Course Code: BCA 302 **L T C**
Course Name: Data Ware Housing and Data Mining **3 1 4**

INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its sub parts, if any.
3. Examiners are requested to go through the Course Outcomes(CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy(BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNINGOBJECTIVES:
In thiscourse,thelearnerswill beableto developexpertise relatedtothefollowing:-
1. To understand the basic principles, concepts and applications of Data warehousing and ELT tools.
2. Differentiate Online Transaction Processing and Online Analytical processing
3. To understand the Data Mining Process, Technologies & Rules, platform tools and data pre-processing or data visualization techniques.
4. Identifying business applications of data mining
5. Develop skills in selecting the appropriate data mining algorithm for solving practical problems.

PRE-REQUISITES:
1. Discrete Mathematics
2. Information system concept

COURSEOUTCOMES(COs):
Aftercompletionofthiscourse,thelearners willbe ableto:-

CO#	DetailedStatementoftheCO	*BTLevel	MappingtoPO #
CO1	Understand the various component of Datawarehouse	BTL2	PO1, PO2, PO3,PO7,PO5
CO2	Appreciate the strengths and limitations of various data mining and data warehousing models	BTL3	PO1, PO2, PO3,PO7, PO10
CO3	Critically evaluate data quality to advocate application of data pre-processing techniques.	BTL3	PO1, PO2, PO3,PO4
CO4	Describe different methodologies used in data mining and data ware housing.	BTL4	PO1, PO2, PO3,PO4,PO7
CO5	Design a data mart or data warehouse for any organization	BTL5	PO1,PO2,PO3, PO4,PO11
CO6	Test real data sets using popular data mining tools such as WEKA	BTL6	PO1, PO2, PO3,PO4, PO6, PO7,PO8

UNIT–I
No. of Hours:12 Chapter/Book Reference: TB3[Chapters - 1,2,3]

Introduction to Data Warehousing: Overview, Difference between Database System and Data Warehouse, The Compelling Need for data warehousing, Data warehouse – The building Blocks: Defining Features, data warehouses and data marts, overview of the components, three tier architecture, Metadata in the data warehouse.
ETL tools: - Defining the business requirements: Dimensional analysis, information packages – a new concept, requirements gathering methods, requirements definition: scope and content

UNIT–II

No. of Hours:11 Chapter/Book Reference: TB3 [Chapters - 10,11,12]

Principles of Dimensional Modeling: Objectives, From Requirements to data design, Multi-Dimensional Data Model, Schemas: the STAR schema, the Snowflake schema, fact constellation schema.
OLAP in the Data Warehouse: Demand for Online Analytical Processing, limitations of other analysis methods, OLAP definitions and rules, OLAP characteristics, major features and functions, hyper cubes.
OLAP Operations: Drill-down and roll-up, slice-and-dice, pivot or rotation, OLAP models, overview of variations, the MOLAP model, the ROLAP model, the DOLAP model, ROLAP versus MOLAP, OLAP implementation considerations. Query and Reporting, Executive Information Systems (EIS), Data Warehouse and Business Strategy

UNIT–III

No. of Hours:10 Chapter/BookReference:TB1 [Chapters:1,3], TB2[Chapter - 3], RB5[Chapter - 17]

Data mining and data pre-processing:
Data mining: Introduction, What kind of data can be mined, What kind of patterns to be mined, Which technologies are used, What kinds of applications are targeted, Major issues in data mining.
Data pre-processing: Overview of Data pre-processing, data cleaning, data integration, data reduction, data transformation and data discretization, exploring data using IRIS datasets. Introduction to apriori algorithm for association mining rule.

UNIT–IV

No. of Hours: 10 Chapter/Book Reference: TB1[Chapters - 1, 3], RB2, RB3

Data mining applications, and Data mining Tools:
Applications of data mining: Data mining for retail and telecommunication industries, data mining and recommender systems.
Introduction to data mining tools (open source): Weka, RapidMiner, IBM Watson for classification and clustering algorithms using IRIS Datasets

TEXTBOOKS:

TB1. Kamber and Han, "Data Mining Concepts and Techniques", Third edition, Hartcourt India P.Ltd.,2012.
TB2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to data mining", Pearson education, 2006
TB3. Paul Raj Poonia, "Fundamentals of Data Warehousing", John Wiley & Sons, 2004

REFERENCEBOOKS:

RB1. Ashok N. Srivastava, Mehran Sahami, "Text Mining Classification, Clustering, and Applications", Published by Chapman and Hall/CRC1st Edition, June 23, 2009
RB2. Ian H., Eibe Frank, Mark A. Hall, Christopher Pal "Data Mining: Practical Machine Learning Tools and Techniques"Published by Morgan Kaufmann; 4th edition ,December 1, 2016
RB3. G. K. Gupta, "Introduction to Data Mining with Case Studies", PHI, 2006
RB4. Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw Hill, 1 July 2017
RB5. Shmueli, "Data Mining for Business Intelligence : Concepts, Techniques and Applications in Microsoft Excel with XLMiner",Wiley Publications

Course Code: BCA 304 **L T C**
Course Name: E-Commerce **3 1 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its sub parts, if any.
3. Examiners are requested to go through the Course Outcomes(CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy(BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following: -

1. To learn and understand the basic nature of e-commerce.
2. To study how the internet and web support e-commerce.
3. To explain how to use technologies to build e-commerce websites.
4. To make students aware of the business environment associated with e-commerce.

PRE-REQUISITES:

1. Basic Knowledge of computers and business concepts.
2. Basic knowledge of the Internet.

COURSE OUTCOMES(COs):

After completion of this course, the learners will be able to: -

CO#	Detailed Statement of the CO	*BT Level	Mapping to PO #
CO1	Understand the framework and business models of E-commerce.	BTL2	PO1, PO2, PO3, PO7
CO2	Explain the concept of network infrastructure and gain knowledge about mobile commerce.	BTL2	PO1, PO2, PO3, PO7, PO10
CO3	Demonstrate the process of secure electronic transactions for E-commerce.	BTL3	PO1, PO2, PO3, PO4
CO4	Analyze various e-commerce secure payment gateway.	BTL4	PO1, PO2, PO3, PO4, PO7
CO5	Evaluate Internet banking platform to work with E-commerce infrastructure.	BTL5	PO1, PO2, PO3, PO4, PO11
CO6	Implement ecommerce website for online business.	BTL6	PO1, PO2, PO3, PO4, PO6, PO7, PO8

UNIT-I

No. of Hours: 10 Chapter/Book Reference: TB1[Chapters – 1,2],

Introduction: Definition of Electronic Commerce,Evolution of e-commerce, E-Commerce& E Business, Unique features of e-commerce, applications of E-Commerce, advantages and disadvantages of E-commerce, Types of e-commerce:B2B, B2C, C2C, M-commerce, Social Commerce

E-commerce infrastructure: Technological building blocks:Internet, web and mobile applications

UNIT II

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters - 2, 3], RB1,RB3

Building an e-commerce presence: Planning, System Analysis, Design, Choosing Software, Hardware, Other E-commerce site tools: Tools For website design, Tools for SEO, Interactivity and active contents (Server side scripting)

Important Components of E-commerce website: Product Cataloging, Product Listing Page, Product description Page, Cart building andCheckout, Third party integrations: Payment systems, Data Layer Integrations for analytics, Customer support integration, Order tracking, Shipping, return and cancellation

New Technologies for E-commerce: Chatbots, Recommendation systems (Personalisation), Smart Search, Product Comparison,Augmented reality, Big data, Cloud computing

UNIT III

No. of Hours: 10 Chapter/Book Reference: TB2 [Chapters - 5, 6, 7], RB1, RB3

Electronic Payment Systems-

Overview of Electronics payments, electronic Fund Transfer, Digital Token based Electronics payment System, Smart Cards, Credit Cards, Debit Cards, Emerging financial Instruments Smartphone wallet, Social / Mobile Peer to Peer Payment systems, Digital Cash and Virtual Currencies,Online Banking, Payment Gateway, Electronic Billing Presentment and Payment.

UNIT IV

No. of Hours: 10 Chapter/Book Reference: TB1[Chapters - 5, 6, 7], RB4

Security Threats and Issues: Cyber crimes, Credit card frauds/theft, Identity fraud, spoofing , sniffing, DOS and DDOS attacks, Social network security Issues, Mobile Platform Security issues, Cloud security issues

Technology Solutions: Encryption :Secret Key Encryption, Public Key Encryption, Digital Certificates and public key infrastructure

Securing channels: Secured Socket Layer (SSL), Transport Layer Security(TLS) , Virtual Private Network (VPN), Protecting Networks: Firewalls, Proxy Servers, Intrusion detection and protection systems , Anti Virus software

TEXT BOOKS:

TB1. Kenneth C. Laudon, "E-Commerce: Business, Technology and Society", 15th Edition, Pearson education

TB2. KK Bajaj & Debjani Nag," E-Commerce: The Cutting Edge of Business "McGraw Hill, II edition, 2015

TB3. Efraim Turban, Jae Lee, David King, H. Michael Chung, "Electronic Commerce – A Managerial Perspective", Addison-Wesley.

REFERENCE BOOKS:

RB1. The Complete Reference: Internet, Margaret Levine Young, Tata McGraw Hill.

RB2. E-Commerce: Concepts, Models, Strategies, CSV Murthy, Himalayas Publishing House.

RB3. Frontiers of Electronic Commerce, Ravi Kalakota & Andrew B. Wilson, Addison-Wesley (An Imprint of Pearson Education).

RB4. Network Security Essentials: Applications & Standards, William Stallings, Pearson Education.

Course Code: BCA 306 **L T C**
Course Name: Internet of Things **3 1 4**

INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its sub parts, if any.
3. Examiners are requested to go through the Course Outcomes(CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy(BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:
In this course, the learners will be able to develop expertise related to the following:
1. To learn and understand the concept of Internet of Things (IOT).
2. To study the constituent components of Internet of Things.
3. To design and develop IoT applications using different, Sensors/actuators.
4. To seek working knowledge of Arduino, Raspberry pi Boards and to develop cloud based IOT projects.

PRE-REQUISITES:
1. Basic Programming Knowledge
2. Use of Internet

COURSE OUTCOMES (COs):
After completion of this course, the learners will be able to:-

CO#	Detailed Statement of the CO	*BT Level	Mapping to PO #
CO1	Understand the architecture and the functional blocks of Internet of Things.	BTL2	PO1, PO2, PO3
CO2	Explain the concepts of Internet of Things and gain knowledge to design IoT applications	BTL2	PO1, PO2, PO3,PO7, PO10
CO3	Demonstrate the process of capturing and analyzing data in Internet of Things.	BTL3	PO1, PO2, PO3,PO4
CO4	Examine the various components involved in IoT design methodology.	BTL4	PO1, PO2, PO3,PO4,PO7
CO5	Evaluate an IoT device to work with a Cloud Computing infrastructure.	BTL5	PO1,PO2,PO3, PO4,PO11
CO6	Implement IoT protocols for communication.	BTL6	PO1,PO2, PO3,PO4, PO6, PO7,PO8

UNIT–I

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters - 1,3,4,6]; TB2[Chapters - 1,2,3]

Internet of Things (IoT): Vision, Definition, Conceptual framework, Architectural view, Technology behind IoT, Sources of the IoT, M2M Communication, IoT examples.
Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, Communication technologies, Data enrichment and consolidation, Ease of designing and affordability.

UNIT–II

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapters - 4,7,8,11], TB2 [Chapters - 4,5,7,9], TB4[Chapters - 2,4,5,6,9]

Hardware for IoT: Sensors, Digital sensors, Actuators, Radio frequency identification (RFID) technology, Wireless sensor networks, Participatory sensing technology.
Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported hardware platforms such as Arduino, NetArduino, Raspberry Pi, Beagle Bone, Intel Galileo boards and ARM cortex.

UNIT–III

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters - 1,3,4,], TB2 [Chapters - 2,3,6], TB4 [Chapter - 7]

Network & Communication Aspects in IoT: Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination
Programming the Arduino: Arduino platform boards anatomy, Arduino IDE, Coding using emulator, Using libraries, Additions in Arduino, Programming the Arduino for IoT.

UNIT–IV

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters - 15,16], TB3[Chapters - 13, 14, 15, 16, 17], RB1[Chapter - 4]

Challenges in IoT Design Challenges: Development challenges, Security challenges, Other challenges.
IoT Applications: Smart metering, E-health, City automation, Automotive applications, Home automation, Smart cards, Communicating data with H/W units, Mobiles, Tablets, Designing of smart street lights in smart city.

TEXT BOOKS:

TB1. Rajan Gupta, Supriya Madan, "Fundamentals of IoT", BPB Publications, Ist Edition, 2023
TB2. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things Key Applications and Protocols", Wiley.
TB3. Jeeva Jose, "Internet of Things", Khanna Publishing House.
TB4. Michael Miller, "The Internet of Things", Pearson Education.
TB5. Raj Kamal, "Internet of Things", McGraw-Hill, 1st Edition, 2016

REFERENCE BOOKS:

RB1. Arshdeep Bahgaand Vijay Madisetti,"Internet of Things: A Hands-on Approach", University Press, 2015
RB2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.

Course Code: BCA 308	**L**	**T/P**	**C**
Course Name: Major Project	**0**	**12**	**6**

PROJECT REPORT

All the students are required to submit a report based on the project work done by them during the sixth semester.

SYNOPSIS (SUMMARY/ABSTRACT) :
All students must submit a summary/abstract separately with the project report. Summary, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up must adhere to the guidelines and should include the following:

- Name / Title of theProject
- Statement about theProblem

Course Code: BCAT 312 **L T C**
Course Name: Data Visualization & Analytics **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. Students will develop relevant programming abilities.
2. Students will demonstrate proficiency with statistical analysis of data.
3. Conduct exploratory data analysis using visualization.
4. Craft visual presentations of data for effective communication.

PRE-REQUISITES:

1. Basics of Python Programming (BCA-206)

COURSE OUTCOMES(COs):

After completion of this course, the learners will be able to:-

CO#	Detailed Statement of the CO	*BT Level	Mapping to PO #
CO1	Illustrating the features of Multithreading in python.	BTL2	PO1, PO2, PO3, PO5
CO2	Analyzing data using suitable python library.	BTL2	PO1, PO2, PO3,PO7, PO10
CO3	Visualizing data using Matplotib, Seaborn library.	BTL3	PO1, PO2, PO3,PO4
CO4	Develop python applications with database connectivity operations.	BTL3	PO1, PO2, PO3,PO4

UNIT–I

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters - 1, 2], TB2 [Chapters - 1, 2]

Analytics: Basic Nomenclature, Analytics Process Model, Analytics part in different profiles, Analytical Model Requirements.

Data Sources for data collection, Sampling and Sampling distribution, Types of data elements, Missing Values, Outlier Detection and Treatment, Standardization using Min/max and z-score, categorization, Segmentation.

UNIT–II

No. of Hours: 11 Chapter/Book Reference: TB2 [Chapter - 3], TB3 [Chapter - 7]

Statistical Hypothesis Testing, p-Values, Confidence Intervals.

Correlation, Simpson's Paradox, Some Other Correlational Caveats, Correlation and Causation, Correlation Statistics-ANOVA.

UNIT–III

No. of Hours: 11 Chapter/Book Reference: TB3[Chapter - 3], TB4 [Chapter - 8]

Data Visualization: Graphs in Python: Line Graph, Bar charts, Pie-charts, Scatter plots, multiple plots, Subplots, Legends, Changing figure Size, Styling plots using Matplotib Library**.** Functions like relplot(), displot() and catplot ().

Seaborn Library: Introduction, Line plot, Dist plot, Lmplot, Count plot, Color palettes.

UNIT–IV

No. of Hours: 11 Chapter/Book Reference: TB5 [Chapter - 4], TB3 [Chapter - 7]

GUI Programming: Creating User-interface, GUI Widgets with Tkinter, Creating Layouts, Check Box, Radio Buttons, List Box, Menus, Menus Options, Dialog Boxes
Database Access: Database Connectivity Operations: Create, lnsert, Select, Delete, Drop, Update.

TEXT BOOKS:
TB1. Analytics in a Big Data World, Essential Guide to Data Science and its Application, Bart Baesens, Wiley Big Data Series.
TB2. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data Published by John Wiley & Sons, Inc
TB3. Data Science from Scratch, 2nd Edition by Joel Grus Publisher(s): O'Reilly Media, Inc
TB4. Agile tools for real world data: Python for Data Analysis by Wes McKinney, O'Reilly
TB5. Python and Tkinter Programming JOHN E. GRAYSON

REFERENCE BOOKS:
RB1. Allen Downey, "Think Python: How to Think Like a Computer Scientist", O'Reilly, 2nd Edition,2015.
RB2. ReemaThareja, "Python Programming using Problem Solving Approach", Oxford University Press, 1" Edition, 2017. RB4. Joel Grus, "Data Science from Scratch", O'Reilly, 2no Edition ,2019.
RB3. Tony Gaddis, "starting out with Python", Pearson, 3'd Edition, 2014.
RB4. Y. Daniel Liang, "lntroduction to Programming Using Python", Pearson, 1" Edition, 201,3.
RB5. Programming in Python 3: A Complete Introduction to the Python Language (2nd Edition), Mark Summerfield

Course Code: BCAP 312 **L T C**
Course Name: Data Visualization & Analytics Lab **0 2 1**

This is the associated practical paper. The learning outcomes are same as the corresponding theory paper.

<table>
<tr><th colspan="3">List of Practicals</th></tr>
<tr><th>S.No.</th><th>Detailed Statement</th><th>Mapping to CO#</th></tr>
<tr><td colspan="3">Core Practicals</td></tr>
<tr><td>1.</td><td>Write a program to create a DataFrame have E-commerce data and perform selection of row/column using loc() and iloc()</td><td>CO1,CO2,CO3</td></tr>
<tr><td>2.</td><td>Create a Series object S5 containing numbers. Write a program to store the square of the series values in object S6. Display S6's values which are >15.</td><td>CO1, CO2, CO4</td></tr>
<tr><td>3.</td><td>Write a program to fill all missing values in a DataFrame with zero.</td><td>CO1, CO2</td></tr>
<tr><td>4.</td><td>Program for combining DataFrames using concat(), join(),merge()</td><td>CO1, CO2</td></tr>
<tr><td>5.</td><td>Write a program to draw bar graph for the following data for the Medal tally of CWG-2018:-
<table>
<tr><td>Gold</td><td>Silver</td><td>Bronze</td><td>Total</td></tr>
<tr><td>26</td><td>20</td><td>20</td><td>66</td></tr>
</table></td><td>CO1, CO2,CO3</td></tr>
<tr><td>6.</td><td>Implementing Line plot, Dist plot, Lmplot, Count plot using Seaborn library</td><td>CO1, CO2,CO3</td></tr>
<tr><td colspan="3">Application Based Practicals (Implement minimum 5 out of 10 practicals)</td></tr>
<tr><td>7.</td><td>Create a DataFrame namely aid that stores aid (Toys,books,uniform,shoes) by NGO's for different states. Write a program to display the aid for:-
(a) Books and Uniforms only
(b) Shoes only</td><td>CO1, CO2,CO5</td></tr>
<tr><td>8.</td><td>Create a DataFrame ndf having Name, Gender, Position, City, Age, Projects. Write a program to summarize how many projects are being handled by each position for each city?
Use pivot()</td><td>CO1, CO2,CO5</td></tr>
<tr><td>9.</td><td>Marks is a list that stores marks of a student in 10 unit test. Write a program to plot Line chart for the student's performance in these 10 test.</td><td>CO1, CO2</td></tr>
<tr><td>10.</td><td>Write a program to plot a horizontal bar chart from the height of some students.</td><td>CO1, CO2,CO3</td></tr>
<tr><td>11.</td><td>Write a program to implement ANNOVA.</td><td>CO1, CO2,CO3,CO5</td></tr>
<tr><td>12.</td><td>Write a program to show correlation between two randomly generated numbers .</td><td>CO1,</td></tr>
</table>

		CO2,CO4,CO5
13.	Write a program to implement Covariance.	CO1, CO2, CO5
14.	Create a GUI based form for admission purpose for your college	CO1, CO2, CO3
15.	The created GUI based application form is to connected to a database and use insert query to enter data.	CO1, CO2, CO5

Note:
1. In total 10 practicals to be implemented. 2 additional practical may be given by the course instructor.
2. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.

Course Code: BCAT 314 **L T C**
Course Name: Deep Learning with Python **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its sub parts, if any.
3. Examiners are requested to go through the Course Outcomes(CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy(BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:-

1. To present the mathematical, statistical and computational challenges of building neural networks
2. To study the concepts of deep learning and important deep learning techniques
3. To introduce important Deep Learning architectures
4. To enable the students to apply deep learning techniques to support real-life applications

PRE-REQUISITES:

Basics of Python Programming

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO#	Detailed Statement of the CO	*BT Level	Mapping to PO #
CO1	Understand the basic concepts of Deep Learning and differentiate between shallow learning and deep learning.	BTL2	PO1, PO2, PO6
CO2	Implement various Deep Learning Models.	BTL3	PO2, PO3, PO4,PO8
CO3	Understand different Deep Learning architectures and training algorithms.	BTL3	PO1, PO2, PO3,PO5, PO8
CO4	Understanding Dimensionality Reduction and optimization in Deep Learning.	BTL4	PO1, PO2, PO3,PO4
CO5	Understanding and implementing Recurrent Neural Network (RNN).27	BTL3	PO1,PO2,PO3, PO8
CO6	Applying Deep Learning techniques in real life applications such as object detection and analysis.	BTL6	PO2, PO3,PO4, PO5, PO6,PO8

UNIT-I

No. of Hours:11 Chapter/Book Reference: TB1 [Chapters - 1, 2], TB2 [Chapter - 2], TB3 [Chapters - 3, 5]

Introduction – Overview of Machine Learning, Introduction to Artificial Neural Network (ANN), Perceptron, Training a Neural Network, Activation Functions, Loss Function, Hyperparameters, Gradient Descent, Stochastic Gradient Descent, Backpropagation and regularization, Batch normalization, Building an ANN in Python, Frameworks-TensorFlow, Keras.

UNIT-II

No. of Hours:12 Chapter/Book Reference: TB1 [Chapters - 3, 4, 5, 6], TB2 [Chapters - 3,4,5], TB3[Chapters - 7, 8]

What is Deep Learning? Deep vs Shallow Networks, Convolution Neural Networks (CNN) –Convolution Layers, Pooling Layer, Flattening, FullyConnected Layers, Softmax and Cross-Entropy, Building a CNN in Python, Fully Connected CNN, CNN Architectures – LeNet, AlexNet, ZFNet, GoogLeNet, VGGNet, ResNet, DenseNet, Training a Convnet: weights initialization, batch normalization, hyperparameter optimization

UNIT-III

No. of Hours:11 Chapter/Book Reference: TB1 [Chapters - 3, 4, 7]

Deep Belief Networks, Auto Encoders, Concept of Dimensionality Reduction, Autoencoder, Denoising Autoencoders, Deep Autoencoders, Concept of Reinforcement Learning

UNIT-IV

No. of Hours: 11 Chapter/Book Reference: TB2 [Chapter - 7]; TB3 [Chapter - 9]

Recurrent Neural Networks (RNN), LSTM, Sequence Prediction and Time Series Forecasting with LSTM, Overview of Object Detection Techniques using Deep Learning, Overview of Transfer Learning.

TEXT BOOKS:

TB1. Adam Gibson and Josh Patterson, Deep Learning: A Practitioner's Approach, (O'Reilly).
TB2. Mohamed Elgendy, Deep Learning for Vision Systems, Manning Publications, ISBN: 9781617296192
TB3. Navin Kumar Manaswi, Deep Learning with Applications Using Python, Apress (2018)

REFERENCE BOOKS:

RB1. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
RB2. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
RB3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
RB4. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.
RB5. Charu C. Aggarwal, Neural Networks and Deep Learning, Springer, 2018.
RB6. M. Arif Wani, Farooq Ahmad Bhat, Saduf Afzal, Asif Iqbal Khan, Advances in Deep Learning, Springer, 2020.

Course Code: BCAP 314 **L T C**
Course Name: Deep Learning with Python Lab **0 2 1**

This is the associated practical paper. The learning outcomes are same as the corresponding theory paper.

List of Practical

S.No.	Detailed Statement	Mapping to CO#
1.	Write a program for creating a perceptron.	**CO1**
2.	Write a program to implement multi-layer perceptron using TensorFlow. Apply multi-layer perceptron (MLP) on the Iris dataset.	**CO1**
3.	(a) Write a program to implement a Convolution Neural Network (CNN) in Keras. Perform predictions using the trained Convolution Neural Network (CNN). (b) Write a program to build an Image Classifier with CIFAR-10 Data.	**CO5**
4.	(a) Write a program to perform face detection using CNN. (b) Write a program to demonstrate hyperparameter tuning in CNN.	**CO5**

	(c)Predicting Bike-Sharing Patterns – Build and train neural networks from scratch to predict the number of bike share users on a given day.	
5.	Write a program to build auto-encoder in Keras.	**CO2, CO3**
6.	Write a program to implement basic reinforcement learning algorithm to teach a bot to reach its destination.	**CO3**
7.	(a) Write a program to implement a Recurrent Neural Network (b) Write a program to implement LSTM and perform time series analysis using LSTM.	**CO5**
8.	(a) Write a program to perform object detection using Deep Learning (b) Dog-Breed Classifier – Design and train a convolutional neural network to analyze images of dogs and correctly identify their breeds. Use transfer learning and well-known architectures to improve this model.	**CO2,CO4**
9.	(a) Write a program to demonstrate different activation functions. (b) Write a program in TensorFlow to demonstrate different Loss functions.	**CO2**
10.	Write a program to build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets	**CO5**

Note:
1. In total 10 practicals to be implemented. 2 additional practical may be given by the course instructor.
2. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.

Course Code: BCA 316 **L T C**
Course Name: IT Act and Cyber Laws **4 1 5**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

1. Students will be able to have the basic clarity and understanding of cybercrimes and cyber security laws
2. Students will be able to understand the need for cyber laws, will be able to describe and differentiate between substantive, procedural, and preventive cybercrime laws.
3. To understand and critically assess national, regional, and international cybercrime laws.
4. To create awareness among the students about how crime being is committed in the cyber world.

PRE-REQUISITES:

None

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to: -

CO #	Detailed Statement of the CO	*BT Level	Mapping to PO #
CO1	Define various Cyber laws in the world, Classification of Cybercrime	BTL1	PO1, PO7
CO2	Describe and explain the ways in which certain cybercrimes are perpetrated.	BTL2	PO3
CO3	Explain and use the objectives of national cyber security strategies.	BTL2 BTL3	PO3, PO7
CO4	Discover IPR and E-commerce law.	BTL4	PO2
CO5	Explain and Evaluate E-Commerce Issues and provisions in Indian Law.	BTL5	PO3, PO4
CO6	Design and create frameworks for international cooperation on cyber security Matters.	BTL6	PO4, PO6

UNIT I

No. of Hours:14 Chapter/Book Reference: TB5 [Chapter - 1], RB2 [Chapters - 1, 2], RB3 [Chapters - 1, 3]

Introduction to the Cyber World and Cyber Law: Cyber World: An Overview, The internet and online resources, Introduction to Computer Crimes and Cyber Crimes, Distinction between cybercrimes and conventional crimes, Reasons for commission of cyber-crime, Cyber forensic.
Classification of cyber-crimes: Cyber criminals and their objectives, Planning of attacks.
Types of cybercrimes: Cyber Stalking; Forgery and Fraud, Social engineering attacks, Phishing, DoS and DDoS attacks, Identity Theft, Salami Attack, Net Extortion.
Introduction to Cyberspace: Cybercrime, Threats to the virtual world, Cyber Crimes & Social Media attacks, Cyber Squatting, Cyber Espionage, Cyber Warfare, Cyber Terrorism, Cyber Defamation, Crime related to IPRs, Computer Vandalism etc.
Access and Unauthorized Access, Data Security, E-Contracts and E-Forms

UNIT II

No. of Hours: 14 Chapter/Book Reference: TB1 [Chapter - 1], RB2 Chapter –2]

Introduction to Cyber Law, Need for Cyber Law

Evolution of the IT Act, Genesis and Necessity - Salient features of the IT Act, 2000, Various authorities under IT Act and their powers, Penalties & Offences, Amendments.

Impact on other related Acts (Amendments) - Amendments to Indian Penal Code, Indian Evidence Act, Bankers Book Evidence Act, Reserve Bank of India Act - Cyberspace Jurisdiction.

Online Safety for all with special reference for women and children, Misuse of individual information. Violation of privacy, Trafficking of Information and Data

UNIT-III

No. of Hours: 10 Chapter/Book Reference: TB1 [Chapter - 4], RB2 [Chapter - 7]

E–Commerce and Laws in India: Digital/Electronic Signature in Indian Laws, Digital Certificates, Certifying Authority, E-Commerce Issues and provisions in Indian Laws, Concept of E-Governance and its Implication in India, Issues related to E-Taxation in Cyberspace, E-Contracts and its validity in India (f) Cyber Tribunal & Appellate Tribunal.

UNIT-IV

No. of Hours: 12 Chapter/Book Reference: TB1 [Chapter - 2], RB2 [Chapters - 4, 5]

Intellectual Property Rights - Domain Names and Trademark Disputes, Concept of Trademarks in Internet Era, Cyber Squatting, Reverse Hijacking Jurisdiction in Trademark Disputes, Copyright in the Digital Medium, Copyright in Computer Programmes.

Cyber Laws in India – Crime against Individual, Crime against Property, Crime against Nation,

Indian Case Laws, An introduction to International Cyber Laws

TEXT BOOKS:

TB1. Supriya Madan, Rajan Gupta, "Security in Cyber Space and its Legal Perspective", AGPH Books

TB2. Sharma J. P,& Kanojia S. (2016). Cyber Laws. New Delhi: Ane Books Pvt. Ltd.

TB3. Duggal, P. Cyber Laws. (2016) Universal Law Publishing.

TB4. Kamath, N. (2004). Law relating to computers, internet and e-commerce: A guide to Cyber Laws and the Information Technology Act, 2000 with rules, regulations and notifications (2nd ed.). Delhi: Universal Law Publishing Co.

TB5. Cyber security: Nina Godbole, Wiley Publication 2016

REFERENCE BOOKS:

RB1. Baase, S. (2013). A Gift of Fire: Social, Legal, and Ethical Issues for Computing

RB2. Cyber Law Simplifies: Vivek Sood, McGraw Hill Publication

RB3. Introduction to Cyber Security: Anand Shinde

RB4. Technology (4th ed.) Upper Saddle River, NJ: Pearson Education.

Course Code: BCAT-318 **L T C**
Course Name: Mobile Application Development **4 0 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNINGOBJECTIVES:

In thiscourse,thelearnerswill beableto developexpertise relatedtothefollowing:-

1. Identify various concepts of mobile application programming that make it unique from programming for other platforms.
2. To help learner to gain a basic understanding of Android application development.
3. Program mobile applications for the Android operating system that use basic and advanced phone features, and deploy applications to the Android marketplace for distribution.

PRE-REQUISITES:

1. Java Programming
2. Programming fundamental

COURSEOUTCOMES(COs):

Aftercompletionofthiscourse,thelearners willbe ableto:-

CO#	DetailedStatementoftheCO	*BTLevel	MappingtoPO #
CO1	Recognize the concept of application development for mobile devices.	BTL2	PO1, PO2,
CO2	Understand the basic technologies used by the Android platform	BTL2	PO1, PO2,
CO3	Recognize and use Android Environment Emulator and Application life cycle	BTL3	PO1, PO2, PO3,PO4
CO4	Develop mobile applications for the Android operating system that use basic and advanced phone features	BTL5	PO1, PO2, PO3,PO4,PO7
CO5	Deploy applications to the Android marketplace for distribution	BTL6	PO1,PO2,PO3, PO4,PO11

UNIT-I

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters - 1, 2], TB2 [Chapters - 2, 3]

Introduction: Brief history of mobile applications, Different types of mobile applications, Brief history of Android, Introduction to Android Development Environment, Android Application

Design Essentials: Anatomy of an Android applications, Creating First Android Application, Creating Android project , Project organization, Setting up real Android device , Setting up Android emulator, Developing simple user interface , Running your first application

Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

UNIT-II

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapter - 3,4,5,6], TB2 [Chapters – 5, 6, 7]

User Interface in Android: Adaptive and responsive user interfaces, User Input Controls, Menus, Screen Navigation, Recycler View, Drawables, Themes and Styles, Fragments Fragment Life Cycle, Introduction to Material Design.
Android Application Components: App Widgets, Processes and Threads, User Interface Components, Views and layouts, Input controls, Input Events, Settings, Dialogs, Menus, Notifications, Toasts, Testing the user interface

UNIT – III

No. of Hours: 11 Chapter/Book Reference: TB1 [Chapters - 8, 9], TB2 [Chapter - 9]

Background tasks: AsyncTask, AsyncTaskLoader, Connecting App to Internet, Broadcast receivers, Services, Notifications, Alarm managers.
Sensor, Location and Maps: Sensor Basic, Motion and Position Sensors, Location services, Google maps API, Google Places API

UNIT- IV

No. of Hours: 11 Chapter/Book Reference: TB1[Chapters - 9,10], TB2[Chapter - 10]

Working with data in Android: Shared Preferences, App Setting, SQLite primer, Store data using SQLite database, Content Providers, Content Resolver, Loader
Publishing Your App: Preparing for publishing, Signing and preparing the graphics, publishing to the Android Market
Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

TEXT BOOKS:

TB1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
TB2. Wei-Meng Lee," Beginning Android 4 Application Development", Wiley India Pvt. Ltd.
TB3. J. F. DiMarzio, "Android: A Programmers Guide", McGraw Hill Education (India) Private Limited.

REFERENCE BOOKS:

RB1. Paul Deitel "Android for Programmers: An App-Driven Approach" 1st Edition, Pearson India.
RB2. Wei-Meng Lee, "Beginning Android Application Development", Wiley Publishing

Course Code: BCAP 318 **L T C**
Course Name: Mobile Application Development Lab **0 2 1**

This is the associated practical paper. The learning outcomes are same as the corresponding theory paper.

List of Practicals		
	Detailed Statement	**Mapping to CO#**
Core Practicals (Implement minimum 8 out of 10 practicals)		
1.	Create "hello world" application to display "hello world" in the middle of the screen in the emulator as well asandroid phone	**CO1**
2.	Create an android app to display various android lifecycle phases.	**CO3**
3.	Create a calculator app that performs addition, subtraction, division and multilpication operation on numbers.	**CO2**
4.	Write an Android application to convert into different currencies for example, Rupees to dollar	**CO4, CO5**
5.	Write an android application to convert a ball from size of radius 2(colour red) to radius 4(colour blue) to radius 6 (colour green). The ball must rotate in circle for 1 minute before changing size and colour.	**CO4, CO5**
6.	Write an application to mark the daily route of travel in map.	**CO4, CO5**
7.	Write an application to record video and audio on topic "Intent" and play the audio and video.	**CO4, CO5**
8.	Create a spinner application with strings taken from resource directory	**CO4, CO5**

	res/values/strings.xml and on changing the spinner value, image will change. Image is saved in the drawable directory.	
9.	Create an app that uses radiobutton group which calculates discount on shopping bill amount. Use ediitext to enter bill amount and select one of three radio buttons to determine a discount for 10, 15, or 20 percent.the discount is calculated upon selection of one of the buttons and displayed in a textview control.	**CO3,CO4, CO5**
10.	Create an application that uses checkbox for construction of a shopping list so the user can check off items as they are picked up. The checked items should be displayed in a textview control.	**CO4, CO5**
11.	Create a login application to verify username and password. On successful login, redirect to another activity that has a textview to display "welcome user" with logout button. On click of logout button, a dialog should appear with ok and cancel buttons. On click of oK button, go back to the login activity and on click of cancel button, stay on the same activity.	**CO2**, **CO4, CO5**
12.	Create an application to perform the operations of create, insert, delete, view and update, using sqlite database.	**CO4, CO5**
13.	Create an application to pick up any image from the native application gallery and display it on the screen.	**CO4, CO5**
14.	Read phonebook contacts using content providers and display in list.	**CO2,CO4, CO5**
15.	Create an application to take picture using native application.	**CO2,CO4, CO5**

Note:
1. In total 10 practicals to be implemented. 2 additional practical may be given by the course instructor.
2. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.

Course Code: BCA 372 **L T C**
Course Name: Practical-XII IOT Lab **0 4 2**

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:

5. To learn and understand the concept of Internet of Things (IOT).
6. To study the constituent components of Internet of Things.
7. To design and develop IoT applications using different, Sensors/actuators.
8. To seek working knowledge of Arduino, Raspberry pi Boards and to develop cloud based IOT projects.

PRE-REQUISITES:

3. Basic Programming Knowledge
4. Use of Internet

COURSE OUTCOMES (COs):

After completion of this course, the learners will be able to:-

CO#	Detailed Statement of the CO	*BT Level	Mapping to PO #
CO1	Understand the architecture and the functional blocks of Internet of Things.	BTL2	PO1, PO2, PO3
CO2	Explain the concepts of Internet of Things and gain knowledge to design IoT applications	BTL2	PO1, PO2, PO3,PO7, PO10
CO3	Demonstrate the process of capturing and analyzing data in Internet of Things.	BTL3	PO1, PO2, PO3,PO4
CO4	Examine the various components involved in IoT design methodology.	BTL4	PO1, PO2, PO3,PO4,PO7
CO5	Evaluate an IoT device to work with a Cloud Computing infrastructure.	BTL5	PO1,PO2,PO3, PO4,PO11
CO6	Implement IoT protocols for communication.	BTL6	PO1,PO2, PO3,PO4, PO6, PO7,PO8

List of Practicals

S.No.	Detailed Statement	Mapping to CO #
1.	Study and Install IDE of Arduino	CO1,CO2
2.	Write the steps to add libraries in Arduino and setup of Arduino IDE for programming.	CO2, CO3
3.	Write a Program using Arduino for Blink LED.	CO2, CO3
4.	Write a Program for monitoring Temperature using Arduino and LM35 Temperature Sensors.	CO2, CO3,
5.	Write a Program for Controlling Raspberry Pi with WhatsApp.	
6.	Write a program to shows how to fade an LED on pin 9 using the analog Write( )function.	CO3,CO4
7.	Write the steps to add blynk libraries for NodeMCU and account on IFTTT for home automation.	CO2, CO3,CO4
8.	Write a program of Fade LED using NodeMCU(ESP8266) and blynk app	CO2, CO3,CO4
9.	Write a program for Arduino by using Ultrasonic sensors and servo motor (HC-	CO2, CO3,CO4

	SR04), and make a smart dustbin.	
10.	Write a program for controlling bulb on/off by using Blynk app.	CO2, CO3,CO4

Suggested IOT based Applications

1. Create home automation project for controlling electrical home appliances via Google assistant or any other IOT based project may be undertaken.
2. Setting up Wireless Access Point using Raspberry Pi.
3. Fingerprint Sensor interfacing with Raspberry Pi
4. Raspberry Pi GPS Module Interfacing.

Visitor Monitoring with Raspberry Pi and Pi Camera

Note:
1. In total 10 practicals and one application to be implemented. 2 additional practical may be given by the course instructor.
2. This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.