SEMESTER – III
BIG DATA ANALYTICS
THEORY

1. Course Description

Programme:	**M.Sc. Data Science**	**Max. Hours: 45**
Course Code:	**P24/CAI/DSE/302**	**Hours per week: 3**
Course Type:	**DISCIPLINE SPECIFIC ELECTIVE**	**Max. Marks: 100**
No. of credits:	**3**	

2. Course Objectives

- To become familiar with the fundamental concepts of big data management and Analytics.
- To become competent in recognizing challenges faced by applications dealing with very large volumes of data.

3. Course Outcomes

On completion of the course the student will be able to:

CO1: E***xplain*** evolution of big data, it's structure, elements and big data analytics (Cognitive level – 2)

CO2: ***Analyze*** **&** ***Use*** HBase in big data processing and data manipulation using hive and analyze data with pig. (Cognitive level – 3,4)

CO3*: Apply* analytical approaches and tools to analyze data (Cognitive level - 5)

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4. Course Content

MODULE I –INTRODUCTION TO BIG DATA **(15 Hrs.)**

Overview of Big Data: Introduction to Big Data, Evolution of Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics. Exploring the Use of Big Data in Business Context: Use of Big Data in Social Networking, Use of Big Data in Preventing Fraudulent Activities, Use of Big Data in Detecting Fraudulent Activities in Insurance Sector, Use of Big Data in Retail Industry. Introducing Technologies for Handling Big Data: Distributed and Parallel Computing for Big Data.

MODULE II–YARN, HIVE AND PIG **(15 Hrs.)**

Understanding Hadoop YARN Architecture: Introduction YARN, Advantages of YARN, YARN Architecture, Working of YARN. Exploring Hive: Introducing Hive, Getting Started with Hive, Hive Services, Data Types in Hive, Built-In Functions in Hive, Hive DDL, Data Manipulation in Hive, Data Retrieval Queries, Using JOINS in Hive. Analyzing Data with Pig: Introducing Pig, Running Pig, Getting Started with Pig Latin, Working with Operators in Pig, Working with Functions in Pig, Debugging Pig, Error Handling in Pig.

MODULE III–OOZIE, ANALYTICAL APPROACHES AND TOOLS TO ANALYZE DATA **(15 Hrs.)**

Using Oozie: Introducing Oozie, Installing and Configuring Oozie, Understanding the Oozie Workflow, Simple Application. NoSQL Data Management: Introduction to NoSQL, Types of NoSQL Data Models, Schema-Less Databases, Materialized Views, Distributed Models, Sharding, Map Reduce Partitioning and Combining, Composing Map Reduce Calculations. Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics, Developing an Analytic Team. Analytical Approaches and Tools to Analyze Data: Analytical Approaches, History of Analytical Tools, Introducing Analytical Tools, Comparing Various Analytical Tools.

5. References

1. DT Editorial Services, Big Data – Black Book(dream tech).
2. Radha S,M. Vijaya lakshmi, Big Data Analytics.
3. ArshdeepB and Vijay M, Big Data Science & Analytics–A Hands-On Approach.
4. FrankOhlhorst, Big Data Fundamentals–Concepts, Drivers, Techniques.
5. Kuan-ChingLi, HJiang, LTYang, ACuzzocrea, Big Data Algorithms, Analysis and Applications.
6. Tom White, Hadoop: The Definitive Guide.
7. Shiva Achari, Hadoop Essentials.

8. Alex Holmes, Hadoop in Practice.

6.Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local/Regional/National /Global Development Needs	Relevance
Global Development	Big data analytics plays a crucial role in addressing global development challenges by providing insights, optimizing resources, informing decision-making, and driving innovation across various sectors and regions.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1	Learn structure, elements, applications, and uses of big data analytics.
EMP	Modules 2 and 3	Analyzing and testing data using Pig, Hive.

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7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars
2.	Experimental	Quiz
3.	Problem solving	Troubleshoot (debug) code

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA -40%	End Semester Examination-60%
CO1	CIA 1 – Written Exam	Written Exam
CO2	CIA 2 – Assignment	
CO3	CIA 2 – Skill test - Lab	

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b) Model Question Paper- End Semester Exam

BIG DATA ANALYTICS

MODEL QUESTION PAPER
THEORY

Course Code: P24/CAI/DSE/302 **Max Marks: 60**
Credits: 3 **Time: 2 ½ Hrs.**

SECTION – A

I. Answer the following **3 x 12 = 36**

1. Define Big Data. Explain in detail about the structure of big data and explore the use of big data in business.

OR

2. Explain the various technologies for handling big data.

3. Define YARN. Explain in detail about YARN architecture and its working.

OR

4. Explain in detail about analyzing data with PIG.

5. Explain in detail about OOZI configuration and its workflow.

OR

6. Explain in detail about Map reduce partitioning and calculations

SECTION – B

II. Answer any FOUR **4 x 6 = 24**

7. Write a short note on distributed systems.
8. Explain briefly the applications of big data.
9. Define Hive. Explain in detail about JOINS in HIVE.
10. Explain about Error handling in PIG.
11. Write a short note on analytical approaches and tools to analyze data.
12. Write a short note on materialized views.

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c)Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
I	15	1	2	12	2	12
II	15	2	2	12	2	6
III	15	3	2	12	2	6

NOTE: From
Section-A any 3 questions can be answered (INTERNAL CHOICE).
Section-B any 4 questions can be answered. (EXTERNAL CHOICE)

9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions(hrs)
1	1	2	15
2	2	3,4	15
3	2	5	15

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BIG DATA ANALYTICS

Course Description

Programme:	**M.Sc. Computer Science (AI & ML)**	**Max. Hours: 60**
Course Code:	**P24/CAI/DSE/302**	**Hours per week: 4**
Course Type:	**DISCIPLINE SPECIFIC ELECTIVE**	**Max. Marks: 100**
No. of credits:	**2**	

Course Objectives

- To learn and develop programs applying the fundamental concepts of big data management and analytics.

Course Outcomes

On completion of the course the student will be able to:

CO1: Explain how to set up and install Hadoop and implement file management tasks in Hadoop. (Cognitive level – 2)

CO2: ***Use*** Hive and Pig to perform DDL & DML operations on data. (Cognitive level – 3,4)

PRACTICAL SESSIONS

1. Perform some tasks by using web-based tools of the Hadoop system.
2. Implement the following file management tasks in Hadoop:
   a. Adding files and directories
   b. Creating file, retrieving file and deleting files
   c. Write a Map Reduce program for basic word count.
3. Installing and running Hive, practice some Hive commands.
   a. Using Hive; create, insert, update, alter, delete, and drop the tables
   b. Using Hive; query the data from the database tables.
   c. Using Hive; create views, use functions, create indexes for the database tables.
4. Installing and running Pig, practice some Pig commands.
   a. Write Pig Latin scripts using eval functions to analyze your data.
   b. Write Pig Latin scripts using math functions to analyze your data.
   c. Write Pig Latin scripts using string functions to analyze your data.
5. Write simple scripts to understand the using NoSQL in Hadoop systems.

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BIG DATA ANALYTICS
MODEL QUESTION PAPER
PRACTICAL

Course Code : P24/CAI/DSE/302/P

Time : 2 Hrs
Max Marks:50M

Answer any two:

1. Using Hive perform CRUD operations on the student(rno,name,pno) table.
2. Write Pig Latin scripts using string functions to analyze employee data.
3. Write a Map Reduce program for basic word count.

Prepared by Name and Signature of the teaching faculty	Checked & Verified by Name and Signature of HoD	Approved by Name and Signature of Principal
Kavitha B **Teaching Faculty**	**D. Sowjenya** **Head of the Department**	**Dr. Uma Joseph** **Principal**

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SEMESTER - III

BLOCKCHAIN TECHNOLOGY

THEORY

1. **Course Description**

Programme:	**M.Sc. Computer Science (AI & ML)**	**Max. Hours: 45**
Course Code:	**P24/CAI/DSE/301**	**Hours per week: 3**
Course Type:	**DISCIPLINE SPECIFIC ELECTIVE**	**Max. Marks: 100**
No. of credits:	**3**	

2. **Course Objectives**

- To understand the basic theory underlying blockchain technology and the range of problems that can be solvable.
- To learn various blockchain platforms.
- To learn the development of decentralized applications

3. **Course Outcomes**

On completion of the course the student will be able to:

CO1: ***Illustrate*** and ***explain*** essential concepts of blockchain and Bitcoin.
(Cognitive levels – 2)

CO2: ***Apply*** smart contracts for specific transactions.
(Cognitive level – 3,4)

CO3: ***Choose*** and ***Design*** the decentralized application using Hyperledger fabric.
(Cognitive levels – 5,6)

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4. Course Content

MODULE I: FUNDAMENTALS OF BLOCKCHAIN AND CRYPTOCURRENCY-BITCOIN (15 Hrs.)

Introduction, Origin of Blockchain- What is blockchain, The Bitcoin and the blockchain, Blockchain solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future. Blockchain Types and Consensus Mechanism: Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol.

Cryptocurrency- Bitcoin: Introduction, Bitcoin and the cryptocurrency, Cryptocurrency basics.

MODULE II: PUBLIC BLOCKCHAIN SYSTEMS (15 Hrs.)

Introduction, Public Blockchain, Popular Public Blockchains: The Bitcoin: Common Terminologies, Proof of Work (PoW) and Hash cash in Bitcoin, Block propagation and Relay, Transaction in the Bitcoin Network. Ethereum Blockchain: Introduction, Code is Law and Ethereum classic, Ethereum components, How Mining Works in Ethereum, Merkle Patricia Tree, Architecture of Ethereum, Workflow of Ethereum. Smart Contracts: Introduction, characteristics of smart contract, Types of smart contracts, smart contracts in Ethereum.

MODULE III: PRIVATE AND CONSORTIUM BLOCKCHAIN SYSTEM (15 Hrs.)

Introduction, Key characteristics of private blockchain, why we need private blockchain, private blockchain examples, Smart contract in private environment- Design limitations, The CAP Theorem, The BASE theory. Types of faults in a distributed environment, consensus for processes, Requirements of a consensus algorithm, RAFT consensus algorithm, BYZANTINE FAULT. Consortium Blockchain: Characteristics of consortium Blockchain, Need of consortium Blockchain, Hyperledger Platform, The Reference Architecture, Transaction flow, Certificate Authority, Membership service Provider, Consensus services (RAFT), chaincode structure, Life cycle chaincode, private data collection in identity.

5. References

1. Blockchain Technology-Chandramouli Subramanian, Asha A George, Abhilash KA and Meena Karthikeyan, 2020, Universities press(India) Private Ltd.
2. Hyperledger Fabric In-Depth, Ashwani Kumar,2020, BPB Publications.
3. Hyperledger Cookbook, Xun Wu, Chuanfeng Zhang and Andrew Zhang, Pckt Publishing
4. Blockchain Basics, Daniel Drescher, Apress Publication http://vlabs.iitb.ac.in/vlabs-dev/labs/blockchain/labs/index.php

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6. Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global Development	Encompass various areas reflecting both current challenges and potential future advancements of scalability, interoperability, security etc.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1 and 2	Applying public blockchains-Bitcoin and Ethereum for block creation and smart contracts.
EMP	Modules 3	Testing and evaluating networks on Hyperledger Fabric

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7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars
2.	Experimental	Quiz
3.	Problem solving	Identifying, formulating, and addressing challenges of interoperability of blockchains.

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA -40%	End Semester Examination-60%
CO1	CIA 1 – Written Exam	Written Exam
CO2	CIA 2 – Assignment	
CO3	CIA 2 – Lab	

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b) Model Question Paper- End Semester Exam

BLOCKCHAIN TECHNOLOGY

MODEL QUESTION PAPER

THEORY

Course Code: P24/CAI/DSE/301 **Max Marks: 60**

Credits: 3 **Time: 2 ½ Hrs.**

I: Answer the following: **3 x 12 = 36**

1. Explain in detail about different Blockchain and Consensus Mechanisms.

OR

2. Describe in detail about Bitcoin and Cryptocurrency.

3. Explain in detail about architecture and workflow of Ethereum.

OR

4. Describe the importance of smart contracts in Ethereum.
5. Define Consensus algorithm. Explain in detail about the RAFT Consensus mechanism.

OR

6. Describe the chaincode structure and its life cycle..

II: Answer any Four: **4 x 6 = 24**

7. Discuss about blocks in a blockchain.
8. Write a short note on components of blockchain.
9. Explain in detail about Merkle Patricia Tree.
10. Write a short note on popular public blockchains.
11. Discuss CAP theorem.
12. Write a short note on the need for a private blockchain.

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c) Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
I	15	1	2	12	2	12
II	15	2	2	12	2	6
III	15	3	2	12	2	6

NOTE: From
Section-A any 3 questions can be answered (INTERNAL CHOICE).
Section-B any 4 questions can be answered. (EXTERNAL CHOICE)

9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions(Hrs.)
1	1	2	15
2	2	3,4	15
3	2	5,6	15

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SEMESTER III

BLOCKCHAIN TECHNOLOGY PRACTICAL

1. Course Description

Programme: M.Sc. Computer Science (AI & ML)
Course Code: P24/CAI/DSE/301/P
Course Type: DSE
No. of credits: 2

Max. Hours: 60
Hours per week: 4
Max. Marks: 50

2. Course Objective

To explore various Blockchain platforms for creating decentralized applications.

3. Course Outcomes

CO1: Exploring public blockchain- Ethereum and creation of smart contracts.
CO2: Applying chain code in Hyperledger fabric to perform transactions.

4. Practical Sessions

1 Create the following systems using Ethereum or Hyperledger Fabric:

1. Health care system.
2. Supply chain system.
3. E-Commerce.
4. Educational system.
5. Banking/Finance system

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MODEL QUESTION PAPER

BLOCKCHAIN TECHNOLOGY
PRACTICAL

COURSE CODE: P24/CAI/DSE/301/P **Max.Marks: 50**
Exam Duration: 2 Hrs.

Answer any one of the following.

Create the following systems using Ethereum or Hyperledger Fabric:

1. Health care system.
2. Supply chain system.
3. E-Commerce.
4. Educational system.
5. Banking/Finance system.

Prepared by	Checked & Verified by	Approved by
Ms.Khalida Tabassum Teaching Faculty	Ms. D. Sowjenya Head of the Department	Dr.Uma Joseph Principal

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SEMESTER - III

COMPUTER VISION

THEORY

1. **Course Description**

Programme:	**M.Sc. Computer Science (AI & ML)**	**Max. Hours: 45**
Course Code:	**P24/CAI/DSE/304**	**Hours per week: 3**
Course Type:	**DISCIPLINE SPECIFIC CORE**	**Max. Marks: 100**
No. of credits:	**3**	

2. **Course Objectives**

- To introduce students, the fundamentals of image formation.
- To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition.
- To develop an appreciation for various issues in the design of computer vision and object recognition systems.

3. **Course Outcomes**

On completion of the course the student will be able to:
CO1: ***Illustrate*** and ***explain*** image formation and processing essentials.
(Cognitive levels – 2)
CO2: ***Apply*** object and feature detection techniques.
(Cognitive level – 3,4)
CO3***: Choose*** and ***Design*** the processing of 3D reconstruction.
(Cognitive levels – 5,6)

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4.Course Content

MODULE I: INTRODUCTION TO COMPUTER VISION, IMAGE FORMATION AND PROCESSING **(15 Hrs.)**

Introduction to computer vision, Image formation: Geometric primitives and transformations, Photometric image formation, The digital camera.

Image processing: Point operators, Linear filtering, Non-linear filtering Geometric transformations.

MODULE II:RECOGNITION AND FEATURE DETECTION **(15 Hrs.)**

Recognition: Instance recognition, Image classification, Object detection. Feature detection and matching: Points and patches, Edges and contours, Contour tracking, Lines and vanishing points, Segmentation.

MODULE III: 3D RECONSTRUCTION **(15 Hrs.)**

3D reconstruction: Shape from X, 3D scanning, Surface representations, Point-based representations, Volumetric representations, Model-based reconstruction, Recovering texture maps and albedos.

5. References

1. Computer Vision: Algorithms and Applications 2nd Edition, Richard Szeliski, © 2022 Springer.
2. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
3. Haralick& Shapiro, "Computer and Robot Vision", Vol II.
4. G_erardMedioni and Sing Bing Kang "Emerging topics in computer vision".
5. Emanuele Trucco and AllessandroVerri "Introductory Techniques for 3-D Computer Vision", Prentice Hall, 1998.
6. Olivier Faugeras, "Three-Dimensional Computer Vision", The MIT Press, 1993.

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6.Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global Development	Computer Vision serves as a highly accurate pattern recognition tool, enhancing facial recognition, signature analysis, video surveillance, and detection of suspicious activities.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1 and 2	Applying image processing, object detection and feature detection techniques.
EMP	Modules 3	Testing and evaluating 3D reconstruction models.

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7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars
2.	Experimental	Quiz
3.	Problem solving	Identifying, formulating, and addressing the detection and processing of images, objects using image processing, object detection and 3D reconstruction techniques.

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA -40%	End Semester Examination-60%
CO1	CIA 1 – Written Exam	Written Exam
CO2	CIA 2 – Assignment	
CO3	CIA 2 – Lab	

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b) Model Question Paper- End Semester Exam

COMPUTER VISION

MODEL QUESTION PAPER
THEORY

Course Code:P24/CAI/DSE/304 **Max Marks: 60**
Credits: 3 **Time: 2 ½ Hrs.**

I: Answer the following: **3 x 12 = 36**

1. Define computer vision. Explain in detail about Geometric primitives and Transformations of 2D and 3D.

OR

2. Discuss image processing. Explain in detail about point operators.

3. Explain in detail about object detection.

OR

4. Define segmentation. Explain in detail various procedures of segmentation.
5. Explain in detail about 3D scanning with an application.

OR

6. Describe in detail Model based reconstruction.

II:Answer any Four: **4 x 6 = 24**

7. Write a short note on digital camera processing steps.
8. Discuss linear filtering.
9. Describe briefly edges and contours.
10. Explain Snakes and scissors in contour tracking.
11. Write a short note on Surface interpolation.
12. Briefly explain volumetric representations.

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c)Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
I	15	1	2	12	2	12
II	15	2	2	12	2	6
III	15	3	2	12	2	6

NOTE: From
Section-A any 3 questions can be answered (INTERNAL CHOICE).
Section-B any 4 questions can be answered. (EXTERNAL CHOICE)

9. CO-PO Mapping

CO	PO	Cognitive Level	Class room sessions(hrs)
1	1	2	15
2	2	3,4	15
3	2	5,6	15

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SEMESTER III

COMPUTER VISION PRACTICAL

1.Course Description

Programme: M.Sc. Computer Science (AI & ML)
Course Code: P24/CAI/DSE/304/P
Course Type: DSC
No. of credits: 2

Max. Hours: 60
Hours per week: 4
Max. Marks: 50

2.Course Objective

To explore various techniques of image processing, object detection, feature detection and 3D reconstruction.

3.Course Outcomes

CO1: Exploring image formation and image processing techniques.
CO2: Applying object detection and 3D reconstruction procedures.

4. Practical Sessions

1. Implementing various basic image processing operations in python/matlab/open-CV: Reading image, writing image, conversion of images, and complement of an image
2. Implement contrast adjustment of an image. Implement Histogram processing and equalization.
3. Show Geometric primitives and transformations.
4. Implement the various low pass and high pass filtering mechanisms.
5. Find points and patches by detecting features.
6. Performing/Implementing image segmentation.
7. Implement surface representations of 3D.
8. Object detection and Recognition on available online image datasets
9. Character or digit classification
10. Face classification.

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DEPARTMENT OF COMPUTER SCIENCE
ST. FRANCIS COLLEGE FOR WOMEN, HYDERABAD

MODEL QUESTION PAPER

COMPUTER VISION
PRACTICAL

COURSE CODE: P24/CAI/DSE/304/P

Max.Marks: 50
Exam Duration: 2 Hrs

Answer any one of the following.

1. Write a program to implement contrast adjustment of an image, Histogram processing and equalization.
2. Write a program to find points and patches by detecting features
3. Write a program to implement Object detection and Recognition on available online image datasets
4. Write a program for classification of Character or digit.
5. Write a program to implement Face classification.

Prepared by	Checked & Verified by	Approved by
Ms.Khalida Tabassum	**Ms. D. Sowjenya**	**Dr.Uma Joseph**
Teaching Faculty	**Head of the Department**	**Principal**

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SEMESTER – III

DEEP LEARNING

THEORY

1. Course Description

Programme:	**M.Sc. Data Science**	**Max. Hours: 45**
Course Code:	**P24/CAI/DSC/301**	**Hours per week: 3**
Course Type:	**DISCIPLINE SPECIFIC CORE**	**Max. Marks: 100**
No. of credits:	**3**	

2. Course Objectives

- To understand the basic theory on deep learning.
- To learn the implementation of problems that can be handled by deep learning using Keras.
- To learn the implementation of neural networks.

3. Course Outcomes

On completion of the course the student will be able to:

CO1: ***Illustrate*** and ***explain*** keras-A neural network API and tensor board- Visualization toolkit.
(Cognitive levels – 2)
CO2: ***Apply*** deep learning with convolutional neural networks and Generative Adversarial Networks.
(Cognitive level – 3,4)
CO3*: Choose* and ***Design*** the word embedding and Recurrent neural networks.
(Cognitive levels – 5,6)

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4. Course Content

MODULE I: FOUNDATIONS OF NEURAL NETWORKS, WORKING WITH KERAS

(15 Hrs.)

Perceptron, The first example of Keras code, Multilayer perceptron, Problems in training the perceptron and a solution, Activation functions, sigmoid, ReLU, One-hot encoding, Defining a simple neural net in Keras, Running a simple Keras net and establishing a baseline, Improving the simple net in Keras with hidden layers and with dropout, Testing different optimizers in Keras, Increasing the number of epochs, Controlling the optimizer learning rate, Increasing the number of internal hidden neurons, Increasing the size of batch computation, Summarizing the experiments run for recognizing handwritten charts, Adopting regularization for avoiding overfitting Hyperparameters tuning, Predicting output, A practical overview of backpropagation, Towards a deep learning approach.Installing and Configuring Keras, Keras API, Keras architecture, tensor, Composing models in Keras, Overview of predefined neural network layers, predefined activation functions, metrics, optimizers. Saving and loading the weights and the architecture of a model, Checkpointing, Using TensorBoard and Keras, Quiver and Keras.

MODULE II: DEEP LEARNING WITH CONVOLUTIONAL NETWORKS, GENERATIVE ADVERSARIAL NETWORKS

(15 Hrs.)

Deep convolutional neural network, Local receptive fields, Shared weights and bias, Pooling layers, Max and Average pooling, ConvNets, LeNet and LeNet code in Keras, Understanding the power of deep learning, Recognizing and Improving the CIFAR-10 images with deep learning, Very deep convolutional networks for large-scale image recognition, Recognizing cats with a VGG-16 net, Utilizing Keras built-in VGG-16 net module. Overview of Generative Adversarial Networks and GAN applications, Deep convolutional generative adversarial networks, Keras adversarial GANs for forging MNIST and CIFAR, WaveNet.

MODULE III: WORD EMBEDDINGS AND RECURRENT NEURAL NETWORK

(15 Hrs.)

Distributed representations, word2vec, skip-gram and CBOW word2vec models, Extracting word2vec embeddings, Using third-party implementations of word2vec, Exploring GloVe, Using pre-trained embeddings and learning from scratch, Fine-tuning learned embeddings from word2vec and GloVe, Look up embeddings. Recurrent Neural Network: SimpleRNN cells, SimpleRNN with Keras, RNN topologies, Vanishing and exploding gradients, Long short term memory, LSTM with Keras, sentiment analysis, Gated recurrent unit, GRU with Keras, POS tagging, Bidirectional and Stateful RNNs.

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5. References

1. Deep Learning with Keras, by Antonio Gulli, Sujit Pal, Packt Publishing, 2017..
2. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville published by MIT Press.
3. Neural Networks and Deep Learning: A Textbook, by Charu C. Aggarwal, Springer.
4. Deep Learning (The MIT Press Essential Knowledge series) by John D. Kelleher
5. Deep Learning From Scratch: Building with Python from First Principles by Seth Weidman, O`Reilley.

6.Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global Development	Deep learning has remarkable success across various domains, including computer vision, natural language processing, speech recognition, and reinforcement learning etc.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1 and 2	Applying artificial neural networks using sequential API, CNN, GAN
EMP	Modules 3	Testing and evaluating Word Embeddings and RNN.

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7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars
2.	Experimental	Quiz
3.	Problem solving	Image Classification, NLP tasks etc.

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA -40%	End Semester Examination-60%
CO1	CIA 1 – Written	Written Exam
CO2	CIA 2 – Assignment	
CO3	CIA 2 – Lab	

b) Model Question Paper- End Semester Exam

DEEP LEARNING

MODEL QUESTION PAPER
THEORY

Course Code: P24/CAI/DSC/301 **Max Marks: 60**
Credits: 3 **Time: 2 ½ Hrs.**

I: Answer the following **3 x 12 = 36**

1. Describe in detail about Multilayer perceptrons.

OR

2. Define Keras. Explain in detail about Keras API and architecture.

3. Define the power of deep learning.Discuss Recognizing and Improving the CIFAR-10 images with deep learning,

OR

4. Describe about Deep convolutional generative adversarial networks Numerical perceptron.
5. Explain in detail about Extracting word2vec embeddings and Using third-party Implementations of word2vec.

OR

6. Discuss the Recurrent Neural Network and explain about RNN topologies

II. Answer any Four: **4 x 6 = 24**

7. Discuss about sigmoid, ReLU.
8. Write a short note on TensorBoard.
9. Write a short note on ConvNets, LeNet and LeNet code in Keras.
10. Discuss about WaveNet.
11. Explain about CBOW word2vec models.
12. Write about Stateful RNNs.

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SEMESTER III

DEEP LEARNING PRACTICAL

1. Course Description

Programme: M.Sc. Data Science **Max. Hours: 60**
Course Code: P24/CAI/DSC/301/P **Hours per week: 4**
Course Type: DSC **Max. Marks: 50**
No. of credits: 2

2. Course Objective

To install and customize Keras to explore and implement deep learning mechanisms like generative adversarial networks, recurrent neural networks.

3. Course Outcomes

CO1: Exploring Keras for Generative adversarial networks and convolutional networks.
CO2: Applying Keras API for Word embeddings and RNN.

4. Practical Sessions

1. Neural Networks, Working with Keras:
   a. Running a simple Keras net and establishing a baseline.
   b. Installing and Configuring Keras.

2. Deep Learning with ConvNets, Generative Adversarial Networks:
   a. Recognizing and Improving the images with deep learning
   b. working with Keras adversarial Generative Adversarial Networks

3. Word Embeddings and Recurrent Neural Network:
   a. Extracting word2vec embeddings
   b. Implementing Simple Recurrent Neural Networks with Keras

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MODEL QUESTION PAPER

DEEP LEARNING
PRACTICAL

COURSE CODE: P24/CAI/DSC/301/P

Max.Marks: 50
Exam Duration: 2 Hrs.

Answer any one of the following.

1. Implement handwritten digit recognition using MNIST dataset with ANN.
2. Write a program for image recognition of CIFAR-10 Image dataset using CNN.
3. Implement Generative Adversarial Networks with keras.
4. write a program representing Word2Vec.
5. Write a program on RNN for finding sequences of words.

Prepared by	Checked & Verified by	Approved by
Ms.Khalida Tabassum Teaching Faculty	Ms. D. Sowjenya Head of the Department	Dr.Uma Joseph Principal

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SEMESTER - III

INTERNET OF THINGS
THEORY

1. Course Description

Programme: M.Sc. Computer. Science (AI&ML) **Max. Hours: 45**
Course Code: P24/CAI/DSC/302 **Hours per week: 3**
Course Type: DISCIPLINE SPECIFIC CORE **Max. Marks: 100**
No. of credits: 3

2. Course Objectives.

Students understanding will be enhanced by:

- Exploration towards the integration of the physical and logical worlds.
- Exposure in understanding how IoT devices are designed & developed.

3. Course Outcomes

CO1: ***Explain and*** **Compute** Able to understand the application areas of IOT
CO2: ***Apply*** Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor network
CO3***: Choose*** and ***Design*** Able to understand building blocks of Internet of Things and characteristics

4.Course Content

MODULE I: INTRODUCTION TO INTERNET OF THINGS (15 Hrs.)

Introduction to Internet of Things: IOT vision, Strategic research and innovation directions, IoT Applications, Related future technologies, Infrastructure, Networks and communications, Processes, Data Management, Security, Device level energy issues & IoT Related Standardization

MODULE II: INTERNET OF THING AND PROTOCOL (15 Hrs.)

Internet of things: An Overview, Design Principles for Connected devices, Design Principles For Connected Devices-Internet communication Overview, IP, TCP, IP protocol Suite, UDP. IP addresses – DNS, Static and Dynamic IP addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols – HTTP, HTTPS.

MODULE III: PROTOTYPING AND PROGRAMMING FOR IOT (15 Hrs.)

Prototyping: Cost Vs Ease of Production, Prototypes and Production, Open-Sources vs Closed Source. Prototyping Embedded Devices – Sensors, Actuators, Microcontrollers, SoC, Choosing a platform, Prototyping Hardware platforms – Arduino, Raspberry Pi. Prototyping

the physical design – Laser Cutting, 3D printing, CNC Milling. Techniques for writing embedded C code: Integer data types in C, manipulating bits – AND, OR, XOR, NOT, Reading and writing from I/ O ports. Simple Embedded C programs for LED Blinking, Control of motor using switch and temperature sensor for Arduino board.

5.References:

1. Internet of Things - Converging Technologies for smart environments and Integrated ecosystems, River Publishers.
2. Designing the Internet of Things, Adrian McEwen & Hakim Cassimally, published 2014© 2014 John Wiley and Sons, Ltd.
3. Designing the Internet of Things, Adrian McEwen, Hakim Cassimally. Wiley India Publishers
4. Fundamentals of embedded software: where C meets assembly by Daneil W lewis, Pearson.
5. Internet of things -A hands on Approach, ArshdeepBahga, Universities press.

6.Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global Development	The global development of IoT is characterized by rapid technological advancements, industry convergence, and evolving regulatory frameworks, paving the way for transformative opportunities and challenges in the years to come.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD &EMP	Modules 1, 2&3	Through formal education, hands-on experience, online courses, certifications, and participation in IoT projects, individuals can position themselves for success in the dynamic and growing field of IoT.

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7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars
2.	Online Participation	Quiz
3.	Skill Development	Activities

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA -40%	End Semester Examination-60%
CO1	CIA 1 – Written	Written Exam
CO2	CIA 2 – Assignment	
CO3	CIA 2 – Hands activity	

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b) Model Question Paper- End Semester Exam

INTERNET OF THINGS

MODEL QUESTION PAPER
THEORY

Course Code: P24/CAI/DSC/302 **Max Marks: 60**
Credits: 3 **Time: 2 ½ Hrs.**

SECTION – A

I. Answer the following: **3 x 12= 36**

1. Explain in detail the Internet of Things presents security-related challenges.

OR

2. Explain in detail various IoT Related Standardization.
3. Explain in detail with a neat diagram of the Internet protocol suite.

OR

4. Write briefly Design Principles of IoT.
5. How to choose the right platform for your Internet of Things device? Explain wit required device configuration.

OR

6. Explain the different types of memory that might be encountered for writing embedded code.

SECTION – B

II Answer any Four: **4 x 6 = 24**

7. Differentiate between IoT and M2M.
8. What is IoT? Write the characteristics of an IoT System.
9. Define sensor and explain the characteristics of sensor.
10. List the characteristics of Actuators.
11. With a neat diagram explaining scalar and Multimedia sensing techniques.
12. Explain the major factors that influence the choice of sensors in IoT-based sensing solutions.

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c)Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
I	15	1	2	12	2	12
II	15	2	2	12	2	6
III	15	3	2	12	2	6

NOTE: From

Section-A any 3 questions can be answered (INTERNAL CHOICE).
Section-B any 4 questions can be answered. (EXTERNAL CHOICE)

9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions(hrs.)
1	1	2	15
2	2	3,4	15
3	2	5,6	15

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SEMESTER - III

INTERNET OF THINGS PRACTICAL

1.Course Description

Programme: M.Sc. Computer. Science (AI&ML) **Max. Hours: 60**
Course Code: P24/CAI/DSC/302/P **Hours per week:4**
Course Type: DSC **Max.Marks :50**
No. of credit: 2

2. Course Objectives

- To understand the working principle of various communication protocols.
- To analyze the various routing algorithms.
- To know the concept of data transfer between nodes.

3. Course Outcomes

- Understand the design, characteristics and technologies of the Internet of Things.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

4.Practical Sessions

1. Study the fundamentals of IOT Software and components.
2. Familiarization with Arduino/Raspberry Pi and perform necessary software.
3. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every2 seconds.
4. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when Push buttons are pressed or at sensor detection.
5. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
6. To interface the motor using a relay with Arduino/Raspberry Pi and write a program to turn ON the motor when push button is pressed.

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INTERNET OF THINGS

MODEL QUESTION PAPER
PRACTICAL

Course Code: P24/CAI/DSC/302/P

Max. Time:2 Hrs.
Max. Marks: 50

I. Answer any ONE from the following

1. Familiarization with Arduino/Raspberry Pi and perform necessary software.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when Push buttons are pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface the motor using a relay with Arduino/Raspberry Pi and write a program to turn ON the motor when push button is pressed.

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Ms. Shobana **Teaching Faculty**	**Ms. D. Sowjenya** **Head of the Department**	**Dr. Uma Joseph** **Principal**

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SEMESTER -III

OBJECT ORIENTED DESIGN
THEORY

1. Course Description

Programme: MSC. AI & ML
Course Code: P24/CAI/DSE/303
Course Type: DISCIPLINE SPECIFIC ELECTIVE
No. of credits: 3

Max. Hours: 45
Hours per week: 3
Max. Marks: 100

2. Course Objectives

- To analysing and designing problems using object-oriented analysis and design techniques
- To apply and design problems using UML structural and behavioural modelling.
- To analyse and develop an application, system, or business by applying object-oriented programming, as well as using visual modeling iterative and incremental processes.

3. Course Outcomes

On completion of the course the student will be able to:

CO1: To *understand* the object-oriented approach to analysing and designing systems and key mechanisms of class and object diagram. and software solutions. (Cognitive levels –2)

CO2: To *Apply* and construct various UML models including use case diagrams, class diagrams, interaction diagrams, state chart diagrams, activity diagrams, and implementation diagrams using the appropriate notation (Cognitive level – 4)

CO3: *Ability* to demonstrate the importance of modeling in the software development life cycle. (Cognitive levels – 5,6)

4. Course Content

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MODULE I: INTRODUCTION TO COMPLEX SYSTEMS AND OBJECT MODELS (15 Hrs.)

Complexity: the structure of complex systems, the inherent complexity of software, the five attributes of a complex system, organized and disorganized complexity, bringing order to chaos, on designing complex systems The object model: the evolution of the object model, foundations of the object model, elements of the object model, applying the object model.

MODULE II: BASIC STRUCTURAL MODELING (15 Hrs.)

Classes and Objects: the nature of an object, relationships among objects, the nature of a class, relationships among classes, the interplay of classes and objects, on building quality classes and objects. Classification: the importance of proper classification, identifying classes and objects, key abstractions and mechanisms. Notation: unified modeling language (UML), package diagrams, component diagrams, deployment diagrams.

MODULE III: BASIC BEHAVIORAL MODELING AND SOFTWARE MANAGEMENT (15 Hrs.)

Notation: use case diagrams, activity diagrams, class diagrams, sequence diagrams, interaction overview diagrams, composite structure diagrams, state machine diagrams, timing diagrams, object diagrams, communication diagrams. Process: first principles, the macro process: SDLC, the micro process: the analysis and design process. Pragmatics: management and planning, staffing, release management, reuse, quality assurance and metrics, documentation, tools, special topics, the benefits and risks of object-oriented development.

5. References

1. Grady Booch, Object-Oriented Analysis and Design with Applications, Third Edition, Pearson Education, Inc. 2007.
2. Ali Bahrami, Object Oriented Systems Development
3. Grady Booch, The Unified Modeling Language User Guide
4. Berd Oestereich, Developing software with UML – OOAD in practice
5. Sarnath Ramnath, Brahma Dathan, Object-Oriented Analysis and Design
6. B. D. McLaughlin, Gary Pollics, David West, Head First – Object Oriented Analysis & Design

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6. Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global Development	Information Security Information security is essential for ensuring that critical business operations can continue in the event of a security breach or cyber-attack. It safeguards all types of data against theft and loss. Sensitive data, protected health information (PHI and is widely employed in everything from system software to game development.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1 and 2	To develop object-oriented principles to model and design skills.
EMP	Modules 3	To implement object-oriented frameworks, develop business logic, and create data access and business objects.

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7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars
2.	Experimental	Quiz, Group Discussion
3.	Problem solving	To Design and implement classes & objects & build structural, behavioural models

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA -40%	End Semester Examination-60%
CO1	CIA 1 – Written Exam	Written Exam
CO2	CIA 2 – Assignment	
CO3	CIA 2 – Lab	

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b) Model Question Paper- End Semester Exam

OBJECT ORIENTED DESIGN

MODEL QUESTION PAPER
THEORY

Course Code: P24/CAI/DSE/303 **Max Marks: 60**
Credits: 3 **Time: 2 ½ Hrs.**

I: Answer the following **3 x 12 = 36**

1. Define complexity. Explain in detail about five attributes of a complex system.

OR

2. Explain in detail about evolution and foundation of object models.

3. Explain in detail about classes and objects with an example.

OR

4. Explain in detail about component diagrams with an example.

5. Discuss the difference between sequence diagrams and interaction diagrams.

OR

6. Explain about state machine diagrams.

II. Answer any Four: **4 x 6 = 24**

7. Explain the elements of the object model.
8. Explain the structure of complex systems.
9. Write a short note on deployment diagrams.
10. Discuss briefly about relationships among objects.
11. Write a short note on quality assurance and metrics.
12. Discuss about SDLC.

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c)Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
I	15	1	2	12	2	12
II	15	2	2	12	2	6
III	15	3	2	12	2	6

NOTE: From
Section-A any 3 questions can be answered (INTERNAL CHOICE).
Section-B any 4 questions can be answered. (EXTERNAL CHOICE)

9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions(hrs)
1	1	2	15
2	2	4	15
3	2	5	15

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SEMESTER III

OBJECT ORIENTED DESIGN

PRACTICAL

1.Course Description

Programme: M.Sc. Computer Science (AI & ML)
Course Code: P24/CAI/DSE/303/P
Course Type: DSE
No. of credits: 2

Max. Hours: 60
Hours per week: 4
Max. Marks: 50

2.Course Objective

- To understand & design the concepts of the Object-based view of Systems.
- To solve a software problem using UML models.

3.Course Outcomes

CO1: Understand the importance of systems analysis and design in solving problems.
CO2: Apply and develop a system using iterative and incremental process.

4. Practical Sessions

Rendering of UML diagrams for Case Studies:

1. Online Examination
2. Point of Sales
3. Banking System
4. ATM operations
5. Online Shopping
6. Transport App on mobile
7. Dish TV services
8. Airline System
9. College Management System.
10. Online Hospital Management

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MODEL QUESTION PAPER
OBJECT ORIENTED DESIGN
PRACTICAL

COURSE CODE: P24/CAI/DSE/303/P

Max.Marks: 50
Exam Duration: 2 Hrs

Answer any one of the following.

1. Draw the following diagrams and explain their functionality:
   a) Use case diagram for College Management System.
   b) Activity diagram pertaining to your case study.
2. Draw the following diagrams and explain their functionality:
   a) Class diagram for Library management system.
   b) Timing diagram pertaining to your case study.
3. Draw the following diagrams and explain their functionality:
   a) Sequence diagram for money withdrawal operation using ATM.
   b) Use case diagram pertaining to your case study.
4. Draw the following diagrams and explain their functionality:
   a) State machine diagram for all transactions associated with ATM.
   b) Communication diagram pertaining to your case study.
5. Draw the following diagrams and explain their functionality:
   a) Activity diagram for Online shopping
   b) Class diagram pertaining to your case study.

Prepared by	Checked & Verified by	Approved by
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