Credit Framework for Master of Computer Applications (DS &AI) (NEP-2020)
School of Computer Applications, BBD University, Lucknow

Semester	Discipline Specific Core (DSC) (Major)	Discipline Specific Elective (DSE) (Major)	Generic Elective (GE)(Minor)	Co-Curricular (CC)	Vocational Course(VC)	Survey/Seminar/MOOC/Community Outreach (SSMC)	GP	Total Credit
1	6 Subjects 28 Credits (6+6+4+4+4+4 Credits)						1 Credit	29
2	5 Subjects 24 Credits (2+4+6+6+4+2 Credits)	1 Subject 4 Credits					1 Credit	29
3	3 Subjects 14 Credits (6+4+4 Credits) Dissertation 10 Credits	1 Subject 4 Credits					1 Credit	29
4	1 Subject 4 Credits (Online Mode) Project 24 Credits						1 Credit	29

Babu Banarasi Das University, Lucknow
School of Computer Applications
Master of Computer Applications (DS&AI)
Evaluation Scheme (w. e. f. Academic Session 2023-24)

SEMESTER I

Course Category	Course Code	Course Title	Contact Hours			Evaluation Scheme			Credits	Mode
			L	T	P	CIA	ESE	Course Total		
DSC	MCADSN11101	Python with Data Science	3	1	0	40	60	100	4	IBM
DSC	MCADSN11102	Principles of Programming Using Java	3	1	0	40	60	100	4	School
DSC	MCADSN11103	Soft Computing	3	1	0	40	60	100	4	
DSC	MCADSN11104	Relational Database Management System	3	1	0	40	60	100	4	
DSC	MCADSN11105	Web Technology & Application Development	3	1	0	40	60	100	4	
DSC	MCADSN11106	Probability and Statistics	3	1	0	40	60	100	4	
DSC	MCADSN11151	Web Technology & Application Development Lab	0	0	4	40	60	100	2	
DSC	MCADSN11152	Relational Database Management System Lab	0	0	4	40	60	100	2	
	GPN1101	General Proficiency	0	0	0	100	0	100	1	
Total			**18**	**6**	**8**	**420**	**480**	**900**	**29**	

SEMESTER II

Course Category	Course Code	Course Title	Contact Hours			Evaluation Scheme			Credits	Mode
			L	T	P	CIA	ESE	Course Total		
DSC	MCADSN12101	NoSQL and MONGO DB	2	0	0	40	60	100	2	IBM
DSC	MCADSN12102	Descriptive Analytics	3	1	0	40	60	100	4	IBM
DSC	MCADSN12103	Advance Java	3	1	0	40	60	100	4	School
DSC	MCADSN12104	Advance .Net Framework and C#	3	1	0	40	60	100	4	
DSC	MCADSN12105	Big Data and Data Warehousing	3	1	0	40	60	100	4	
DSE		Discipline Specific Elective-I	3	1	0	40	60	100	4	
DSC	MCADSN12151	Advance Java Lab	0	0	4	40	60	100	2	
DSC	MCADSN12152	Advance .Net Framework and C# Lab	0	0	4	40	60	100	2	
DSC	MCADSN12153	Seminar & Term Paper (STP)	0	0	4	100	0	100	2	
	GPN1201	General Proficiency	0	0	0	100	0	100	1	
Total			**17**	**5**	**12**	**520**	**480**	**1000**	**29**	

SEMESTER III

Course Category	Course Code	Course Title	Contact Hours			Evaluation Scheme			Credits	Mode
			L	T	P	CIA	ESE	Course Total		
DSC	MCADSN13201	Big Data Analytics and Architecture	3	1	0	40	60	100	4	IBM
DSC	MCADSN13202	Artificial Intelligence	3	1	0	40	60	100	4	IBM
DSC	MCADSN13203	Client Side Scripting	3	1	0	40	60	100	4	School
DSE		Discipline Specific Elective-II	3	1	0	40	60	100	4	
DSC	MCADSN13252	Client Side Scripting Lab	0	0	4	40	60	100	2	
DSC	MCADSN13253	Dissertation	0	0	0	40	60	100	10	
	GPN1301	General Proficiency	0	0	0	100	0	100	1	
Total			**12**	**4**	**4**	**340**	**360**	**700**	**29**	

SEMESTER IV										
Course Category	Course Code	Course Title	Contact Hours			Evaluation Scheme			Credits	Mode
			L	T	P	CIA	ESE	Course Total		
DSC	MCADSN14201	Machine Learning	4	0	0	40	60	100	4	IBM
DSC	MCADSN14251	Project	0	0	0	250	450	700	24	School
	GPN1401	General Proficiency	0	0	0	100	0	100	1	
Total			**4**	**0**	**0**	**390**	**510**	**900**	**29**	
Discipline Specific Elective-I										
1	MCADSN12121	Cognitive Computing								
2	MCADSN12122	Cloud Computing								
3	MCADSN12123	Internet Of Things(IoT)								
4	MCADSN12124	Advance Data Mining & Data Warehousing								
Discipline Specific Elective-II										
1	MCADSN13221	Deep Learning								
2	MCADSN13222	Natural Language Processing								
3	MCADSN13223	Digital Image Processing								
4	MCADSN13224	Human Computer Interaction								

DSC	Discipline Specific Core
DSE	Discipline Specific Elective
GE	Generic Elective
CC	Co-Curricular
VC	Vocational Course
GP	General Proficiency
L	Lecture
T	Tutorial
P	Practical

Master of Computer Applications

(Data Science & Artificial Intelligence)

In Collaboration with IBM

FIRST SEMESTER

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**		I	
Course Name	Python with Data Science				
Code	MCADSN11101				
Course Type	DSC	**L**	**T**	**P**	**Credit**
Pre-Requisite		3	1	0	4
Course Objectives	Using the frameworks necessary to analyze and interpret data and acquire technical expertise using popular open-source analytics frameworks for Data Science.				

Course Outcomes	
CO1	Understand programming basics including functions, variables, and data type.
CO2	Data Science lifecycle revolve around using some techniques and other analytical methods to produce insights and predictions from data to achieve a business objective.
CO3	Applying and analysing, is the process of determining which features might be useful in training a model, and then creating those features by transforming raw data found in log files and other sources.
CO4	Understand Data engineering and data modelling practices using machine learning and building and create role-playing challenge-based scenarios to propose real-world solutions

Module	**Course Contents**	**Contact Hrs.**	**Mapped CO**
1	**Introduction of Python**: What is Python, its advantages and disadvantages, how to run python scripts, how to use variables, String operator and functions, Inputting the data, Working with Boolean and other statements, Use of pandas library for data analysis, Different types of errors that one can encounter while working with Python	15	CO1
2	**Introduction To Data Science:** What is Data Science, what does a data scientist do, various examples of Data Science in the industries, How Python is deployed for Data Science applications, Various steps in Data Science process like data wrangling, data exploration and selecting the Model	15	CO2
3	**Data Manipulation and Visualization:** Introduction to NumPy, Pandas and Matplotlib, how to Import NumPy module, what is a data Manipulation using Panda's library? Series object in pandas, Data Frame in Pandas, Loading an handling data with Pandas, Introduction to Matplotlib, Using Matplotlib for plotting Graphs and charts like Scatter, Bar, Pie, Line, Histogram and more	15	CO3
4	**Supervised And Unsupervised Learning:** What is linear regression? Logistic Regression, what is **classification**? Decision Tree, Confusion Matrix, Random Forest, Naïve Bayes classifier, support vector machine, use cases of unsupervised learning, what is clustering and Types of clustering. What is K-means clustering and Hierarchical Clustering? Step by step calculation of k-means algorithm	15	CO4

Suggested Readings

1. Analytics: Data Science, Data Analysis and Predictive Analytics for Business" by Daniel Covington.
2. Machine Learning for Big Data: Hands-On for Developers and Technical Professionals" by Jason Bell.

Online Resources

1. https://cognitiveclass.ai/courses/python-for-data-science

Course Articulation Matrix														
PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	2	1	2	1	2	1		1		1	2	1	2
CO2	1	3		2	2	1		1		2		3	2	3
CO3	1	3		3	3	3			1	1		2	2	3
CO4	2	3		1	2	2	1		1	3	1	3	2	3

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**	I		
Course Name	Principles of Programming Using Java				
Code	MCADSN11102				
Course Type	DSC	**L**	**T**	**P**	**Credit**
Pre-Requisite		3	1	0	4
Course Objectives	The Objective of the course is students will understand the principles of programming language as well as understanding the key decisions that must be made when designing a new programming language.				

Course Outcomes	
CO1	Understand the various programming paradigms.
CO2	Understand the basics of data, data types and statements.
CO3	Student able to solve problems using functions.
CO4	Understand object-oriented programming, Functional and Logic Programming Languages.

Module	**Course Contents**	**Contact Hrs.**	**Mapped CO**
1	**Introduction: The Role of Programming Languages:** Why Study Programming Languages, Towards Higher-Level languages, Programming paradigms; **Programming environments Language Description:** Syntactic structure; **Language Translation Issues:** Programming language Syntax, Stages in translation, Formal Translation Models.	15	CO1
2	**Data, Data Types, and Basic Statements:** Names, Variables, Binding, Type Checking, Scope, Scope Rules, Lifetime and Garbage Collection, Primitive Data Types, Strings, Array types, Associative arrays, Record types, Union types, Pointers and References, Arithmetic expressions, Overloaded operators, Type conversions, Relational and Boolean expressions, Assignment statements, Mixed mode assignments, Control structures, Selection, Iterations, Branching, Guarded statements.	15	CO2
3	**Subprograms and Implementations:** Subprograms, Design issues, Local referencing, Parameter passing, Overloaded methods, Generic methods, Design issues for functions, Semantics of call and return, Implementing simple subprograms, Stack and Dynamic local variables, Nested subprograms, Dynamic scoping.	15	CO3
4	**Object-Orientation, Functional and Logic Programming Languages:** Grouping of data and Operations, Constructs for Programming Structures, Abstraction Information Hiding, Program Design with Modules, Defined types, Object Oriented programming concept of Object, Inheritance, Polymorphism, Encapsulation. **Functional and Logic Programming Languages:** Introduction to Lambda calculus, Fundamentals of functional programming languages, Introduction to LISP Concepts; **Introduction to logic and logic programming:** Programming with Prolog.	15	CO4

Suggested Readings

1. **"**Programming Languages: Design and Implementations", Terrance W.Pratt, Marvin V. Zelkowitz, T.V. Gopal, Fourth ed., Prentice Hall.
2. "Programming Language Design Concept", David A. Watt, Willey India.
3. "Programming languages: Concepts and Constructs", Ravi Sethi, Second Ed., Pearson.

Online Resources

1. https://onlinecourses.nptel.ac.in/noc22_cs47/preview

Course Articulation Matrix														
PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2						1					2		
CO2	2					1	1					2	1	
CO3	2	2				1	1					2	1	2
CO4	2	2	1		2	1	1			3		3	2	2

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**		I	
Course Name	Soft Computing				
Code	MCADSN11103				
Course Type	DSC	**L**	**T**	**P**	**Credit**
Pre-Requisite		3	1	0	4
Course Objectives	The main objective of the soft computing techniques to improve Data Analysis Solution is to strengthen the dialogue between the Statistics and soft computing research communities to cross- pollinate both fields and generate mutual improvement activities.				
Course Outcomes					
CO1	Understand how artificial intelligence influences various modern developments.				
CO2	Understand how Fuzzy System Controller controls various devices.				
CO3	Understand different types of Fuzzy System used in real world.				
CO4	Understand to develop high quality optimized Solution for a problem.				

Module	**Course Contents**	**Contact Hrs.**	**Mapped CO**
1	**Introduction:** Soft Computing, Differences between Soft Computing and Hard Computing, Requirements of Soft Computing, Applications of Soft Computing Artificial Intelligence & Neural Network: Introduction to Artificial Intelligence, Models of Artificial Neural Network, Learning Rules and Various Activation Functions, Hebbian Learning Rule, Perception Learning Rule, Delta Learning Rule, Widrow – Hoff Learning Rule, Correlation Learning Rule, Winner – Take All Learning Rule, Associative Memories.	15	CO1
2	**Introduction to Fuzzy System:** Fuzzy System, Fuzzy Logic, Fuzzy Sets and Crisp Sets, Evolution of Fuzzy System, Fuzzy Set Operations, Fuzzy to Crisp Conversion, Inference in Fuzzy Logic, Fuzzy Rule Base, Fuzzy Knowledge Base, Fuzzy Controller, Fuzzification and Defuzzification.	15	CO2
3	**Type – II Fuzzy Set:** Need of Type – II Fuzzy Set, Type – II Fuzzy Set, Generalized Type – II Fuzzy Set, Interval Type- II Fuzzy Set, Fuzzy System, Fuzzy Knowledge Base Modeling Approach: Mamdani Approach, Takagi Sugeno's Approach, Interpretability and Accuracy Trade- Off in Fuzzy Knowledge Base System, Handling Interpretability and Accuracy Trade-Off in Fuzzy Knowledge Base System,	15	CO3
4	**Genetic Algorithm:** Basic Concept, Working Principle of Genetic Algorithm, Flow Chart of Genetic Algorithm, Genetic Representation (Encoding), Initialization and Selection, Genetic Operators, Mutation, Generation Cycle, Applications.	15	CO4

Suggested Readings

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic.
2. Algorithm: Synthesis and Applications" Prentice Hall of India.
3. N.P. Padhy," Artificial Intelligence and Intelligent Systems" Oxford University Press.

Online Resources

1. https://onlinecourses.nptel.ac.in/noc22_cs54/preview

Course Articulation Matrix														
PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1		1				2			1	1	2	2	1
CO2	2	3	1	2		2	1		2			2	2	1
CO3	1	3	2	2		3	2		2			2		2
CO4	2	3		2	3	3	3		2	3		2	3	3

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**		I	
Course Name	Relational Database Management System				
Code	MCADSN11104				
Course Type	DSC	**L**	**T**	**P**	**Credit**
Pre-Requisite		3	1	0	4
Course Objectives	The objective of this course is to introduce the fundamental concepts of DBMS, terminologies of database management system, E-R Modelling, PL/SQL concept, database transactions and concurrency control techniques.				
Course Outcomes					
CO1	Understand the basic concepts of the database and data models.				
CO2	Understand the fundaments concepts ER diagrams and map ER diagrams into Relations.				
CO3	Evaluate the alternative database designs to determine which one is better according to selected criteria.				
CO4	Understand the basic concepts/features of database transactions and concurrency control techniques.				

Module	**Course Contents**	**Contact Hrs.**	**Mapped CO**
1	**Introduction:** Data and information, Concepts of persistent data, File system , Basic File Operations, File Structure and Organization, Types of File Organization: Sequential file organization, Heap file organization, Hash file organization, B+ file organization, Indexed sequential access method ,Cluster file organization. **Database Management System:** Introduction of DBMS, Characteristics of the Database Approach, Components of Database System, Database Management System vs. File Management System, Advantages and Disadvantages of DBMS, DBMS Users , DBMS Architecture: 1-Tier Architecture, 2-Tier Architecture and 3-Tier Architecture. Capabilities of good DBMS, Database Schemas and Instances, Classification of Database Management Systems, Database Languages. **Data Models:** Introduction of Data Models, Relational Data Model, Entity Relationship Data Model, Object Based Data Model, Semi-Structure Data Model.	15	CO1
2	**Relational Database Management System & Data Modeling:** Introduction to Relational database, Structure of Relational Database, Relational model terminology: Relations , Domains, Attributes, Tuples, Relational Constraints, Codd Rule, Entity-Relationship Model: Entity Sets, Entity Types, Attributes, Attributes Types, Relationships, Relationship Types ,Keys, Constraints, Entity-Relationship Model: E-R Model Concepts, Notation for E-R Diagram, Mapping Constraints, Extended E-R Features, Reduction of E-R Diagram to Relation. **Relational Algebra:** Concepts of Relational Algebra, Fundamentals Operations: Select, Project, Rename, Union, Set difference, division, Cartesian Product, Additional Relational-Algebra Operations: Set Intersection, Joins.	15	CO1 & CO2

3	**SQL and Database Design Theory:** Introduction on SQL: Characteristics of SQL, Advantage of SQL, SQL Data Type and Literals, Types of SQL Commands, SQL Operators and their Procedure, Queries and Sub Queries, Aggregate Functions, Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, View, Cursors Triggers and PL/SQL. **Functional Dependencies and Normalization:** Informal Design Guidelines for Relation Schemas, Database Anomalies, Functional Dependencies, Armstrong's axioms, Closure of Attribute sets, Normalization, Need of Normalization, Normal Forms, First Normal Form, Second Normal Form, Third Normal Forms and Boyce-Codd Normal Forms, Fourth Normal Form and Fifth Normal Form.	15	CO3
4	**Transaction Processing & Concurrency Control:** Basic concept; Introduction to Transaction, ACID properties; transaction state; Basic idea of serializability, view and conflict serializability, Recovery and, Recovery Techniques: Log Based Recovery, Shadow Paging, deferred database modification, immediate database modification, checkpoints. **Concurrency Control:** Definition of concurrency, lost update, dirty read and incorrect summary problems due to concurrency. Deadlock Handling: Deadlock Concepts, Deadlock Prevention, Deadlock Detection and Recovery, Concurrency Control Techniques: Lock Based Protocol, Timestamp-Ordering Protocol, Validation-Based Protocols**.**	15	CO3 & CO4

Suggested Readings

1. Korth, Silbertz, Sudarshan, Database Concepts, McGraw Hill, Seventh Edition-2019
2. Date C J, An Introduction to Database Systems, Addison Wesley, Eight Edition-2017
3. Elmasri, Navathe, Fundamentals of Database Systems, Addison Wesley, Seventh Edition-2017

Online Resources

1. https://onlinecourses.nptel.ac.in/noc22_cs91/preview

Course Articulation Matrix

PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2					1			1		1	2	2	1
CO2	1	2	3	1	3	2	1		3	2	2	2	2	2
CO3	1	1	2	3	2	2	2		3	2	2	2	2	3
CO4	2	2	1	2		2	1		1	1		2	1	2

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**	I		
Course Name	Web Technology & Application Development				
Code	MCADSN11105				
Course Type	DSC	**L**	**T**	**P**	**Credit**
Pre-Requisite		3	1	0	4
Course Objectives	To focus on the process of Web Development. To build sound concepts of several languages used in Web Technology and create a dynamic, interactive website quickly, confidently, and successfully				
Course Outcomes					
CO1	Understand the basic concept of HTML and application in web designing.				
CO2	Students develop static and dynamic website using HTML and CSS.				
CO3	Understanding the basic concept of Java Script and its application.				
CO4	Student able to develop personal and professional websites.				

Module	**Course Contents**	**Contact Hrs.**	**Mapped CO**
1	**HTML, DHTML:** Introduction to HTML5; Introduction to Text Formatting tags; **Types of Lists:** Ordered, Unordered, Definition lists; **Table tags:** Methods to Create Tables , Attributes of Table tag, colspan and rowspan; Block level and Inline elements; Classes; Entities; frameset tags and its Attributes; **Form tag:** Creation of Forms, Textbox, Radio Button, Hidden etc; Introduction to DHTML; Document Object Model; Style Sheets: Need of CSS; **Types of Style Sheet:** Inline, Internal and External.	15	CO1
2	**JAVA SCRIPT:** Introduction to JavaScript: Advantages of JavaScript; Basic Programming Techniques: Data Types and Literal, Creating Variables and JavaScript Array; Operators and Expressions in JavaScript; JavaScript Programming Constructs: Conditional Checking, Loops; **Functions in JavaScript:** Built in Functions and User Defined Functions; Dialog Boxes; JavaScript Document **Object Model (DOM):** Object hierarchy in DOM, Event Handling; Form Object: Form Object's Methods and Properties, Text Element, Button Element, etc.; Other Built in Objects in JavaScript: String, Math and Date Object; Writing Client Side Validations HTML Form Elements.	15	CO2
3	**Working with XAMPP Web Server:** Introduction, Installation, Configuration; **Database Handling:** Introduction MySQL, Connecting MySQL, Creating and Selecting Database, Creating Table, Inserting, Retrieving, Deleting and Updating Data in Database; **Basic of PHP:** Introduction to PHP: Features of PHP, Basics of PHP, Data Types, Variables, Constants, Operators, Arrays; Conditional Statements and Iterations.	15	CO3
4	**Functions in PHP:**User Defined and Built in Functions; Working with String Functions; **Working with Forms in PHP:** Adding elements to a form, uploading files to the web server using PHP; Debugging and Errors: Types of Errors and Error handling in PHP; Database Connectivity with MySQL.	15	CO4

Suggested Readings

1. Burdman Jessica, “Collaborative Web Development”, Addison Wesley. 2002.
2. Bayross Ivan,”HTML, DHTML. JavaScript, and PHP”, BPB Publications, 4th Edition, 2001.
3. Xavier, C,”Web Technology and Design”, New Age International, 2000.

Online Resources

1. https://onlinecourses.swayam2.ac.in/nou20_cs05/preview

Course Articulation Matrix														
PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2		1		2	1	1					1	1	1
CO2	2	1	1	1	2	2	1		1	1	1	2	2	2
CO3	2	1	2	2	2	3	2		3	2	2	2	3	3
CO4	2	2	2	2	2	3	2		3	3	3	2	3	3

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**	I		
Course Name	Probability & Statistics				
Code	MCADSN11106				
Course Type	DSC	**L**	**T**	**P**	**Credit**
Pre-Requisite		3	1	0	4
Course Objectives	Subjects analyze relevant statistical measures for different types of data & use the basic probability concept & Methods of sampling and testing hypotheses.				
Course Outcomes					
CO1	To apply statistical distributions methods for real life problems.				
CO2	To draw & demonstrate valid inferences based on the analysis of statistical data.				
CO3	To Implement the concept of probability.				
CO4	To Implement the various techniques of testing of hypothesis.				

Module	**Course Contents**	**Contact Hrs.**	**Mapped CO**
1	**Measurement of Central Tendency:** Concept of Central Tendency, Types of Central Tendency: Arithmetic Mean, Geometric Mean, Harmonic Mean, Median and Mode. **Measures of dispersion**: Concept of dispersion, Absolute and Relative Measures of Dispersion: Range, Quartile, Inter Quartile Range, Mean Deviation, Standard Deviation **Correlation and Regression:** Concept and types of correlation: Karl Pearson's, Spearman's Rank correlation, Linear Regression: Concept and line of best fit (Y on X and X on Y).	15	CO1
2	**Probability and Expected Value:** Experiment, Sample Space, Event, Types of Events, Probability, Classical Approach, Subjective Approach, Axiomatic Approach & Modern Definition; Probability Theorems (Additive, Multiplicative), Conditional Probability, Bayes's Theorem, Mathematical Expectation, Random Variable & Probability Distribution of Random Variable.	15	CO2
3	**Theoretical Distributions:** Meaning of Theoretical Distributions, Difference between Theoretical & Observed Frequency Distributions, Binomial Distribution, Properties and Constants of Binomial Distribution; Poisson Distribution, Characteristics, Properties and Constants of Poisson Distribution, Poisson Distribution as an Approximation of Binomial Distribution; Normal Distribution, Properties and Constants of Normal Distribution, Relation between Binomial, Poisson & Normal Distribution. **Sampling:** Population or Universe, population size, types of population, objective of sampling, methods of sampling.	15	CO3
4	**Statistical Hypothesis**: Types of hypotheses, Procedure of testing the hypothesis, Types of Error, Level of Significance, Degree of freedom. Chi-Square Test, Student's t-Distribution, Analysis of Variance, F-Test. **Statistical Quality Control:** Introduction, Types of Control Charts, X-Bar Chart, R Chart, C-Chart, Advantages and Limitations of SQC.	15	CO4

Suggested Readings

1. S.C. Gupta, “Fundamental of Statistics “, Second Edition
2. Roy D. Yates and David J. Goodman, “Probability and Stochastic Processes-A friendly introduction for Electrical & Computer Engineers, Second Edition
3. Rohatgi V, “An Introduction to probability and Mathematical Statistics” Wiley Eastern Ltd. New Delhi

Online Resources

1. https://archive.nptel.ac.in/courses/111/105/111105077/
2. https://onlinecourses.nptel.ac.in/noc22_cs120/preview

Course Articulation Matrix														
PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	2	3	1	1				1	2	1		2
CO2	2	2	2	2	1	1					1			2
CO3	2	2	2	2	2	1					1			2
CO4	3	2	2	3	2	1				2	2			2

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**	I		
Course Name	Web Technology & Application Development Lab				
Code	MCADSN11151				
Course Type	DSC -Lab	**L**	**T**	**P**	**Credit**
Pre-Requisite		0	0	4	2
Course Objectives	To focus on the process of Web Development. To build sound concepts of several languages used in Web Technology and create a dynamic, interactive website quickly, confidently, and successfully.				
Course Outcomes					
CO1	Gradually build a static website using HTML, DHTML and CSS. Move this skill upward by creating some degree of user interactivity using JavaScript.				
CO2	Working with PHP and MySQL for server-side data processing.				

Module	**Course Contents**	**Contact Hrs.**	**Mapped CO**
1	1. Implementation of List Tags in HTML. 2. Implementation of Table Tag in HTML. 3. Implementation of Frameset Tag in HTML. 4. Implementation of different Form Tags in HTML. 5. Implementation of Cascading Style Sheet in Web Pages. 6. Implementation of control structure in Java Script. 7. Implementation of Looping structure in Java Script. 8. Implementation of form validate in Java Script.	15	CO1
2	1. Installation, configuration and working with XAMPP Web Server. 2. Creating Database, table, and query handling in MySQL. 3. Implementation of PHP tags, variables, and conditional construct. 4. Implementation of looping structure in PHP 5. Implementation of functions in PHP 6. Implementation of string functions in PHP 7. Implementation of database connectivity using MySQL. 8. Writing simple applications with Technologies like HTML, JavaScript, PHP.	15	CO2

Suggested Readings

1. Burdman Jessica, “Collaborative Web Development”, Addison Wesley. 2002.
2. Xavier, C,”Web Technology and Design”, New Age International, 2000.
3. Bayross Ivan,”HTML, DHTML. JavaScript, and PHP”, BPB Publications, 4th Edition, 2001.

Online Resources

1. https://html-iitd.vlabs.ac.in/
2. https://www.cybrary.it/practice-lab/introduction-to-programming-using-java-script

Course Articulation Matrix

PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	1	2	1	1	1	1		2	2	1	2	2	2
CO2	2	2	3	3	2	2	2		2	3	3	2	3	3

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**	I		
Course Name	Relational Database Management System Lab				
Code	MCADSN11152				
Course Type	DSC -Lab	**L**	**T**	**P**	**Credit**
Pre-Requisite		0	0	4	2
Course Objectives	The main objective is students gain knowledge about databases for storing the data and to share the data among different kinds of users for their business operations				
Course Outcomes					
CO1	Develop database modelling for a problem and normalization.				
CO2	Design a database using PL/SQL.				

Module	**Course Contents**	**Contact Hrs.**	**Mapped CO**
1	1. Creating and Managing Tables a. Creating and Managing Tables b. Including Constraints 2. Manipulating Data a. Using INSERT statement. b. Using DELETE statement. c. Using UPDATE statement. 3. SQL Statements – 1 a. Writing Basic SQL SELECT Statements b. Restricting and Sorting Data c. Single-Row Functions 4. SQL Statements – 2 a. Displaying Data from Multiple Tables b. Aggregating Data Using Group Functions c. Subqueries 5.. Using SET operators, Date/Time Functions, GROUP BY clause a. Using SET Operators b. Datetime Functions c. Enhancements to the GROUP BY Clause d. Advanced Subqueries 6. Creating and Managing other database objects a. Creating Views b. Other Database Objects c. Controlling User Access 7. Using DCL commands a. creating users. b. Authenticating users a. c. Roll back command	15	CO1 & CO2
2	1. Creating and Operation on Sequenced 2. Creating and Performing operation on Index 3. Creating a Simple Program of PL/SQL 4. Creating and Using Stored Procedure through PL/SQL 5. Creating and Using Function through PL/SQL 6. Creating Implicit and Explicit Cursor Program 7. Creating Triggers and Firing it	15	CO1 & CO2

Suggested Readings

1. Ivan Bayross, “SQL, PL/SQL: The Programming Language of Oracle”, BPP Publication
2. Connolly & Begg, “Database Systems: A Practical Approach to Design, Implementation and Management”, Pearson Education.

Online Resources

1. https://www.youtube.com/watch?v=TB5T2O8Hwm8

Course Articulation Matrix														
PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2			1	2	1	1		2		1	1	1	
CO2	1	1	1	1	2	2	2		2		1	2	1	1

SECOND SEMESTER

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**	II		
Course Name	No SQL & MongoDB				
Code	MCADSN12101				
Course Type	DSC	**L**	**T**	**P**	**Credit**
Pre-Requisite		2	0	0	2
Course Objectives	Students will understand fundamental concepts of several different NOSQL products. Students will also learn various CRUD operations and the querying mechanisms in NOSQL. Students will also comprehend advanced topics. Use the MongoDB tools to develop and deploy your applications.				
Course Outcomes					
CO1	Define, compare, and use the four types of NoSQL Databases (Document-oriented, Key Value Pairs, Column-oriented and Graph).				
CO2	Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.				

Module	**Course Contents**	**Contact Hrs.**	**Mapped CO**
1	Definition of NOSQL, History of NOSQL and different NOSQL Products Interfacing Exploring Mongo DB java, Exploring Mongo DB Ruby/Python, Interfacing and Interacting with NOSQL Interacting with NOSQL	15	CO1
2	Data Model Design (Embedded Data Models and Normalized Data Models), Querying NOSQL stores, Modifying Data Stores and Managing Evolution MongoDB Use Cases, Understanding the NOSQL architecture, Understanding the, NOSQL architecture, Understanding the, NOSQL architecture, Performing CRUD, NOSQL in cloud, Parallel Processing with Map Reduce, Big Data with Hive Surveying Database, Migrating from RDBMS to NOSQL, Query for All Documents in a Collection, Query by a Top-Level Field	15	CO1

Suggested Readings

1. David Hows, “The definitive guide to MongoDB”, 2nd edition, Apress Publication, 2009, 8132230485.
2. Shakuntala Gupta Edward, “Practical MongoDB”, Second edition, Apress Publications, 2016, ISBN 1484206487

Online Resources

1. https://cognitiveclass.ai/courses/data-science-methodology-2

Course Articulation Matrix

PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	1	2	2	1	1		2	2	1	2	2	1
CO2	2	2		2	2	2	2	2	3	2		2	3	3

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**	II		
Course Name	Descriptive Analytics				
Code	MCADSN12102				
Course Type	DSC	**L**	**T**	**P**	**Credit**
Pre-Requisite		3	1	0	4
Course Objectives	Understand how analytics provided a solution to industries using real case studies and learn the importance of analytics and how it is transforming the world today.				
Course Outcomes					
CO1	To understand and implement the concept of configuring and using IBM Cognitive Analytics Tool.				
CO2	Understand how a business analysis software works, and its architecture.				
CO3	Create different types of advanced reports.				
CO4	Learn to create gauge, pie charts and RAVE visualizations.				

Module	Course Contents	Contact Hrs.	Mapped CO
1	**Changing business with data insight Overview:** Understand how analytics is transforming the world, Understand the profound impact of analytics in business decisions, understand what analytics is and how it works, understand why business analytics has become important in various industries, Understand the history of analytics and how it has changed today, Understand how to analyse unstructured data, Understand how analytics is making the world smarter, understand where the future of analytics lies, Explain why successful enterprises need business analytics, Understand how business analytics can help turn data into insight, Understand how predictive analytics. is transforming all types of organizations, explain how analytics supports retail companies, understand how analytics can reduce crime rates and accidents, Explain the use of analytics in law enforcement and insurance companies, understand how analytics can affect the future of education, Predictive Analytics Modeler, Big Data Developer, Data Warehouse Developer	15	CO1
2	**IBM Cognos Analytics for Consumers:** Introduction to IBM Cognos Analytics – Reporting What is IBM Cognos Analytics – Reporting, Explore the environment, Examine the side panel, explore authoring templates, Generate the report, create list reports Examine list reports, Group data, Format list columns, include list headers and footers Focus reports using filters Create filters, Filter your data with advanced detail filters, Create crosstab reports Create a crosstab report, Add measures to crosstab reports, Data sources for crosstabs.	15	CO2
3	**Accessing the data warehouse and present data graphically:** Extend reports using calculations Derive additional information from the data source, add run-time information to your report, Add Date/Time functions to your report, Add string functions to your report. Information integration Components, Functions, Information integration, The challenges, Data workflow, Present data graphically Create a chart report, Different chart options, Create charts containing peer and nested items, Create and reuse custom chart	15	CO3

	palettes, Add data-driven baselines and markers to charts, Focus reports using prompts Examine parameters and prompts, Create a parameter item on the report, Build a prompt page, Add a prompt item to a report, Use additional report building techniques Enhance report design, Add objects, Organize objects using tables, Break a report into sections, Convert a list to a crosstab, Reuse objects within the same report.		
4	**Wrap up and planning considerations and customize reports:** Wrap up and Planning considerations Summary and Planning Considerations, Data insight, The big picture, Bringing all together, Suggestions for success. Customize reports with conditional formatting Change displays based on conditions, 3 steps for conditional formatting, Step 1. Create a variable, Step 2. Assign the variable to a report object, Step 3. Apply formatting to object based on condition value. Drill-through definitions Let users navigate to related data in IBM Cognos Analytics, set up drill-through access from a report, Package-based drill through, Specify the values passed to target parameters, Steps to set up a package-based drill through definition, Limit the items that users can drill through from, Drill Through Assistant. Enhance report layout View the structure of the report, Force page breaks in reports, Horizontal pagination, Modify structures	15	CO4

Suggested Readings

1. IBM Courseware
2. Analytics: Business Intelligence, Algorithms and Statistical Analysis (Predictive Analytics, Data Visualization, Data Analytics, Business Analytics, Decision Analysis, Big Data, Statistical Analysis)" by Todd J Blatt
3. Learning Spark: Lightning-Fast Big Data Analysis by Holden Karau
4. Python for Everybody: Exploring Data in Python 3 by Dr. Charles Russell Severance Managing Your Business
5. The Wall Street Journal Guide to Information Graphics: The Dos and Don'ts of Presenting Data, Facts, And Figures

Online Resources

1. https://cognitiveclass.ai/courses/data-science-methodology-2

Course Articulation Matrix

PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	2	2	1	1		1	1	1	1	2	1
CO2	1	2		2		1	2	2	1	1		2	3	3
CO3	1	1		1	1	2	3	1	2	2	2	2	1	2
CO4	2	2		2	3	2	2	1	2	3	1	3	2	3

Program	Master of Computer Applications (DS & AI)				
Year	I	Semester	II		
Course Name	Advance Java				
Code	MCADSN12103				
Course Type	DSC	L	T	P	Credit
Pre-Requisite		3	1	0	4
Course Objectives	To Design and develop GUI applications using Swing and Event Handling. Design and develop Web applications and learn the creation of pure Dynamic Web Application using JDBC.				
Course Outcomes					
CO1	Will develop more powerful and flexible components using swing.				
CO2	Build complex system from software components.				
CO3	Will develop an application using database.				
CO4	Will develop and deploy web application.				

Module	Course Contents	Contact Hrs.	Mapped CO
1	**Event Handling & Swing:** **Event Handling:** The Delegation Model of Event Handling, Event Classes, Sources, Listeners, Adapter Classes as Helper Classes in Event Handling. **Java Swing:** Introduction to Swing; Diff B/W AWT and Swing; Components hierarchy; Creating a Swing application; Swing components: JCoponent, JLabael, JButton, Actions, JScrollBar, JSlider, JProgressBar, JList, JComboBox; Container and frame: JPanel, JRootPane, JDialog, JOptionPane; Menu & Toolbar: JMenuitem, JMenubar, JPopupMenu; JTable & Tree: JTable & JTree; Layered Panes, Tabbed Panes, Split Panes	15	CO1
2	**Distributed Objects:** The Roles of Client and Server, Remote Method Invocation (RMI): N-tier Architecture, Distributed object technologies, RMI Architecture, Locating & loading Remote classes, locating remote objects & providing references to them, Setup for Remote Method Invocation, Parameter Passing in Remote Methods Server Object Activation, Unicast Remote Object, Socket Vs RMI programming.	15	CO2
3	**Java Database Connectivity (JDBC):** Introduction to JDBC, JDBC Installation, JDBC Drivers Type, Connection, JDBC-ODBC Bridge Driver. Driver Manager Class, Java. SQL Package (Connection Interface, Statement Interface, JDBC URLs, Statements-Creating Executing Closing, Result Set-Data Types and Conversions, Prepared Statement, Callable Statement, Mapping SQL and Java Types, Prepared Statement Interface, Result Set Interface, Result Set Meta Data Interface, SQL Exception class, Advanced Connection Management, Introduction of LDAP.	15	CO3
4	**Web Applications & Web Services:** Java Servlets: Introduction to Server-Side Technologies; The JAVA Servlet Architecture, Servlet Life Cycle; HTTP Protocol & HTTP Methods; Web Server & Web container; Servlet Interface; HTTP Servlet; Generic Servlet; Servlet Config; Servlet Context; Servlet Communication; Retrieving Form Data in a Servlet, Session Tracking, Cookies. **Web Services:** Advance Features of Web Services: Working of Web Services, Web API; Contexts and Dependency Injection for the Java EE Platform; Java	15	CO4

	Persistence API; Security in Java EE; Java EE Supporting Technologies Struts: Introduction to Struts, Overview on MVC Design Pattern, Working of Struts Framework; MVC; Request Handling in Struts; Struts main Components; Sample Program.		

Suggested Readings

1. E. Balagurusamy, Programming with Java, Tata McGraw Hill.
2. Patrick Naughton and Herbertz Schildt, “Java 2.0: The Complete Reference”, TMH, 1999.
3. Ivan Bayross, “Web technologies”, BPB Publication.
4. Deitel & Deitel, "Java How to program”, Prentice Hall, 4th Edition, 2000.
5. Gary Cornell and Cay S. Horstmann, "Core Java Vol 1 and Vol 2", TMH.
6. Stephen Asbury, Scott R. Weiner, Wiley, "Developing Java Enterprise Applications", 1998.
7. Java 6 Programming black books Kogent solutions published by dreamtech press edition 2007.
8. SOA for the Business Developer, B. Margolis (with J. L. Sharpe), MC Press, 2007.
9. Web Services Platform Architecture, S. Weerawarana, F. Curbera, F. Leymanm, T. Storey and D. F. Ferguson, Pearson Education, 2005.
10. Hibernate in Action, Christian Bauer and Gavin King, Manning Publications Co., 2004
11. Ethan Cerami, “Web Services”, O’REILLY Media, 2002.
12. Ralph Moseley, “Developing Web Applications”, 2008, Wiley India, New Delhi.
13. Eric Jendrock, D. Carson, I. Evans, D. Gollapudi, K. Haase, C. Srivastha, “The Java EE6 Tutorial”, Volume-1, Fourth Edition, 2010, Pearson India, New Delhi
14. Steve Holzner, “Java black book”, Paraglyph Press; Second Edit ion (July 1, 2002)

Online Resources

1. https://gfgc.kar.nic.in/sirmv-science/GenericDocHandler/138-a2973dc6-c024-4d81-be6d-5c3344f232ce.pdf
2. https://www.edureka.co/blog/advanced-java-tutorial

Course Articulation Matrix

PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	2	3	2	1	1		2		2	3	3
CO2	1	3	3	3	3	3	2	1		3		3	3	3
CO3	1	3	3	3	3	3	3	2		3		3	3	3
CO4	1	3	3	3	3	3	3	2		3		3	3	3

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**	II		
Course Name	Advance .Net Framework and C#				
Code	MCADSN12104				
Course Type	DSC	**L**	**T**	**P**	**Credit**
Pre-Requisite		3	1	0	4
Course Objectives	The Subject provides the Fundamental Concepts of Windows Desktop Application and Website Development with machine learning and data science through .Net framework and C#.				
Course Outcomes					
CO1	Develop the understanding of .Net technology using C# and Asp.net.				
CO2	Understand the Database Connectivity.				
CO3	Develop the understanding of Static and Dynamic web pages.				
CO4	Understanding Machine Learning and data science using ML.Net.				

Module	**Course Contents**	**Contact Hrs.**	**Mapped CO**
1	**.Net Framework:** Introduction and Origin of .Net technology; Framework Components, Common Language Runtime (CLR) and FCL; Managed and Unmanaged Code; Common Type System (CTS) & Common Language Specification (CLS); Microsoft Intermediate Language (MSIL) and Metadata; Just-In-Time Compilation (JIT); Garbage Collection; Base Classes and Ms.Net Namespaces. Object and Classes: Properties (Read, Write), Indexers, Inheritance (Multilevel and Hierarchical), Constructor Polymorphism (Runtime, Compile Time), Operator Overloading, Interfaces, Delegates and Events, Boxing and Un-boxing.	15	CO1
2	**C# Libraries and Assemblies:** Input output (Streams Classes); Multithreading; Networking and Sockets; Managing Console I/O Operations; .NET Assemblies: Type of Assemblies, GAC (Global Assembly Cache), Concept of Strong Names, Global ASAX Files; Caching Concepts: Page Output Caching, Page Fragment Caching; State management: Session Object, Hidden Fields, View State, Cookies, Cross page posting; Introduction to Generics; Web Configuration and Machine Configuration Files. **Windows and Website Development:** Windows Forms (A Skeletal Form Based Windows Program, Remoting: Server Activated Object, Client Activated Object; Marshalling: Marshal by value, Marshal by reference; Debugging, Exceptions and Error Handling; ASP.NET Web Form Controls: User controls and Server Controls; Web Services: UDDI, DISCO, WSDL; ADO.NET: Architecture, Difference between Dataset and Data Reader, Connection and Command Object; Distributed applications; Reflection; Globalization and Localization; Authentication and Authorizations; XML in .NET.	15	CO2
3	**Advanced Concepts:** REST AND SOAP: Rest, Restful, Soap, WCF, WPF, Implementation of Rest and Soap, Restful Vs Soap. Web server: web server, types, web server used in .net Ajax Controls: AJAX and need for AJAX, Implement with JavaScript, ASP.NET AJAX – Update Panel, Update Progress etc., ASP.NET Ajax Control toolkit, Client-side Template Rendering – Data View control	15	CO3

4	**Introduction to Machine Learning in .Net:** ML v/s AI v/s DL, ML.NET, Setting up Environment, ML.Net SDK, ML.Net Flow, ML Terminology, Create Regression, Cross Validate Model, Algorithms & Hyper parameters, Data load and save from different sources, Model save and load, Classification: binary, Multiclass, Computer vision, Training Overview: ML with ML.NET and Big Data with Spark for .NET	15	CO4

Suggested Readings

1. Balagurusamy —Programming. with C#, Tata McGraw Hill Publication.
2. ASP.NET 3.0 Black Book II, Dreamtech Press.
3. Beginning ASP.NET3.0 II, WROX Publication.
4. Stephen C. Perry, Atul Kahae, Stephen Walther, Joseph Mayo, —Essential of .NET and Related Technologies with a focus on C#, XML, ASP.net and ADO.net‖, Pearson, 2nd Edition, 2009.
5. Hands-On Machine Learning with ML.NET: Getting started with Microsoft ML.NET to implement popular machine learning algorithms in C# Paperback – Import, 27 March 2020 by Jarred Capellman
6. Microsoft ML.Net Machine Learning For .Net Developers Using C#.NET (Microsoft ML.NET C# Machine Learning Programming Series) by Dr. A. F. Salam (Author), Jakia Salam.

Online Resources

1. https://dotnet.microsoft.com/en-us/learn

Course Articulation Matrix

PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	1	2	1					2	1	1
CO2	2	2	2	2	2	2	1		2	2		2	2	2
CO3	2	2	1	2	3	2	2		2	2	2	2	2	2
CO4	2	2	1	2	3	2	2		2	2	2	3	3	3

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**	II		
Course Name	Big Data and Data Warehousing				
Code	MCADSN12105				
Course Type	DSC	**L**	**T**	**P**	**Credit**
Pre-Requisite		3	1	0	4
Course Objectives	To provide an overview of an exciting growing field of big data and study the basic technologies that forms the foundations of big data and describe the processes used in developing and managing data warehouse.				
Course Outcomes					
CO1	Understand the fundamental concepts of big data.				
CO2	Understand techniques and issues for handling large data.				
CO3	Explain the Data Warehousing operations.				
CO4	Explain the Models and Schemas of Data Warehouse.				

Module	Course Contents	Contact Hrs.	Mapped CO
1	**Data Warehousing:** Introduction of Data Warehousing, Types of Data Warehouse, General stages, Components, Architecture, Tools, Database vs Data Warehouse, Characteristics of Data Warehouse, Applications of Data Warehousing, Query Tools, Data Warehouse Bus Architecture; ETL; Types of Data models, Advantages and Disadvantages of Data Model; OLAP: Introduction, Cube, Basic Analytical Operations, Systems types, Benefits of using OLAP services; ROLAP: Introduction, Architecture, Advantages, Tools; MOLAP: Introduction, Architecture, Advantages, Tools, OLTP vs. OLAP, Benefits of OLTP method	15	CO1
2	**Dimensional Model**: Dimensional Model in Data Warehouse, Elements, Steps, Rules, and benefits of Dimensional Modeling **Schemas:** Star and Snowflake Schema in data warehousing, Multidimensional schemas, Galaxy schema, Star Cluster schema **Data Mart**: Type of Data Mart, Steps in implementing a Datamart, **Data Lake**: Architecture, concepts, Maturity stages, Difference between Data lakes and Data Warehouse	15	CO2
3	**Introduction To Big Data**: Evolution of Big Data, Best practices for Big Data analytics, big data characteristics, implications of Big Data, Defining Big Data, Attributes of definition, Vs for Big data, Big Data analytics and Machine Learning, Big Data Analytics and Cloud Computing. **Hadoop**: Hadoop HDFS, GFS and HDFS, MapReduce, Yarn, Hadoop Commons. Analyzing data with Hadoop, Scaling out, Hadoop streaming, Hadoop pipes, concept of Hadoop distributed file system (HDFS), Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Hadoop Processing: MapReduce Framework.	15	CO3
4	**Real-Time Processing for Big Data:** Event, Event Processing, Event Stream processing and Data Stream Processing. Event Type and Pattern. **Data Stream Processing:** Spark, Storm, Kafka, Amazon Kinesis.	15	CO4

	Big Data Analytics for social media: Introduction, NLP and its applications, Text Mining and Anomaly Detection. **Big Data Infrastructures and Platforms:** Introduction, Data Models: Navigational and Relational. NoSQL and NoSQL Data Models.		

Suggested Readings

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013
2. Tom White, "Hadoop: The Definitive Guide", Third Edition, O' Reilley, 2012.
3. Raj Kumar Buyya, Rodrigo N. Calheiros, Amir Vahid Dastjerdi, “Big Data Principles and Paradigms”, Morgan Kaufmann 2016
4. Paul rajponniah Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals, Wiley, 2013.

Online Resources

1. https://nptel.ac.in/courses/106104189
2. https://onlinecourses.nptel.ac.in/noc20_cs92/preview

Course Articulation Matrix

PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	2	2	1	1		1	2	1	2	2	1
CO2	2	2		2	2	2	2		1	3		2	3	3
CO3	1	1		1	2	2	2	1	2	3	2	3	1	2
CO4	2	2		2	2	2	2	1	2	3	1	3	2	3

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**	II		
Course Name	Cognitive Computing				
Code	MCADSN12121				
Course Type	DSE	**L**	**T**	**P**	**Credit**
Pre-Requisite		3	1	0	4
Course Objectives	Students will have the chance to create cognitive applications as well as investigate the influence of knowledge-based artificial intelligence and deep learning data science is a branch of study.				
Course Outcomes					
CO1	Recognize and discuss what cognitive computing is and how it differs from other techniques.				
CO2	Understand the natural language processing concepts and cognitive support systems.				
CO3	Able to develop and implement a cognitive computing-based project.				
CO4	Students will be able to recognize and discuss cognitive computing's business implications.				

Module	Course Contents	Contact Hrs.	Mapped CO
1	**The Foundation of Cognitive Computing:** Theory of Cognition, Elements of a Cognitive System, Design Principles for Cognitive Systems, Bringing Data into the Cognitive System, Machine Learning, Hypotheses Generation and Scoring, Presentation and Visualization Services.	15	CO1
2	**Natural Language Processing in Support of a Cognitive System:** The Role of NLP in a Cognitive System, Semantic Web, Applying Natural Language Technologies to Business Problems, Relationship Between Big Data and Cognitive Computing.	15	CO2
3	**Representing Knowledge in Taxonomies and Ontologies:** Representing Knowledge, Defining Taxonomies and Ontologies, Models for Knowledge Representation, The Importance of Persistence and State, Implementation Considerations, Applying Advanced Analytics to Cognitive Computing, Predictive Analytics, Text Analytics, Image Analytics and Speech Analytics.	15	CO3
4	**The Role of Cloud and Distributed Computing in Cognitive Computing:** Leveraging Distributed Computing for Shared Resources, Characteristics of Cloud Computing, Cloud Computing Models, Delivery Models of the Cloud, Managing Workloads, Security and Governance, Business Implications of Cognitive Computing, IBM's Watson as a Cognitive System, Emerging Cognitive Computing Areas.	15	CO4

Suggested Readings

1. Hurwitz, Kaufman, and Bowles, "Cognitive Computing and Big Data Analytics", Wiley, Indianapolis, IN, 2005, ISBN: 978-1-118-89662-4.
2. Masood, Adnan, Hashmi, Adnan, "Cognitive Computing Recipes-Artificial Intelligence Solutions Using Microsoft Cognitive Services and TensorFlow", 2015
3. Peter Fingar, "Cognitive Computing: A Brief Guide for Game Changers", PHI Publication, 2015
   Rob High, Tanmay Bakshi, "Cognitive Computing with IBM Watson: Build smart applications using Artificial Intelligence as a service", IBM Book Series, 2019

Online Resources

1. https://nptel.ac.in/courses/108105185
2. https://onlinecourses.nptel.ac.in/noc22_ee122/preview

Course Articulation Matrix														
PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	1		1	1	2	1		1	1		2	2	1
CO2	2	2		2	1	2	1		2	2		2	2	2
CO3	2	1		1	2	2	2		1	2	1	2	1	2
CO4	2	2		2	3	3	2		1	3	1	3	2	3

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**	II		
Course Name	Cloud Computing				
Code	MCADSN12122				
Course Type	DSE	**L**	**T**	**P**	**Credit**
Pre-Requisite		3	1	0	4
Course Objectives	To provide skills and knowledge in cloud technology operations and management to implement large-scale systems and provide expertise for creating appropriate cloud infrastructure that fulfils the needs of business services and customers.				
Course Outcomes					
CO1	Understand the Cloud Computing, Reference, and Deployment model basics.				
CO2	To examine existing cloud infrastructures and determine an acceptable architecture that fulfils business goals, you must first understand the evolution, concepts, and benefits of cloud computing.				
CO3	Interpret alternative service delivery and deployment methods to find a model that best fits the company's needs and apply the tools, techniques, and skills acquired to develop Projects.				
CO4	Identify cloud computing security and privacy risks and develop appropriate security solutions to secure cloud resources.				

Module	Course Contents	Contact Hrs.	Mapped CO
1	**The Basic Concepts of Cloud Computing:** Cloud Computing; Definition, Cloud Computing Vision, Goals and Benefits, Characteristics of Cloud Computing, Risks and Challenges of Cloud Computing, Clustering and Grid Computing**. Fundamental Concepts and Models:** Roles and Boundaries**,** Cloud Deployment Models**;** Public, Private, Hybrid and Community Model, Pros and Cons. Cloud Service Models; Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS). **Fundamental Cloud Security:** Basic Concepts; Confidentiality**,** Integrity**,** Availability**,** Introduction Cloud Security Threat, and Mechanism.	15	CO1
2	**Cloud Computing Architecture and Virtualization:** The Cloud Reference Model; Introduction, Workload Distribution**,** Resource Pooling, Dynamic Scalability, Elastic Resource Capacity**,** Service Load Balancing**,** Cloud Bursting, **Virtualization:** Definition, Benefits, Drawback and. Characteristics of Virtualized Environments, Virtualization vs. Cloud Computing, Types of Virtualizations; Application, Network, Storage, Server, Data. **Taxonomy of Virtualization Techniques:** Introduction, Hypervisor, Type-1, Type-2, Pros and Cons, Full and Para Virtualization.	15	CO1 & CO2
3	**Cloud Computing Economics and Data in the Cloud:** Cloud Computing Economics: Cloud Infrastructure; Economics of Private Clouds, Software Productivity in the Cloud, Economies of Scale: Public vs. Private Clouds; Multi-software: Multi-entity Support, Multi-schema Approach, Multi-tenancy using Cloud Data Stores, Data Access Control for Enterprise Applications; **Data in the Cloud:** Relational Databases, Cloud File Systems: Introduction to Google File System and Hadoop Distributed File System, BigTable, HBase, Cloud Data Stores: Datastore and SimpleDB.	15	CO2 & CO4

4	**Cloud Platforms in Industry and Cloud Applications:** Amazon Web Services; Compute Services, Storage Services, Communication Services, Additional Services. Google AppEngine; Architecture and Core Concepts, Application Lifecycle, Cost Model, Observations. Microsoft Azure; Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance. **Cloud Applications:** Healthcare; ECG Analysis in the Cloud, Biology: Protein Structure Prediction, Gene Expression Data Analysis for Cancer Diagnosis. Geoscience; Satellite Image Processing.	15	CO3 & CO4

Suggested Readings

1. Thomas Erl, Ricardo Puttini, Zaigham Mahmood, “Cloud Computing: Concepts, Technology & Architecture”, 1st edition, Pearson, 2019.
2. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computing, Tata Mcgraw Hill, 2013. Cloud Security & Privacy by Tim Malhar, S.Kumaraswammy, S.Latif (SPD,O’REILLY).
3. Gautam Shroff, “Enterprise Cloud Computing: Technology, Architecture, Applications”, Cambridge University Press, 2010.
4. Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", 1st Edition, O'Reilly Media, 2009.
5. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter “Cloud Computing, A Practical Approach”, Tata McGraw Hill Education Publication (TMH Publication), 2009.
6. Kailash Jayaswal, Jagnnath Kallakurchi, Donald J. Houde, Dr. Deven Shah, “Cloud Computing”, Black Book, Dreamtech, 2015.

Online Resources

1. https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs18/preview

Course Articulation Matrix

PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1		1	1	1	1	1		1	1	2	1
CO2	1	2	1		2	2	1	1	2		1	1	2	2
CO3	2	2	2	2	2	2	2	1	2	2	2	3	2	3
CO4	1	2	2	2	2	2	2	1	2	2	1	3	2	3

Program	Master of Computer Applications (D S& AI)				
Year	I	**Semester**	II		
Course Name	Internet of Things (IoT)				
Code	MCADSN12123				
Course Type	DSE	**L**	**T**	**P**	**Credit**
Pre-Requisite		3	1	0	4
Course Objectives	Assess the vision and introduction of IoT. Understand IoT Market perspective. Implement Data and Knowledge Management and use of Devices in IoT Technology. Classify Real World IoT Design Constraints, Industrial Automation in IoT.				
Course Outcomes					
CO1	Understand the basics of Embedded System, IoT and the development model.				
CO2	Understand the architecture, Instruction set and work on an 8-bit microcontroller using simulation and real-time.				
CO3	Ability to select appropriate hardware and microcontrollers based on need of application, Understand the Internet of Things Standards, Frameworks, and techniques.				
CO4	Apply the tools, techniques and skills acquired towards development of Projects.				

Module	**Course Contents**	**Contact Hrs.**	**Mapped CO**
1	Internet of Things (IoT), **Design Principles for Connected Devices:** Introduction to IoT, Basics of Networking, Communication Protocols, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, Sensor Networks, Machine-to-Machine Communications, IoT Examples, IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation.	15	CO1
2	**Technologies Standard and Hardware:** Introduction, Sensors, digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology, Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.	15	CO1 & CO2
3	Network & Communication Aspects in IoT, Case Studies, **Cloud Computing:** Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination, Industrial IoT, Case Study: Agriculture, Healthcare, Activity Monitoring. Introduction of Cloud Computing.	15	CO3
4	Challenges in IoT Design Challenges, **IoT Applications:** Development challenges, Security challenges, Other 15 Hours 1 challenges, Smart metering, e-health, Smart city, automotive applications, home automation, smart cards, communicating data with H/W units, mobiles, tablets, Designing of smart streetlights in smart city.	15	CO4

Suggested Readings

1. Embedded Real Time Systems: Concepts, Design and Programming by Dr.K.V.K.K. Prasad, DreamTech Publication, 2003.
2. The 8051 Microcontroller and Embedded Systems: Using Assembly and C 2/e by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay, Pearson Education, 2011.
3. Designing the Internet of Things‖ by Adrian McEwen, Hakim Cassimally, Wiley Publications, 2012
4. The Internet of Things: Key applications and Protocols‖ Wiley Publications 2nd Edition.

Online Resources

1. https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2. https://onlinecourses.nptel.ac.in/noc19_cs65/preview

Course Articulation Matrix														
PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	1	1		1	1	1	1	1		1	1	2	1
CO2	1	2	1		2	2	1	1	2		1	1	2	2
CO3	2	2	2	2	2	2	2	1	2	2	2	3	2	3
CO4	1	2	2	2	2	2	2	1	2	2	1	3	2	3

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**	II		
Course Name	Advance Data Mining & Data Warehousing				
Code	MCADSN12124				
Course Type	DSE	**L**	**T**	**P**	**Credit**
Pre-Requisite		3	1	0	4
Course Objectives	To understand the principles of Data warehousing and Data Mining and familiar with the Data warehouse architecture and its Implementation. Students also know the architecture of a Data Mining system, data pre-processing methods and classification of the data for the prediction and analysis.				
Course Outcomes					
CO1	Understand the concepts and techniques used in Data Warehouse development and deployment.				
CO2	Apply the exploratory analysis for data mining.				
CO3	Apply statistical and pattern analysis techniques.				
CO4	Design and Develop Data Mining Models.				

Module	**Course Contents**	**Contact Hrs.**	**Mapped CO**
1	**Data Warehousing:** Introduction of Data Warehousing, Types of Data Warehouse, General stages, Components, Architecture, Tools, Database vs Data Warehouse, Characteristics of Data Warehouse, Applications of Data Warehousing, Query Tools, Data Warehouse Bus Architecture; ETL; Types of Data models, Advantages and Disadvantages of Data Model; **OLAP:** Introduction, Cube, Basic Analytical Operations, System types, Benefits of using OLAP services; ROLAP: Introduction, Architecture, Advantages, Tools; **MOLAP:** Introduction, Architecture, Advantages, Tools, OLTP vs. OLAP, Benefits of OLTP method. **Dimensional Model:** Dimensional Model in Data Warehouse, Elements, Steps, Rules, and benefits of Dimensional Modeling. **Schemas:** Star and SnowFlake Schema in data warehousing, Multidimensional schemas, Galaxy schema, Star Cluster schema. **Data Mart:** Type of Data Mart, Steps in implementing a Datamart. **Data Lake:** Architecture, concepts, Maturity stages, Difference between Data lakes and Data Warehouse.	10	CO1
2	**Introduction to Data Mining:** Data Mining, Predictive Analysis, Major issues in data mining. **Data Preprocessing:** Data Cleaning, Handling Missing Data, identifying misclassifications, Identifying Outliers, Measure of center and spread, Data transformations, Min-Max Normalization, Z-score Standardization, Decimal scaling, Normality, Transformations to achieve Normality, transforming categorical values to Numerical values, Binning, Reclassifying categorical values. **Exploratory Data Analysis:** Hypothesis Testing Versus Exploratory Data Analysis, Getting to Know the Data Set, Exploring Categorical Variables, Exploring Numeric Variables, Exploring Multivariate Relationships, Selecting Interesting Subsets of the Data for Further Investigation, Using EDA to Uncover Anomalous Fields, Binning Based on Predictive Value,	15	CO2

	Deriving New Variables: Flag Variables, Deriving New Variables: Numerical Variables, Using EDA to Investigate Correlated Predictor Variables. **Dimension-Reduction Methods:** Need for Dimension-Reduction in Data Mining, Principal Components Analysis, Profiling the Principal Components, Communalities, Validation of the Principal Components, Factor Analysis.		
3	**Univariate Statistical Analysis:** Data Mining Tasks in Discovering Knowledge in Data, Statistical Approaches to Estimation and Prediction, Statistical Inference, Confidence Interval Estimation of the Mean, Reducing the Margin of Error, Confidence Interval Estimation of the Proportion, Hypothesis Testing for the Mean, Assessing the Strength of Evidence Against the Null Hypothesis, Using Confidence Intervals to Perform Hypothesis Tests, Hypothesis Testing for The Proportion **Multivariate Statistics:** Two-Sample t-Test for Difference in Means, Two-Sample Z-Test for Difference in Proportions, Test for the Homogeneity of Proportions, Chi-Square Test for Goodness of Fit of Multinomial Data, Analysis of Variance. **Frequent Pattern Analysis:** Frequent Itemset, Frequent Pattern Mining, Apriori, FP growth, Pattern Mining in Multilevel, Multidimensional Space, Constraint based Frequent Pattern Mining, Mining High-Dimensional data, Mining Approximate Pattern, Pattern Application and Exploration	15	CO3
4	**Preparing to Model the Data:** Supervised Versus Unsupervised Methods, Statistical Methodology and Data Mining Methodology, Cross-Validation, Overfitting, Bias–Variance Trade-Off, Balancing the Training Data Set, Establishing Baseline Performance. **Simple Linear Regression:** Simple Linear Regression, Extrapolation, Coefficient of Determination, Standard Error of the Estimate, Correlation Coefficient, Anova Table for Simple Linear Regression, Outliers, High Leverage Points, and Influential Observations, Population Regression Equation, Verifying The Regression Assumptions, Inference in Regression, t-Test for the Relationship Between x and y, Confidence Interval for the Slope of the Regression Line, Confidence Interval for the Correlation Coefficient ρ, Confidence Interval for the Mean Value of Given, Prediction Interval for a Randomly Chosen Value of Given, Transformations to Achieve Linearity, Box–Cox Transformations. **Classification:** k-Nearest Neighbor Algorithm, Classification Task, k-Nearest Neighbor Algorithm, Distance Function, Combination Function, Quantifying Attribute Relevance: Stretching the Axes, Database Considerations, k-Nearest Neighbor Algorithm for Estimation and Prediction. Decision Tree, Classification and Regression Trees, C4.5 Algorithm, Decision Rules. **Clustering:** Hierarchical and *k*-Means Clustering, The Clustering Task, Hierarchical Clustering Methods, Single-Linkage Clustering, Complete-Linkage Clustering, *k*-Means Clustering, Example of *k*-Means Clustering, Behavior of MSB, MSE, and Pseudo-F as the *k*-Means Algorithm Proceeds	20	CO4

	Model Evaluation Techniques: Model Evaluation Techniques for the Description Task, Model Evaluation Techniques for the Estimation and Prediction Tasks, Model Evaluation Measures for the Classification Task, Accuracy and Overall Error Rate, Sensitivity and Specificity, False-Positive Rate and False-Negative Rate, Proportions of True Positives, True Negatives, False Positives, and False Negatives, Misclassification Cost Adjustment to Reflect Real-World Concerns, Decision Cost/Benefit Analysis, Lift Charts and Gains Charts, Interweaving Model Evaluation with Model Building, Confluence of Results: Applying a Suite of Models.		

Suggested Readings

1. Daniel T. Larose, Chantel D. Larose, "Data Mining and Predictive analysis", Wiley 2015.
2. Paul rajponniah "Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals," Wiley, 2013
3. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques" Elsevier.
4. Max Bramer, "Principles of Data Mining", Springer

Online Resources

1. Prof. Pabitra Mitra, "https://www.youtube.com/@datamining-iitkgp625", IIT Kharagpur, NPTEL 2018
2. https://onlinecourses.swayam2.ac.in/cec19_cs01/preview

Course Articulation Matrix

PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	1	1	1	1				2	1	1	2
CO2	2	2	2	2	2								2	2
CO3	2	2	3	3	2	2							3	3
CO4	3	2	2	2	3	2							3	3

Program	Master of Computer Applications (DS & AI)				
Year	I	Semester		II	
Course Name	Advance Java Lab				
Code	MCADSN12151				
Course Type	DSC -Lab	L	T	P	Credit
Pre-Requisite		0	0	4	2
Course Objectives	To provide practical knowledge about various concepts of Java Swing, RMI, JDBC, Servlet and to make the student learn advanced programming concepts of Java language and problem-solving techniques.				
Course Outcomes					
CO1	Understand and implement different Components of Java Swing and RMI.				
CO2	Understand and implement java program with Java Database Connectivity, Servlet, Java Beans and Struts Framework.				

Module	Course Contents	Contact Hrs.	Mapped CO
1	1. Implement Event handling to show various movements of mouse. 2. Implement Event handling to show use of Listeners. 3. Implement Event handling to show use of Adapters. 4. Develop a Swing Application using various Swing Components 5. Develop a Swing Application using Containers & Frames. 6. Develop a Swing Application using Menu bar Toolbar & JTable. 7. Implementation of RMI Applications. 8. Creation of Bank Account Client/Server Using RMI	15	CO1
2	1. Implementation of Database Connectivity to Create a Table. 2. Implementation of Database Connectivity to insert Records in existing Database. 3. Implementation of Database Connectivity to delete Records from Database. 4. Implementation of Database Connectivity to Modify Records in existing Database. 5. Implementation of Servlets to Handle Get Method. 6. Implementation of Servlets to Handle Post Method. 7. Implementation of Servlets to generate Plain Text. 8. Implementation of Servlets to generate HTML. 9. Implementation of Java Beans to illustrates the procedure of handling session and print a Hello world using Java Bean 10. Implementation of Enterprise java Bean. 11. Use of STRUTS Framework in a Web Applications & making sample program.	15	CO2

Suggested Readings

1. E. Balagurusamy, Programming with Java, Tata McGraw Hill.
2. Patrick Naughton and Herbertz Schildt, “Java 2.0: The Complete Reference”, TMH, 1999.
3. Ivan Bayross, “Web technologies”, BPB Publication.
4. Deitel & Deitel, "Java How to program”, Prentice Hall, 4th Edition, 2000.
5. Gary Cornell and Cay S. Horstmann, "Core Java Vol 1 and Vol 2", TMH.
6. Stephen Asbury, Scott R. Weiner, Wiley, "Developing Java Enterprise Applications", 1998.
7. Java 6 Programming black books Kogent solutions published by dreamtech press edition 2007.
8. SOA for the Business Developer, B. Margolis (with J. L. Sharpe), MC Press, 2007.

9. Web Services Platform Architecture, S. Weerawarana, F. Curbera, F. Leymanm, T. Storey and D. F. Ferguson, Pearson Education, 2005.
10. Hibernate in Action, Christian Bauer and Gavin King, Manning Publications Co., 2004
11. Ethan Cerami, “Web Services”, O’REILLY Media, 2002.
12. Ralph Moseley, “Developing Web Applications”, 2008, Wiley India, New Delhi.
13. Eric Jendrock, D. Carson, I. Evans, D. Gollapudi, K. Haase, C. Srivastha, “The Java EE6 Tutorial”, Volume-1, Fourth Edition, 2010, Pearson India, New Delhi
14. Steve Holzner, “Java black book”, Paraglyph Press; Second Edit ion (July 1, 2002)

Online Resources

1. https://gfgc.kar.nic.in/sirmv-science/GenericDocHandler/138-a2973dc6-c024-4d81-be6d-5c3344f232ce.pdf
2. https://www.edureka.co/blog/advanced-java-tutorial
3. http://trisect.co/course/advance-java/virtual-lab%203

Course Articulation Matrix														
PO-PSO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	3	3	3	2	3		2	3		3	3	3
CO2	3	3	3	3	3	2	3		3	3		3	3	3

Program	Master of Computer Applications (DS & AI)				
Year	I	**Semester**	II		
Course Name	Advance .Net Framework and C# Lab				
Code	MCADSN12152				
Course Type	DSC -Lab	**L**	**T**	**P**	**Credit**
Pre-Requisite		0	0	4	2
Course Objectives	The Subject provides the Fundamental Concepts of Windows Desktop Application and Website Development with machine learning and data science through .Net framework and C#.				
Course Outcomes					
CO1	Develop the understanding of .Net technology using C# and Asp.net.				
CO2	Understand the Database Connectivity.				

Module	Course Contents	Contact Hrs.	Mapped CO
1	1. Implementation of Decision Making and Branching Statements. 2. Implementation of Iterative Statements on Console Applications. 3. Implementation of Enum and Structures on console Applications. 4. Implementation of Arrays and Array List on Console Applications. 5. Implementation of Boxing and Unboxing on Console Applications. 6. Implementation of Strings on Console Applications. 7. Implementation of Inheritance and Polymorphism. 8. Implement concepts of Inheritance, visual inheritance, and Interface. 9. Construct the C# application to implement Operator Overloading. 10. Implementation of Delegates on Console Applications. 11. Implementation of Multithreading in C#. 12. Implementation of Interfaces on Console Applications. 13. Implementation of Events on Console Applications. 14. Implementation of Properties and Indexers on Console Applications. 15. Implement Master Form with Windows application. 16. Implementation of Server-Side Controls in asp.net. 17. Implementation of Database Connectivity in asp.Net. 18. 18.Implementation of Web Services in asp.Net Applications.	15	CO1
2	1. Implement web application using ASP.NET with web controls. 2. Use Dataset, Data Reader, XML Reader & Data Sources (SQL, Object & XML) with Any Windows or Web Application. 3. Write a code for web application to provide input validations using Input Valuators. 4. Create a Web application that illustrates the use of themes and master pages with Sitemap. 5. Create a Web Application in ASP.NET using various CSS. 6. Implement the concept of state management in a web application.	15	CO2

	7. Implement code in ASP.NET that creates and consumes Web service by any web application. 8. Create a simple application to demonstrate the WPF concept. 9. Create a simple application to demonstrate the WCF concept. 10. Setting up Environment in .Net for ML. 11. Create a simple to Program using ML.Net. 12. Data load and save from different sources in ML.Net.		

Suggested Readings

1. Balagurusamy —Programming. withC#, Tata McGraw Hill Publication.
2. ASP.NET 3.0 Black Book II, Dreamtech Press.
3. Beginning ASP.NET3.0 II, WROX Publication.
4. Stephen C. Perry, Atul Kahae, Stephen Walther, Joseph Mayo, —Essential of .NET and Related Technologies with a focus on C#, XML, ASP.net and ADO.net‖, Pearson, 2nd Edition, 2009.
5. Hands-On Machine Learning with ML.NET: Getting started with Microsoft ML.NET to implement popular machine learning algorithms in C# Paperback – Import, 27 March 2020 by Jarred Capellman
6. Microsoft ML.Net Machine Learning For .Net Developers Using C#.NET (Microsoft ML.NET C# Machine Learning Programming Series) by Dr. A. F. Salam (Author), Jakia Salam.

Online Resources

1. https://learn.microsoft.com/en-us/dotnet/core/tutorials/
2. https://ict.iitk.ac.in/courses/introduction-to-c-sharp/

Course Articulation Matrix

PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	2	2		2	2		2	2	2
CO2	2	2	2	2	3	2	2		2	2	1	2	2	2