Linked list, Self-Referential structure, Singly-linked List Operations and its implementation, types of linked lists, introduction to circular linked list.

Module – 4 **08 Hours**

Non Linear Data Structures – Trees
Terminologies, Binary Trees, Properties of Binary trees and representation, Binary Tree Traversal, Binary Search tree and its implementation.

Module – 5 **08 Hours**

Non Linear Data Structures–Graphs: Introduction, Terminologies, Matrix and Adjacency List Representation of Graphs, Traversal methods: Breadth First Search and Depth First Search.
Hashing: Introduction to hashing, Hashing Functions.

Course Outcomes:

The student will be able to

1. Identify types of data structures and use them to solve problems
2. Demonstrate the applications of various data structures
3. Apply the data structures to solve problems.
4. Compare solutions of a given problem using different data structures
5. Choose appropriate data structures to solve real world problems

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Data structures using C	E Balaguruswamy	McGraw Hill	2013 Edition
2	Fundamentals of Data Structures in C	Ellis Horowitz and Sartaj Sahni	Universities Press	2nd Edition,2014
Reference Books				
1	Data Structures: A Pseudo-code approach with C	Gilberg and Forouzan	Cengage Learning	2nd Edition, 2014

Semester: V
Course Name: INTRODUCTION DATABASE MANAGEMENT SYSTEMS

Course Code	21CS552	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Credits	03	Exam Hours	3
Total Hours of Pedagogy	40	Total Marks	100

Pre-requisites:
- Knowledge of programming
- Data structures

Course objectives:
1. Learn and practice data modeling using entity relationship and developing database design
2. Practice SQL programming through a variety of database problems.
3. Apply normalization techniques to normalize the database
4. Demonstrate the use of concurrency and transactions in database
5. Design and build database applications for real world problems.

Module – 1 **08 Hours**

Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications.
Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment.

Module - 2 **08 Hours**

Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, Examples
Mapping conceptual design into a logical design: Relational database design using ER to relational mapping

Module – 3 **08 Hours**

Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations.
SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database.

Module – 4 **08 Hours**

Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL.

Module – 5 **08 Hours**

Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.
Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL.

Course Outcomes:

1. Demonstrate the basic elements of a relational database management system.
2. Identify the data models for relevant problems.
3. Design ER and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data.
4. Create, populate and manage relational databases in SQL.
5. Extend normalization for the development of application software

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Fundamentals of Database Systems	Ramez Elmasri and Shamkant B. Navathe	Pearson	7th Edition, 2017
2	Database System Concepts	Abraham Silberschatz, Henry F. Korth and S. Sudarshan	Tata McGraw Hill Education Private Limited	6th Edition
Reference Books				
1	Database management systems	Ramakrishnan, and Gehrke	McGraw Hill	3rd Edition, 2014
2	An Introduction to Database Systems	Christopher J. Date, S. Swamynathan and A. Kannan	Pearson Education	8th Edition

Semester: V
Course Name: INTRODUCTION TO PYTHON PROGRAMMING

Course Code	**21CS553**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:
- Basic Knowledge of Programming
- Basic Knowledge of MS word, Excel and PDF

Course objectives:
1. Interpret the basic syntax and semantics of several expressions and functions.
2. Demonstrate the concepts of Iterations and files applied in real world scenario
3. Illustrate the python programs using Strings and Dictionaries.
4. Extend the importance of object oriented programming in python.
5. Implement inheritance concepts and File system to solve real world problems

Module – 1 **03 Hours**

Python Basics, Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program, **Flow control,** Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(), Functions, def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number

Module – 2 **03 Hours**

Lists, The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References, Dictionaries and **Structuring Data,** The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things, **Manipulating Strings,** Working with Strings, Useful String Methods

Module – 3 **03 Hours**

Reading and Writing Files, Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module,Saving Variables with the pprint.pformat() Function, Project: Generating Random Quiz Files, Project: Multiclipboard**, Organizing Files,** The shutil Module, Walking a Directory Tree, Compressing Files with the zipfile Module, Project: Renaming Files with American-Style Dates to European-Style Dates,Project: Backing Up a Folder into a ZIP File, **Debugging,** Raising Exceptions, Getting the Traceback as a String, Assertions, Logging, IDLE‟s Debugger.

Module – 4 **03 Hours**

Classes and objects, Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying, **Classes and functions,** Time, Pure functions, Modifiers, Prototyping versus planning, **Classes and methods,** Object-oriented features, Printing objects, Another example, A more complicated example, The init method, The str method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation, **Inheritance,** Card objects, Class attributes, Comparing cards, Decks, Printing the deck, Add, remove, shuffle and sort, Inheritance, Class diagrams, Data encapsulation

Module – 5 **03 Hours**

Working with Excel Spreadsheets, Excel Documents, Installing the openpyxl Module, Reading Excel Documents, Project: Reading Data from a Spreadsheet, Writing Excel Documents, Project: Updating a Spreadsheet, Setting the Font Style of Cells, Font Objects, Formulas, Adjusting Rows and Columns, Charts, **Working with PDF and Word Documents,** PDF Documents, Project: Combining Select Pages from Many PDFs, Word Documents, **Working with CSV files and JSON data,** The csv Module

Course Outcomes

1. Understand Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Implement Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
4. Interpret the concepts of Object-Oriented Programming as used in Python.
5. Implement python data structures to solve real world problems.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Automate the Boring Stuff with Python	Al Sweigart	No Starch Press,	1st Edition,2015
2	Think Python: How to Think Like a Computer Scientist",	Allen B. Downey	Green Tea Press	2nd Edition, 2015.
Reference Books				
1	Introduction to Python Programming	Gowrishankar S, Veena A	CRC Press /Taylor & Francis	1st Edition,2018

Semester: V
Course Name: INTRODUCTION TO OPERATING SYSTEM

Course Code	**21CS554**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**3**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:

The students should have the knowledge of:

- Basics of computer system and its applications
- Basics of computer organization

Course objectives:

1. To introduce Operating System, OS responsibilities, and OS services.
2. To discuss process concept, process and scheduling techniques.
3. To demonstrate deadlock condition in the computer system.
4. To introduce memory management and virtual memory management concepts.
5. To explain file system.

Module – 1 **08 Hours**

Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments.

Operating System Services: User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot.

Module – 2 **08 Hours**

Process Management: Process concept; Process scheduling; Operations on processes; Inter process communication

Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms.

Module – 3 **08 Hours**

Deadlocks: Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

Module – 4 **08 Hours**

Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.

Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.

Module – 5 **08 Hours**

File System, Implementation of File System: File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection: Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.

Course Outcomes:

1. Analyze the need of OS, responsibilities of OS, and OS services.
2. Compare different process scheduling techniques.
3. Examine deadlock situation, prevention, avoidance and recovery.
4. Implement virtual memory management concept and page replacement algorithms.
5. Discuss the file system.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Operating System Principles	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	Wiley-India	7th edition, , 2006
Reference Books				
1	Operating Systems: A Concept Based Approach	D.M Dhamdhere	McGraw- Hill	3rd Ed, 2013.

Basavarajeswari Group of Institutions
ಬಳ್ಳಾರಿ ಇನ್‌ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ಟೆಕ್ನಾಲಜಿ & ಮ್ಯಾನೇಜ್‌ಮೆಂಟ್, ಬಳ್ಳಾರಿ
BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT
Autonomous Institute under Visvesvaraya Technological University, Belagavi
(Recognized by Govt. of Karnataka & AICTE, New Delhi)
"Jnana Gangotri" Campus, #873/2, Ballari-Hosapete Road, Near Allipura, Ballari-583 104 (Karnataka)

Scheme of Teaching and Evaluation for B.E – VI Semester

Artificial Intelligence & Machine Learning

(2021 Scheme)

Semester: VI

Course Name: SOFTWARE PROJECT MANAGEMENT

Course Code	21CS61	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Credits	03	Exam Hours	3
Total Hours of Pedagogy	40	Total Marks	100

Pre-requisites:

Course objectives:

1. To understand the Software Project Planning and Evaluation techniques.
2. To plan and manage projects at each stage of the software development life cycle (SDLC).
3. To learn about the activity planning and risk management principles.
4. To manage software projects and control software deliverables.
5. To develop skills to manage the various phases involved in project management and people management.

Module – 1 **08 Hours**

PROJECT EVALUATION AND PROJECT PLANNING

Importance of Software Project Management – Activities - Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

Module – 2 **08 Hours**

PROJECT LIFE CYCLE AND EFFORT ESTIMATION

Software process and Process Models – Choice of Process models - Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II - a Parametric Productivity Model.

Module – 3 **08 Hours**

ACTIVITY PLANNING AND RISK MANAGEMENT

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.

Module – 4 **08 Hours**

PROJECT MANAGEMENT AND CONTROL

Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.

Module – 5 **08 Hours**

STAFFING IN SOFTWARE PROJECTS

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership

Course Outcomes:

1. Understand Project Management principles while developing software
2. Gain extensive knowledge about the basic project management concepts, framework and the process models.
3. Obtain adequate knowledge about software process models and software effort estimation techniques.
4. Estimate the risks involved in various project activities.
5. Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Software Project Management	Bob Hughes, Mike Cotterell and Rajib Mall	Tata McGraw Hill	Fifth and 2011
2	Accounting for Management	Jawahar Lal	Wheeler Publications, Delhi	Fifth
Reference Books				
1	Effective Software Project Management	Robert K. Wysocki	Wiley Publication	2011
2	Software Project Management	Walker Royce:	Addison-Wesley	1998

Semester: VI
Course Name: MACHINE LEARNING

Course Code	**21AI62**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:
- Knowledge about Probability theory, Statistics theory and Linear Algebra.

Course objectives:
1. Define machine learning and understand the basic theory underlying machine learning.
2. Differentiate supervised, unsupervised and reinforcement learning
3. Understand the basic concepts of learning and decision trees.
4. Understand Bayesian techniques for problems appear in machine learning
5. Perform statistical analysis of machine learning techniques.

Module – 1 **08 Hours**

Introduction:
Machine learning Landscape: Definition, Why, Types of ML, main challenges of ML
Concept learning and Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Find S-Version Spaces and Candidate Elimination Algorithm –Remarks on VS- Inductive bias.

Module - 2 **08 Hours**

End to end Machine learning Project: Working with real data, Look at the big picture, Get the data, Discover and visualize the data, Prepare the data, select and train the model, Fine tune your model.
Classification: MNIST, training a Binary classifier, performance measure, multiclass classification, error analysis, multi label classification, multi output classification

Module – 3 **08 Hours**

Training Models: Linear regression, gradient descent, polynomial regression, learning curves, regularized linear models, logistic regression
Support Vector Machine: Linear, Nonlinear , SVM regression and under the hood

Module – 4 **08 Hours**

Decision Trees -Training and Visualizing DT, making prediction, estimating class, the CART training, computational complexity, GINI impurity, Entropy, regularization Hyper parameters, Regression, instability
Ensemble learning and Random Forest: Voting classifiers, Bagging and pasting, Random patches, Random forests, Boosting, stacking

Module – 5 **08 Hours**

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier– example-Bayesian Belief Network – EM Algorithm

Course Outcomes:

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

1. Understand the concept of Machine Learning and Concept Learning.
2. Apply the concept of ML and various classification methods in a project.
3. Analyze various training models in ML and the SVM algorithm to be implemented.
4. Apply the ML concept in a decision tree structure and implementation of Ensemble learning and Random Forest.
5. Apply Bayes techniques and explore more about the classification in ML

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Machine Learning	Tom M. Mitchell	McGraw-Hill Education	2013 Edition
2	Hands-on Machine Learning with Scikit-Learn &TensorFlow , O'Reilly, Shroff	AurelienGeron	Publishers and Distributors Pvt. Ltd	2019Edition
Reference Books				
1	Introduction to Machine Learning	EthemAlpaydin,	PHI Learning Pvt. Ltd	2nd Edition 2013
2	Machine Learning using Python	Manaranjan Pradhan, U Dinesh Kumar	Wiley	2019 Edition

Semester: VI
Course Name: JAVA FOR MOBILE APPLICATION DEVELOPMENT

Course Code	**21AI63**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:2:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:
- Knowledge of JAVA programming

Course objectives:
1. To have an insight in to enumerations for storing and processing data
2. To understand the architecture and components of android application
3. To design interactive user interface
4. To work with SQLite database
5. To develop a Mobile Application to solve real world problems

Module – 1 **08 Hours**

Enumerations, Autoboxing and Annotations(metadata): Enumerations, Enumeration fundamentals, the values () and valueOf() Methods, java enumerations are class types, enumerations Inherits Enum, example, typewrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of Warning. Annotations, Annotation basics, specifying retention policy, Obtaining Annotations at runtime by use of reflection, Annotated element Interface, Using Default values, Marker Annotations, Single Member annotations, Built-In annotations

Module - 2 **08 Hours**

String Handling: The String Constructors, String Length, Special String Operations, String Literals, String Concatenation, String Concatenation with Other Data Types, String Conversion and toString() Character Extraction, charAt(), getChars(), getBytes() to CharArray(), String Comparison, equals( ) and equals IgnoreCase( ), regionMatches( ) startsWith() and endsWith(), equals( ) Versus==, compareTo( ) Searching Strings, Modifying a String, substring( ), concat( ), replace( ), trim( ), Data Conversion Using valueOf( ), Changing the Case of Characters Within a String, Additional String Methods, StringBuffer, StringBuffer Constructors, length() and capacity(), ensureCapacity(), setLength(), charAt() and setCharAt(), getChars(), append(), insert(), reverse(), delete() and delete CharAt(), replace(), substring(), Additional String Buffer Methods, String Builder

Module – 3 **08 Hours**

Getting Started with Android Programming: Definition of Android, Features of Android, Android Architecture, obtaining the required tools, launching your first android application
Activities, Fragments and Intents: Understanding activities, linking activities using intents, fragments.

Module – 4 **08 Hours**

Getting to know the Android User Interface: Views and View Groups, Frame Layout, Linear Layout, Table Layout, Relative Layout, Scroll View
Designing User Interface with Views: TextView view–Button, Image Button, EditText, Checkbox, Toggle Button, Radio Button and Radio Group Views.
Creating and using Databases: Creating the DB Adapter Helperclass, using the database programmatically.

Module – 5 **08 Hours**

Messaging: Sending SMS, Messages Programmatically, Sending SMS Messages Using Intent, Receiving SMS Messages, Sending Email
Location-Based Services: Displaying Maps, Displaying The Zoom Control, Changing Views, Navigating to A Specific Location, Getting The Location That Was Touched

Course Outcomes:

The student will be able to-

1. Interpret the need for advanced Java concepts like enumerations in developing modular and efficient programs
2. Understand various application components in android.
3. Design efficient user interface using different layouts.
4. Develop application with persistent data storage using SQLite
5. Develop a Mobile application by taking real world scenario

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	JAVA the Complete Reference	Herbert Schildt	Tata McGraw Hill	9th Edition, 2007
2	J2EE-TheCompleteReference	JimKeogh	McGraw Hill	2007
3	Beginning Android Programming with Android Studio	J.F.DiMarzio		4thEdition, 2017
Reference Books				
1	Android Programming for Beginners	John Horton		1stEdition, 2015
2	Head First Android Development	Dawn Griffiths & David Griffiths	O'Reilly	1stEdition, 2015

Semester: VI
Course Name: CLOUD COMPUTING

Course Code	21CS641	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Credits	03	Exam Hours	3
Total Hours of Pedagogy	40	Total Marks	100

Pre-requisites:
- Basic Knowledge of Computer Networks
- Basic Knowledge of DBMS
- Python Programming Knowledge

Course objectives:
1. To learn various concepts and technologies of clouds.
2. To identify all the available cloud services
3. To understand the design approaches to cloud applications
4. To utilize Hadoop & MapReduce frameworks for developing cloud applications
5. To develop various cloud based applications using python

Module – 1 **08 Hours**

Introduction to Cloud Computing: Introduction, Characteristics of Cloud Computing, Cloud Models, Cloud Services Examples, Cloud-based Services & Applications.
Cloud Concepts & Technologies: Virtualization, Load Balancing, Scalability & Elasticity, Deployment, Replication, Monitoring.

Module – 2 **08 Hours**

Cloud Concepts & Technologies: Software Defined Networking, Network Function Virtualization, MapReduce, Identity and Access Management, Service Level Agreements, Billing.
Cloud Services & Platforms: Compute Services, Storage Services, Database Services, Application Services, Content Delivery Services, Analytics Services, Deployment & Management Services, Identity & Access Management Services, Open Source Private Cloud Softwar

Module – 3 **08 Hours**

Hadoop & MapReduce: Apache Hadoop, Hadoop MapReduce Job Execution, Hadoop Schedulers, Hadoop Cluster Setup.
Cloud Application Design: Introduction, Design Considerations for Cloud Applications, Reference Architectures for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Module – 4 **08 Hours**

Python for Cloud: Python for Amazon Web Services, Python for Google Cloud Platform, Python for Windows Azure.

Module – 5 **08 Hours**

Python for Cloud: Python for MapReduce, Python Packages of Interest, Python Web Application Framework – Django, Designing a RESTful Web API.
Cloud Application Development in Python: Design Approaches, Document Storage App, MapReduce App.

Course Outcomes:

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

1. Outline the concepts and technologies of clouds.
2. Identify all the available cloud services
3. Analyze the design methodologies of cloud applications
4. Utilize suitable platforms for developing cloud applications
5. Develop cloud various applications using python

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Cloud Computing: A Hands on Approach	Arshdeep Bahga, Vijay Madisetti	ISBN/EAN13: 1494435144/9781494435141	2013
Reference Books				
1	Cloud Computing: A Practical Approach for Learning and Implementation	A. Srinivasan, J. Suresh	1st Edition, Pearson Publications	2014
2	Explain the Cloud Like I'm 10	Todd Hoff		2017

Semester: VI
Course Name: BLOCKCHAIN TECHNOLOGY

Course Code	**21CS642**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:
- Basic idea of networks
- Basic idea of cloud computing

Course objectives:
1. To describe the fundamentals of distributed computing and evaluate the role it plays in blockchain technology.
2. To examine the fundamentals of cryptography and assess how they affect blockchain technology.
3. To assess the advantages, disadvantages, and various uses of blockchain technology.
4. To become familiar with the technology used in Bitcoin
5. To demonstrate proficiency in utilizing the Ethereum platform to develop blockchain applications.

Module – 1 **08 Hours**

Blockchain 101: Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain.
Decentralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations.

Module - 2 **08 Hours**

Introduction to Cryptography & Cryptocurrencies: Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Cryptocurrency.
How Bitcoin Achieves Decentralization: Distributed consensus, Consensus without identity using a block chain, Incentives and proof of work, Putting it all together

Module – 3 **08 Hours**

Mechanics of Bitcoin: Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bitcoin network, Limitations and improvements.
How to Store and Use Bitcoins: Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets

Module – 4 **08 Hours**

Bitcoin Mining: The task of Bitcoin miners, Mining Hardware, Energy consumption and ecology, Mining pools, Mining incentives and strategies.
Bitcoin and Anonymity: Anonymity Basics, How to De-anonymize Bitcoin, Mixing, Decentralized Mixing, Zerocoin and Zerocash

Module – 5 **08 Hours**

Smart Contracts and Ethereum 101: Smart Contracts: Definition, Ricardian contracts. Ethereum 101: Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts.

Course Outcomes:

The student should be able to

1. Interpret the principles of Distributed computing and analyze its significance in Blockchain technology.
2. Analyze the principles of Cryptography and evaluate its impact on Blockchain technology.
3. Evaluate the benefits, drawbacks, and diverse applications of Blockchain technology
4. Impart the technologies involved in Bitcoin
5. Utilize the Ethereum platform to develop blockchain applications

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained	Imran Bashir	Packt Publishing Ltd, Second Edition	2017
2	Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction	Arvind Narayanan, Joseph Bonneau, Edward W. Felten, Andrew Miller, Steven Goldfeder and Jeremy Clark	Princeton University Press	2016
Reference Books				
1	Mastering Bitcoins: Unlocking Digital Cryptocurrencies	Andreas Antonopoulos	O'Reilly Media, Inc	2013

Semester: VI
Course Name: NATURAL LANGUAGE PROCESSING

Course Code	**21CS643**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:
- Knowledge of Python, Data Structures & Algorithms

Course objectives:
1. Introduce the fundamental techniques of natural language processing.
2. Analyze the natural language text.
3. Describe types of classifiers used for text classification.
4. Understand the concepts of Text mining.
5. Illustrate information retrieval techniques.

Module – 1 **08 Hours**

Introduction to NLP
NLP in real world, NLP tasks, Language – Building Blocks of Language, NLP challenges, Machine Learning, Deep Learning and NLP overview, Approaches to NLP – Heuristics based NLP, Machine Learning for NLP, Deep Learning for NLP
NLP Pipeline
Generic NLP pipeline, Data Acquisition

Module – 2 **08 Hours**

NLP Pipeline
Text Extraction and Clean up – Normalization, Spelling Correction, System Specific Error Correction, Preprocessing – Word Tokenization, Stemming and Lemmatization
Text Representation
Vector Space Model, Bag of words, N – gram, TF – IDF, Word Embedding's – Continuous bag of words (CBOW), Skip Gram.

Module – 3 **08 Hours**

Text Classification
Naïve Bayes classifier, Logistic Regression, Support Vector Machine, CNNs and LSTMs for Text Classification, Case study – Corporate Ticketing

Module – 4 **08 Hours**

Information Extraction (IE)
IE Applications, IE Tasks, Pipeline for IE, Key phrase Extraction, Named Entity Recognition (NER) – Building and NER system, NLP using Active Learning, Dis-ambiguity and Linking Relationship Extraction – Approaches to RE

Module – 5 **08 Hours**

Chat bots
A simple FAQ chat bots, Taxonomy of chat bots – Goal oriented Dialog, Chit chats, Pipeline for building dialog systems, Components of Dialog system – Dialog Act classification, identifying slots, Response Generation, End – to – End approach, Deep Reinforcement Learning for Dialog Generation, Human – in – the – Loop.

Course Outcomes:

The student will be able to-

1. Apply hidden Markov models, and word embeddings to implement autocorrect, auto complete and identify part-of-speech tags for words.
2. Apply logistic regression and naïve Bayes to implement NLP applications that perform sentiment analysis.
3. Illustrate word vectors to complete analogies and translate words.
4. Demonstrate the concepts of neural networks, LSTM, GRUs for sentiment analysis, text generation and named entity recognition.
5. Design NLP applications that perform question-answering and create tools to translate languages and even build chat bots.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems	Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta & Harshit Surana	Oreilly	1st Edition, 2020
Reference Books				
1	Natural Language Understanding	James Allen	Pearson Education	
2	Speech and Language Processing	Jurafsky Dan & Martin James H	Prentice Hall	3rd Edition, 2023
3	Natural Language Processing and Information Retrieval	Tanveer Siddiqui, U.S. Tiwary	Oxford University Press	2008
4	Natural Language Processing with Python	Steven Bird, Ewan Klein & Edward Loper	Oreilly Media	1st Edition, 2009
5	Foundations of Statistical Natural Language Processing	Christopher D Manning & HinrichSchutze	MIT Press	1999
	Links			
1	https://nptel.ac.in/courses/106/105/106105158/			
2	http://www.nptelvideos.in/2012/11/natural-language-processing.html			

Semester: VI
Course Name: MACHINE LEARNING LAB

Course Code	**21AIL66**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**0:0:2**	SEE Marks	**50**
Credits	**01**	Exam Hours	**03**
Total Hours of Pedagogy	**20**	Total Marks	**100**

Course Objectives:

1. To learn and understand the Machine Learning Algorithms
2. Implement and evaluate ML algorithms.
3. Compare and contrast the learning techniques ANN approach, Bayesian learning and reinforcement learning.
4. Able to solve and analyze the problems on ANN, Instance based learning and Reinforcement learning techniques.
5. To impart the knowledge of clustering and classification Algorithms for predictions and evaluating Hypothesis.

List of Experiments

SN	Experiments
1	Illustrate and Demonstrate the working model and principle of Find-S algorithm. **Program:** For a given set of training data examples stored in a .CSV file, implement and demonstrate the Find-S algorithm to output a description of the set of all hypotheses consistent with the training examples.
2	Demonstrate the working model and principle of candidate elimination algorithm. **Program:** For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3	To construct the Decision tree using the training data sets under supervised learning concept. **Program:** Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4	To understand the working principle of Artificial Neural network with feed forward and feed backward principle. **Program:** Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5	Demonstrate the text classifier using Naïve bayes classifier algorithm. **Program:** Write a program to implement the naive Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6	Demonstrate and Analyse the results sets obtained from Bayesian belief network Principle. **Program:** Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Python ML library classes/API.
7	Implement and demonstrate the working model of K-means clustering algorithm with Expectation Maximization Concept. **Program:** Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Python ML library classes/API in the program.
8	Demonstrate and analyse the results of classification based on KNN Algorithm. **Program:** Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
9	Understand and analyse the concept of Regression algorithm techniques. **Program:** Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
10	Implement and demonstrate classification algorithm using Support vector machine Algorithm. **Program:** Implement and demonstrate the working of SVM algorithm for classification.

Course outcomes:

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

1. Implement different classification and clustering algorithms.
2. Demonstrate the working of various algorithms with respect to training and test data sets.
3. Illustrate and analyze the principles of Instance based and Reinforcement learning techniques.
4. Elicit the importance and Applications of Supervised and unsupervised machine learning.
5. Compare and contrast the Bayes theorem principles and Q learning approach.

Semester: VI
Course Name: MOBILE APPLICATION DEVELOPMENT LAB

Course Code	**21AIL67**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**0:0:2**	SEE Marks	**50**
Credits	**01**	Exam Hours	**03**
Total Hours of Pedagogy	**20**	Total Marks	**100**

Course Objectives:
1. Learn and acquire the art of Android Programming.
2. Configure Android studio to run the applications.
3. Understand and implement Android's User interface functions.
4. Create, modify and query on SQLite database.
5. Inspect different methods of sharing data using services.

LIST OF EXPERIMENTS

Part A

Identify the functional requirements, then Design Develop solutions to the problems related to:
1. Create an application to design a Visiting Card
2. Develop an Android application to demonstrate simple calculator
3. Create a SIGN Up activity with Username and Password. Validation of password should happen based on set of rules
4. Develop an application to set an image as wallpaper
5. Develop an application to convert text to speech
6. Develop a counter application
7. Develop an application on phone contact

Part B

Part B programs should be developed as an application and be demonstrated as a mini project in a group by adding extra features or the students can also develop their own application and demonstrate it as a mini project. (Projects/programs are not limited to the list given in Part B)
1. Medical Application Database
2. Content provider Application
3. SMS Application
4. Media player Application
5. EMI Calculator

Course outcomes:
1. Create, test and debug Android application by setting up Android development environment.
2. Implement adaptive, responsive user interfaces that work across a wide range of devices.
3. Infer long running tasks and background work in Android applications.
4. Demonstrate methods in storing, sharing and retrieving data in Android applications.
5. Develop an application to model real world problems

Semester: VI
Course Name: MINI PROJECT

Course Code	**21MN68**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**0:0:4**	SEE Marks	**50**
Credits	**0**	Exam Hours	**03**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Mini-Project Work: Mini Project is a laboratory-oriented/hands on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications etc. Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini-project can be assigned to an individual student or to a group having not more than 4 students

CIE procedure for Mini-project:

i. **Single discipline:** The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the **project report, project presentation skill, and question and answer session** in the ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batches mates

ii. **Interdisciplinary:** Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project. The CIE marks awarded for the Mini-project, shall be based on the evaluation of the **project report, project presentation skill, and question and answer session** in the ratio **50:25:25.** The marks awarded for the project report shall be the same for all the batch mates

Semester: VI
Course Name: COMPUTER GRAPHICS USING OPENGL

Course Code	**21CS69A**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**0:0:2**	SEE Marks	**50**
Credits	**01**	Exam Hours	**3**
Total Hours of Pedagogy	**20**	Total Marks	**100**

Pre-requisites:
1. Basic operations of vectors and matrices.
2. Basic concepts of 2-D computer graphics.
3. Good programming skills in C or C++

Course Objectives:
1. Apply the mathematical concepts and fundamentals of computer graphics to visualize objects in the computer
2. Examine the coordinate systems of computer graphics
3. Evaluate 2D, 3D transformation of objects
4. Determine process of plotting objects using graphics library toolkit
5. Interpret and animated solution to solve real world problems

Design, Develop and Implement the following Programs Using Opengl API
1. Implement different Geometrical Primitives using various types of Symbolic Constants in OpenGL
2. Implement Brenham's line drawing algorithm for all types of slope.
   Refer: Text-1: Chapter 3.5
   Refer: Text-2: Chapter 8
3. Create and rotate a triangle about the origin and a fixed point.
   Refer: Text-1: Chapter 5-4.
4. 3. Draw a color cube and spin it using OpenGL transformation matrices.
   Refer: Text-2: Modelling a Colored Cube.
5. Draw a color cube and allow the user to move the camera suitably to experiment with perspective viewing.
   Refer: Text-2: Topic: Positioning of Camera.
6. Clip a lines using Cohen-Sutherland algorithm
   Refer: Text-1: Chapter 6.7
   Refer: Text-2: Chapter 8
7. To draw a simple shaded scene consisting of a tea pot on a table. Define suitably the position and properties of the light source along with the properties of the surfaces of the solid object used in the scene.
   Refer: Text-2: Topic: Lighting and Shading
8. Design, develop and implement recursively subdivide a tetrahedron to form 3D sierpinski gasket. The number of recursive steps is to be specified by the user.
   Refer: Text-2: Topic: sierpinski gasket.
9. Develop a menu driven program to animate a flag using Bezier Curve algorithm
   Refer: Text-1: Chapter 8-10
10. Develop a menu driven program to fill the polygon using scan line algorithm
    Refer: Text-1: Chapter 2

Course Outcomes
1. Apply the concepts of computer graphics
2. Implement computer graphics applications using OpenGL
3. Implement real world problems using OpenGL

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Computer Graphics-OpenGL	Donald Hearn & Pauline Baker	Pearson Education	2011
2	OpenGL Programming Guide	Dave shreiner	Pearson Education	2010
Reference Books				
1	Interactive computer graphics- A Top Down approach with OpenGL	Edward Angel	Pearson Education	2011
2	Computer Graphics using OpenGL Fillip Learning	M MRaikar	Elsevier	2013

Semester: VI
Course Name: MOBILE APPLICATION DEVELOPMENT

Course Code	**21CS69B**	CIE Marks	**50**
Teaching Hours/Week (L:T:P:S)	**1:0:0**	SEE Marks	**50**
Credits	**1**	Exam Hours	**2**
Total Hours of Pedagogy	**15**	Total Marks	**100**

Pre-requisites:
- Knowledge of JAVA programming

Course objectives:
1. To understand the architecture and components of android application
2. To design interactive user interface
3. To design interface using Specialized Fragments
4. To work with SQLite database
5. To develop an Android Application to solve real world problems

Module – 1 **03 Hours**

Getting Started with Android Programming: Android, Features of Android, Android Architecture, obtaining the required tools, launching your first android application.

Module - 2 **03 Hours**

Activities, Fragments and Intents: Understanding activities, linking activities using intents, fragments

Module – 3 **03 Hours**

Getting to know the Android User Interface: Views and ViewGroups, FrameLayout, LinearLayout, TableLayout, RelativeLayout, ScrollView

Module – 4 **03 Hours**

Designing User Interface with Views: TextView view – Button, ImageButton, EditText, Checkbox, ToggleButton, RadioButton and RadioGroupViews, ProgressBar View, AutoCompleteTextView View, TimePicker View, DatePickerView, ListView View, SpinnerView

Module – 5 **03 Hours**

Understanding Specialized Fragments: List Fragment, DialogFragment, PreferenceFragment
Creating and using Databases: Creating the DBAdapter Helper class, using the database programmatically

Course Outcomes:
1. Understand various application components in android.
2. Design efficient user interface using different layouts.
3. Develop application using Specialized Fragments
4. Develop application with persistent data storage using SQLite
5. Develop an interactive applications using android studio

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Beginning Android Programming with Android Studio	J. F. DiMarzio	4thEdition	2017
Reference Books				
1	Android Programming for Beginners	John Horton	1stEdition	2015
2	Head First Android Development	Dawn Griffiths & David Griffiths	O'Reilly, 1stEdition	2015

Semester: VI
Course Name: ROBOTIC PROCESS AUTOMATION

Course Code	**21CS69C**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**1:0:0**	SEE Marks	**50**
Credits	**01**	Exam Hours	**3**
Total Hours of Pedagogy	**15**	Total Marks	**100**

Pre-requisites:
- Basic Programming Concepts

Course objectives:
At the end of the course, the student will be able to
1. Outline the basic concepts of RPA.
2. Understand the various components of RPA, where it can be applied and how it implemented
3. Describe the different types of variables, Control Flow and data manipulation techniques
4. Model the workflow of various control techniques and OCR in RPA
5. Interpret use of exception handling techniques to handle the log errors.

Module – 1 **03 Hours**

RPA Foundations:
What is RPA – Flavors of RPA- History of RPA- The Benefits of RPA- The downsides of RPA- RPA Compared to BPO, BPM and BPA – Consumer Willingness for Automation- The Workforce of the Future- RPA Skills-On-Premise Vs. the Cloud- Web Technology- Programming Languages and Low Code- OCR-Databases-APIs- AI-Cognitive Automation-Agile, Scrum, Kanban and Waterfall DevOps- Flowcharts.

Module - 2 **03 Hours**

RPA Platforms:
Components of RPA- RPA Platforms-About Ui Path- About UiPath - The future of automation - Record and Play - Downloading and installing UiPath Studio -Learning Ui Path Studio - Task recorder - Step-by- step examples using the recorder.

Module – 3 **03 Hours**

Sequence, Flowchart, and Control Flow:
Sequencing the workflow- Activities - Control flow, various types of loops, and decision making-Step-by- step example using Sequence and Flowchart-Step-by-step example using Sequence and Control flow-Data Manipulation-Variables and Scope- Collections-Arguments – Purpose and use-Data table usage with examples- Clipboard management-File operation with step-by-step example-CSV/Excel to data table and vice versa (with a step-by-step example).

Module – 4 **03 Hours**

Taking Control of the Controls:
Finding and attaching windows- Finding the 08 control- Techniques for waiting for a control- Act on controls – mouse and keyboard activities- Working with UiExplorer- Handling events- Revisit recorder- Screen Scraping- When to use OCR- Types of OCR available- How to use OCR- Avoiding typical failure points.

Module – 5 **03 Hours**

Exception Handling:
Exception Handling, Debugging, and Logging- Exception handling- Common exceptions and ways to handle them-Logging and taking screenshots- Debugging techniques- Collecting crash dumps- Error reporting.

Course Outcomes:

The student should be able to:

1. Discuss the fundamental & basic principles of Robotic Process Automation, Applications in various industries.
2. Summarize the various components & Platforms of RPA.
3. Analyze the different types of variables, control flow and data manipulation techniques.
4. Apply various control techniques and OCR in RPA
5. Design and develop a bot to capture runtime exception & handling of such type of exceptions.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems	Tom Taulli	A press	2020, ISBN-13 (electronic): 978-1-4842-5729-6
2	Learning Robotic Process Automation	Alok Mani Tripathi	Packt Publishing	March 2018 ISBN: (electronic): 9781788470940
Reference Books				
1	Introduction to Robotic Process Automation: a Primer	Frank Casale, Rebecca Dilla, Heidi Jaynes ,Lauren Livingston	Institute of Robotic Process Automation	
2	Richard Murdoch	Robotic Process Automation: Guide To Building Software Robots	Automate Repetitive Tasks & Become An RPA Consultant	

Semester: VI
Course Name: PROGRAMMING IN JAVA

Course Code	**21CS651**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:
- Students should know the basic knowledge on:
- C Programming
- C++

Course objectives:
1. Learn fundamental features of object oriented language and JAVA.
2. To create, debug and run simple Java programs.
3. Learn object oriented concepts using programming examples.
4. Study the concepts of importing of packages and exception handling mechanism.
5. Discuss the String Handling examples with Object Oriented concepts.

Module – 1 **08 Hours**

Introduction to Java: Java's magic: The Bytecode, The Java Buzzwords.
An Overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Lexical Issues.
Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays.

Module - 2 **08 Hours**

Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses.
Control Statements: Java's Selection Statements, Iteration Statements, Jump Statements.

Module – 3 **08 Hours**

Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize( ) Method, A Stack Class.
A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters.
Inheritance: Inheritance Basics, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, The Object Class.

Module – 4 **08 Hours**

Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces.
Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions, Using Exceptions.

Module – 5 **08 Hours**

Enumerations: Enumerations.
I/O: I/O Basics, Reading Console Input, Writing Console Output, Reading and Writing Files, Automatically Closing a File.
String Handling: The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, Data Conversion Using valueOf( ), Changing the Case of Characters Within a String , Additional String Methods, StringBuffer, StringBuilder.

Course Outcomes:

1. Identify classes, objects, members of a class and relationship among them needed for a specific problem.
2. Develop JAVA application programs using control statements.
3. Implement reusability Programs in JAVA using inheritance.
4. Develop JAVA Programs of error handling techniques using exception handling.
5. Demonstrate string handling concepts using JAVA.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Java The Complete Reference	Herbert Schildt	The McGraw Hill	8th Edition,2015
Reference Books				
1	Programming with Java	Mahesh Bhave and Sunil Patekar	Pearson Education	1st Edition,2008
2	Programming with Java A primer	E Balagurusamy	Tata McGraw Hill	

Semester: VI
Course Name: INTRODUCTION TO DATA ANALYTICS

Course Code	**21CS652**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:
- Basic Knowledge of DBMS
- Basic Knowledge of Microsoft Excel

Course objectives:
1. To learn various concepts and technologies of Data Analytics
2. To discuss the various OLTP system characteristics
3. To discuss the various aspects related to the Data lake and Data warehouse
4. To present the data using various Visualization tools

Module – 1 **08 Hours**

Introduction, Business Intelligence, Pattern Recognition, Data Processing Chain.
Business Intelligence Concepts and Applications: Introduction, BI for better decisions, decision types, BI tools, BI skills, BI applications.

Module - 2 **08 Hours**

Structure, objectives, introduction, online transaction processing, OLTP system characteristics, OLTP merits and demerits, need of data warehouse, characteristics of DW, main components of data warehouse, approaches for constructing a data warehouse, dimensional modeling used in DW design-facts, dimensions and attributes, types of schemas, ETI and other tools sets available in market.

Module – 3 **08 Hours**

Structure, objectives, business intelligence, BI characteristics, data quality: a real challenge, data quality best practices, structured versus unstructured, differences between structured and unstructured data, data lake, data lake versus data warehouse, main components of a data lake, modern business intelligence system, benefits and use cases of modern BI.

Module – 4 **08 Hours**

Structure, objectives, presenting data visualization, aims of data visualization, history at a glance, importance of data visualization, types of data visualization-hierarchical, tree diagram, tree map, ring chart, dendogram, temporal, bar chart, line graph, stacked graph, Gantt chart, scatter plot, stacked area chart, sparkline, network, word cloud, matrix chart, node link diagram, multi-dimensional, pie chart, histogram.

Module – 5 **08 Hours**

Introduction, decision tree problem, decision tree construction, decision tree algorithms.
Advanced data visualization- structure, objective, types of advanced data visualization-bubble chart, word cloud, geospatial heat map/ hot spot mapping, data visualization trends, introducing data visualization tools, data visualization best practices.

Course Outcomes:

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

1. Apply the BI concepts to solve real life problems.
2. Design OLTP techniques to provide business solutions
3. Apply BI techniques to design a data lake.
4. Analyze data using various data visualization techniques.
5. Analyze trends using advanced data visualization techniques.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Data Analytics	Anil Maheshwari	Mc Graw Hill Education	2018
2	Data Analytics: Principles, Tools,and Practices	Dr.Gaurav Aroraa Chitra Lele Dr.Munish Jindal	BPB Publications	1st Edition, 2022

Semester: VI
Course Name: INTRODUCTION TO ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Course Code	**21CS653**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites:
- Knowledge of **Mathematics & Data Structures and Algorithms**

Course objectives:
1. Understands the basics of AI, history of AI and its foundations, basic principles of AI for problem solving.
2. Compare and contrast different AI techniques available.
3. Define and explain learning algorithms
4. Explore the basics of Machine Learning & Machine Learning process, understanding data
5. Understand the Working of Artificial Neural Networks.

Module – 1 **08 Hours**

Introduction: What is AI, The foundation of Artificial Intelligence, The history of Artificial Intelligence, Intelligent Agents: Agents and Environments, Good Behaviour: The concept of rationality, the nature of Environments, the structure of Agents.

Module - 2 **08 Hours**

Problem solving by searching: Problem solving agents, Example problems, Searching for solutions, Uniformed search strategies, Informed search strategies, Heuristic functions

Module – 3 **08 Hours**

Introduction to machine learning: Need for Machine Learning, Machine Learning Explained, and Machine Learning in relation to other fields, Types of Machine Learning. Challenges of Machine Learning, Machine Learning process, Machine Learning applications.
Understanding Data: What is data, types of data, Big data analytics and types of analytics, Big data analytics framework, Descriptive statistics, univariate data analysis and visualization.

Module – 4 **08 Hours**

Understanding Data: Bivariate and Multivariate data, Multivariate statistics, Essential mathematics for Multivariate data, Overview hypothesis, Feature engineering and dimensionality reduction techniques,
Basics of Learning Theory: Introduction to learning and its types, Introduction computation learning theory, Design of learning system, Introduction concept learning.
Similarity-based learning: Introduction to Similarity or instance based learning, Nearest-neighbour learning, weighted k- Nearest - Neighbour algorithm.

Module – 5 **08 Hours**

Artificial Neural Network: Introduction, Biological neurons, Artificial neurons, Perceptron and learning theory, types of Artificial neural Network, learning in multilayer Perceptron, Radial basis function neural network, self-organizing feature map.

Course Outcomes:

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

1. Design intelligent agents for solving simple gaming problems.
2. Apply techniques to solve the AI problems
3. Have a good understanding of machine leaning in relation to other fields and fundamental issues and Challenges of machine learning
4. Understand data and applying machine learning algorithms to predict the outputs.
5. Model the neuron and Neural Network, and to analyze ANN learning and its applications.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Artificial Intelligence A Modern Approach	Stuart Russel, Peter Norvig	Pearson Education	3rd Edition, 2015
2	Machine Learning	S. Sridhar, M Vijayalakshmi	Oxford	2021
Reference Books				
1	Artificial Intelligence	Elaine Rich, Kevin Knight	Tata McGraw Hill	3rd Edition, 2009
2	Principles of Artificial Intelligence	Nils J. Nilsson	Elsevier	1980

Semester: VI
Course Name: INTRODUCTION TO CYBER SECURITY

Course Code	**21CS654**	CIE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	SEE Marks	**50**
Credits	**03**	Exam Hours	**3**
Total Hours of Pedagogy	**40**	Total Marks	**100**

Pre-requisites: The students should have the knowledge of:
- Awareness about the loopholes/drawbacks of the advanced technologies on which the society is dependent.
- Awareness about the crimes being done through technology.

Course objectives:
1. To familiarize the cybercrime terminologies and perspectives.
2. To illustrate the phases of cybercrime plan and different types of cybercrimes.
3. To gain the knowledge about the tools and methods used by the criminals.
4. To reveal the techniques used in phishing and identity theft.
5. To emphasize the necessary of computer and cyber forensics.

Module – 1 **08 Hours**

Introduction to Cybercrime:
Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws., Global Perspectives

Module - 2 **08 Hours**

Cyber Offenses:
How Criminals Plan Them: Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cyber cafe & cybercrimes.
Botnets: The fuel for cybercrime, Attack Vector.

Module – 3 **08 Hours**

Tools and Methods used in Cybercrime: Introduction, Proxy Servers, Anonymizers, Phishing, Password Cracking, Key Loggers and Spyways, Virus and Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS Attackes, Attacks on Wireless networks.

Module – 4 **08 Hours**

Phishing and Identity Theft: Introduction, methods of phishing, phishing, phishing techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft

Module – 5 **08 Hours**

Understanding Computer Forensics: Introduction, Historical Background of Cyber forensics, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics.

Course Outcomes:

1. Identify the various terminologies being used in cybercrime.
2. Categorize the types of cybercrimes.
3. Illustrate the tools and methods used by criminals for cybercrime.
4. Compare the various techniques used in phishing and identity theft.
5. Utilize various cyber security techniques including cyber forensics.

Suggested Learning Resources:

Text Books:

Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018)

Reference Books:

Neil Daswani, Moudy Elbayadi Big Breaches: "Cyber-security Lessons for Everyone", Feb 2021

Assessment Details (PCC)

Continuous Internal Examination/ Evaluation (CIE):

	Components	Number	Weightage	Max. Marks
(i)	Tests (A)	3	60%	30
(ii)	Alternate Assessment Tools(AAT) (B)	3	40%	20
	Total Marks			**50**

Final CIE Marks = (A) + (B)

The Alternate Assessment Tools are Assignments, Quiz and Seminar

Semester End examination (SEE)

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
The question paper will have ten full questions carrying 20 marks each.
There will be two full questions (with a maximum of four sub questions) from each module.
The students will have to answer five full questions, selecting one full question from each module.

Assessment Details (Laboratory)

Continuous Internal Evaluation (CIE): 50 Marks

	Components	Weightage	Max. Marks
(i)	Lab Work: Conduction of Experiments (A)	40%	20
(ii)	Lab Journal Writing & Submission (B)	10%	05
(iii)	Lab Test (C)	30%	15
(iv)	Open-Ended Experiments (D)	20%	10
	Total Marks		**50**

Semester End Evaluation (SEE): 50 Marks

1. All laboratory experiments are to be included for practical examination
2. Students can pick one experiment from the questions lot with equal choice to all the students in a batch.
3. Change of experiment is allowed only once and 15% marks allotted to the procedure part to be made zero.
4. Marks distribution: procedure (15%) + Execution (70%)+ viva voce (15%)

Assessment Details (AEC)

Continuous Internal Evaluation (CIE):

	Components	Number	Weightage	Max. Marks
(i)	Tests (A)	3	60%	30
(ii)	Alternate Assessment Tools(AAT) (B)	3	40%	20
	Total Marks			**50**

Final CIE Marks = (A) + (B)

The following are the Alternate Assessment Tools and are not limited to Quiz, Assignments, Presentations, Paper Publications, MOOCs, Industrial Visits and Report Writing, Open Book, Self E-Learning with Certifications, and other cooperative and problem-based learning.

SEE:

1. Theory SEE will be conducted with common question papers for subject
2. The pattern of the question paper is MCQ's. The time allotted for SEE is 02 hours

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