

7th Semester Syllabus — CSE

Emerging Area Specialization: Cyber Security

Compiled from: Handbook of B.Tech. Programmes offered by USICT at Affiliated Institutions of the University.

Applicable from Batch Admitted in Academic Session 2021-22 Onwards

Principles of Entrepreneurship Mindset

L	P	C
2	-	2

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
All	7	HS/MS	HS/MS	MS-401

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To understand basic aspects of establishing a business in a competitive environment.
2. To apply the basic understanding to examine the existing business ventures.
3. To examine various business considerations such as marketing, financial and teaming etc.
4. To assess strategies for planning a business venture.

Course Outcomes (CO)

- CO 1** Understand basic aspects of establishing a business in a competitive environment.
- CO 2** Apply the basic understanding to examine the existing business ventures.
- CO 3** Examine various business considerations such as marketing, financial and teaming etc.
- CO 4** Assess strategies for planning a business venture.

UNIT-I

Entrepreneurial perspective: Foundation, Nature and development of entrepreneurship, importance of entrepreneurs, Entrepreneurial Mind, Individual entrepreneur, Types of entrepreneurs, Entrepreneurship in India.

UNIT-II

Beginning Considerations: Creativity and developing business ideas; Creating and starting the venture; Building a competitive advantage; Opportunity recognition, Opportunity assessment; Legal issues.

UNIT-III

Developing Financial Plans: Sources of Funds, Managing Cash Flow, Creating a successful Financial Plan, Developing a business plan.

UNIT-IV

Developing Marketing Plans: Developing a powerful Marketing Plan, E-commerce, Integrated Marketing Communications. Leading Considerations: Developing Team, Inviting candidates to join team, Leadership model.

Textbook(s):

1. Robert D Hisrich, Michael P Peters & Dean A Shepherd, "Entrepreneurship", 10th Edition, McGraw Hill Education, 2018.

References:

1. Norman M. Scarborough and Jeffery R. Cornwell, "Essentials of Entrepreneurship and Small Business Management", 8th Edition, Pearson, 2016.
2. Rajiv Roy, "Entrepreneurship", 2nd Edition, Oxford University Press, 2011.
3. Sangeeta Sharma, "Entrepreneurship Development", 1st Edition, Prentice-Hall India, 2016.
4. John Mullins, "The New Business Road Test: What entrepreneurs and investors should do before launching a lean start-up", 5th Edition, Pearson Education, 2017.
5. Charantimath, "Entrepreneurship Development and Small Business Enterprise", Pearson Education.

Data Science

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE	7	PCE	PCE-4	CIE-405T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To introduce the students about the knowledge and overview of R or Octave statistical package, data transformation and merging, data visualization and illustration of techniques through R or Octave.
2. To understand statistical techniques like regression analysis and structural equation modelling.
3. To promote deeper understanding of forecasting, time series data analysis and auto regression models.
4. To provide overview of support vector machine, linear discriminant analysis and clustering techniques.

Course Outcomes (CO)

- CO 1** Develop relevant programming abilities.
- CO 2** Demonstrate proficiency with statistical analysis of data.
- CO 3** Develop the ability to build and assess data-based models.
- CO 4** Execute statistical analyses with professional statistical software.

UNIT-I

Overview of R or Octave statistical package. Introduction to R, Variables, Comments, Data Types, Strings, Operators, If-Else, Loops, Functions, Vectors, Lists, Arrays, Data Frames. Data Pre-processing, Data Scales, Similarity and Dissimilarity measures, sampling and quantization of data, filtering, Data transformation and merging, Data visualization, PCA, Correlation, Chi-Square test. Illustration of these techniques through R or Octave.

UNIT-II

Regression Analysis, linear, generalized, regularized regression, Cross-validation, Training and Testing data set, Overview of nonlinear regression, Overview of Ridge regression, Latent variables, Structure Equation Modelling. Illustration of these techniques through R or Octave.

UNIT-III

Forecasting, time series data analysis, Stationarity, Seasonality, recurrent models, autoregressive models. Illustration of these techniques through R or Octave.

UNIT-IV

Classification, Linear discriminant analysis, overview of support vector machine, Decision trees, Clustering, Clustering techniques. Illustration of these techniques through R or Octave.

Textbook(s):

1. Runkler, Thomas A., "Data Analytics: Models and Algorithms for Intelligent Data Analysis", Springer, 2012.
2. Friedman, Jerome, Trevor Hastie, and Robert Tibshirani, "The Elements of Statistical Learning", Vol. 1, New York: Springer Series in Statistics, 2001.

References:

1. Zuur, Alain, Elena N. Ieno, and Erik Meesters, "A Beginner's Guide to R", Springer, 2009.
2. Hansen, Jesper Schmidt, "GNU Octave: Beginner's Guide: Become a Proficient Octave User by Learning this High-level Scientific Numerical Tool from the Ground Up", Packt Publishing Ltd, 2011.

Data Science Lab

L	P	C
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Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE	7	PCE	PCE-4	CIE-405P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Data Science) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
1. Installation of R, basic syntax of R.
2. Describing data, viewing and manipulating data using R.
3. To plot the probability distribution curve through R software.
4. To perform chi square test on various data sets.
5. To use Python as a programming tool for the analysis of data structures.
6. To perform various operations such as data storage, analysis and visualization through R software.
7. To perform descriptive statistics analysis and data visualization in Python.
8. To perform Principal Component Analysis on datasets using R software.
9. To perform linear regression on datasets using R software.
10. To perform Data Aggregation and Group-Wise Operations.
11. To edit and execute programs involving Flow Controls.
12. To edit and execute programs involving functions.

Data Warehousing and Data Mining

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE	7	PCE	PCE-5	CIE-425T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To understand the need of data warehousing for data analysis.
2. To understand and apply OLAP operations.
3. To identify the need of various data mining techniques.
4. To apply various data mining techniques.

Course Outcomes (CO)

- CO 1** Able to understand the ETL Process.
- CO 2** Able to understand and apply OLAP operations for data analysis.
- CO 3** Able to apply supervised learning based data mining techniques.
- CO 4** Able to apply unsupervised learning based data mining techniques.

UNIT-I

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. Data pre-processing: Data cleaning, Data transformation, ETL Process, ETL tools. Defining the business requirements: Dimensional analysis, information packages – a new concept, requirements gathering methods, requirements definition: scope and content.

UNIT-II

Principles of Dimensional Modelling: 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 is the answer, 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

Data Mining Basics: What is Data Mining, Data Mining Defined, The knowledge discovery process (KDD Process), Data Mining Applications – The Business Context of Data Mining, Data Mining for Process Improvement, Data Mining as a Research Tool, Data Mining for Marketing, Benefits of data mining. Major Data Mining Techniques: Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, KNN Algorithm.

UNIT-IV

Cluster detection, K-means Algorithm, Outlier Analysis, memory-based reasoning, link analysis, Mining Association Rules in Large Databases: Association Rule Mining, genetic algorithms, neural networks. Data mining tools.

Textbook(s):

1. Paul Raj Poonia, "Fundamentals of Data Warehousing", John Wiley & Sons, 2004.
2. Kamber and Han, "Data Mining Concepts and Techniques", Hart Court India P. Ltd., Elsevier, 2nd Edition, 2001.

References:

1. W. H. Inmon, "Building the Operational Data Store", 2nd Edition, John Wiley, 1999.
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson.
3. Shmueli, "Data Mining for Business Intelligence: Concepts, Techniques and Applications in Microsoft Excel with XLMiner", Wiley Publications.

Data Warehousing and Data Mining Lab

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Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE	7	PCE	PCE-5	CIE-425P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Data Warehousing and Data Mining) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
1. Study of ETL process and its tools.
2. Program of Data warehouse cleansing to input names from users (inconsistent) and format them.
3. Program of Data warehouse cleansing to remove redundancy in data.
4. Introduction to WEKA tool.
5. Implementation of Classification technique on ARFF files using WEKA.
6. Implementation of Clustering technique on ARFF files using WEKA.
7. Implementation of Association Rule technique on ARFF files using WEKA.
8. Implementation of Visualization technique on ARFF files using WEKA.
9. Perform Data Similarity Measure (Euclidean, Manhattan Distance).
10. Perform Apriori algorithm to mine frequent item-sets.
11. Develop different clustering algorithms like K-Means, K-Medoids Algorithm, Partitioning Algorithm and Hierarchical clustering.
12. Apply Validity Measures to evaluate the quality of clustering.

Cyber Crime and Cyber Laws

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	CS-EAE	CS-EAE-3	CS-421T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. Understand the threats in networks and security concepts.
2. Apply authentication applications in different networks.
3. Understand security services for email.
4. Awareness of firewall and its applications.

Course Outcomes (CO)

- CO 1** Understands the different elements of cybercrime and how to deal with such issues with clarity.
- CO 2** Analysis of various legal provisions of cyber-crimes and the mechanism of their enforcement.
- CO 3** To know the essential legal provisions of internet governance.
- CO 4** To understand the prevention of cyber crimes.

UNIT-I

Cyber Crime – Overview, Internal and External Attacks, Attack Vectors. Cybercrimes against Individuals – E-mail spoofing and online frauds, Phishing and its forms, Spamming, Cyber-defamation, Cyberstalking, Cyber Bullying and harassment, Computer Sabotage, Pornographic offenses, Password Sniffing, Keyloggers and Screenloggers.

UNIT-II

Cybercrime against organization – Unauthorized access of computer, Password Sniffing, Denial-of-Service (DOS) attack, Backdoors and Malwares and its types, E-mail Bombing, Salami Attack, Software Piracy, Industrial Espionage, Intruder attacks, Security policies violations, Crimes related to Social Media, ATM, Online and Banking Frauds, Intellectual Property Frauds.

UNIT-III

The World Wide Web, Web Centric Business, e-Business Architecture, Models of e-Business, e-Commerce, Threats to virtual world. IT Act 2000 – Objectives, Applicability, Non-applicability, Definitions, Amendments and Limitations. Cyber Crimes – Cyber Squatting, Cyber Espionage, Cyber Warfare, Cyber Terrorism, Cyber Defamation.

UNIT-IV

Digital Signature, E-Signature, Electronic Records, Electronic Evidence and Electronic Governance. Controller, Certifying Authority and Cyber Appellate Tribunal (Rules announced under the Act), Network and Network Security, Access and Unauthorized Access.

Textbook(s):

1. Nina Godbole and Sunit Belapore, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publications, 2011.
2. Karnika Seth, "Computers, Internet and New Technology Laws", Lexis Nexis Buttersworth Wadhwa, 2012.
3. Vikas Vashishth, "Law and Practice of Intellectual Property in India".

References:

1. William Stallings, "Cryptography and Network Security: Principles and Practices", Fifth Edition, Prentice Hall Publication Inc., 2007.
2. Harish Chander, "Cyber Laws and IT Protection", PHI Learning Pvt. Ltd, 2012.
3. Shon Harris, "All in One CISSP, Exam Guide", Sixth Edition, McGraw Hill, 2013.

Cyber Crime and Cyber Laws Lab

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Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	CS-EAE	CS-EAE-3	CS-421P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Cyber Crime and Cyber Laws) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
 1. Checklist for reporting cyber crime at Cyber Crime Police Station.
 2. Checklist for reporting cyber crime online.
 3. Reporting phishing emails.
 4. Demonstration of email phishing attack and preventive measures.
 5. Basic checklist, privacy and security settings for popular social media platforms.
 6. Reporting and redressal mechanism for violations and misuse of social media platforms.
 7. Do's and Don'ts for posting content on social media platforms.
 8. Registering complaints on a social media platform.
 9. List out security controls for mobile phone and implement technical security controls in the personal mobile phone.
 10. Log into computer system as an administrator and check the security policies in the system.

Cyber Security and Forensics

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	CS-EAE	CS-EAE-4	CS-423T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To understand the threats in networks and security concepts.
2. To apply authentication applications in different networks.
3. To correctly define and cite appropriate instances for the application of computer forensics; correctly collect and analyze computer forensic evidence.
4. To identify the essential and up-to-date concepts, algorithms, protocols, tools, and methodology of computer forensics.

Course Outcomes (CO)

- CO 1** Understand the foundations of cyber security and threat landscape.
- CO 2** Analyze governance, regulatory, legal, economic, environmental, social and ethical contexts of cyber security.
- CO 3** Understand the concept of cyber security and issues and challenges associated with it.
- CO 4** Understand the cyber crimes, their nature, legal remedies, and how to report the crimes through available platforms and procedures.

UNIT-I

Introduction to Incident Response Process: Computer Security Incident, Goals of Incident response, Who is involved in Incident response, Incident Response Methodology, Pre-incident preparation, Detection of Incidents, Initial response, Formulate a response strategy, Investigate the incident, Reporting and Resolution.

UNIT-II

Preparing for Incident Response: preparing Individual Hosts, Recording of Cryptographic Checksum of critical files, enabling secure Audit Logging, Building Up your Hosts Defense, Preparing a Network: Installing Firewalls and IDS, User access control Lists, Establishing Appropriate Policies and Procedures, creating a response tool kit, Establishing an Incident Response Team, Incident handling after Detection of an Incident.

UNIT-III

Fundamentals of Computer Forensics, Computer Forensics Technology, Live data collection from Windows systems, Live data collection from Unix systems, Data Acquisition of digital evidence from electronic media,

Evidence collection and preservation, Network Forensics, Email Investigations, Mobile device forensics, Computer Forensics Analysis and Validation, Macro Threats.

UNIT-IV

Data analysis Techniques: Preparation for Forensic Analysis, Restoring a forensic Duplicate, Recovering deleted files on Windows systems, recovering Unallocated Space, Free Space and Slack space, Writing forensic Reports, Report Writing Guidelines.

Textbook(s):

1. K Mandia, C. Proise, Matt Pepe, "Incident Response and Computer Forensics", 2nd Edition, 2003, TMH.
2. John R. Vacca, "Computer Forensics", 2nd Edition, 2004, Firewall Media.

References:

1. Chad Steel, "Windows Forensics", 1st Edition, 2006, Wiley India.
2. R M Slade, "Software Forensics", 1st Edition, 2004, TMH.
3. Majid Yar, "Cybercrime and Society", 1st Edition, 2006, Sage Publications.

Cyber Security and Forensics Lab

L	P	C
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Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	CS-EAE	CS-EAE-4	CS-423P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Cyber Security and Forensics) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
 1. Creating a Forensic Image using FTK Imager / EnCase Imager.
 2. Perform data acquisition using USB Write Blocker and FTK Imager.
 3. Forensics Case Study: solve the case study (image file) provided in lab using EnCase Investigator or Autopsy.
 4. Capturing and analyzing network packets using Wireshark; recovering and inspecting deleted files (check for deleted files, recover them, analyze and inspect the recovered files).
 5. Installation and configuration of Computer Host Firewall.
 6. Demonstration of email phishing attack and preventive measures.
 7. Installation and configuration of computer Anti-virus.
 8. Do's and Don'ts for posting content on social media platforms.
 9. Wi-Fi security management in computer and mobile.
 10. Setting and configuring two factor authentication in the mobile phone.

Ethical Hacking

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	CS-EAE	CS-EAE-5	CS-425T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To acquire knowledge about various security threats that exist and can be exploited.
2. To learn how bots, botnets, viruses, worms, Trojans, DOS attacks, DDOS attacks etc. work and are utilized for hacking.
3. To learn various ethical laws that exist in India and abroad and their significance.
4. To understand how loopholes and potential risks can be detected and learn a wide variety of solutions that can be applied to protect data and networks.

Course Outcomes (CO)

- CO 1** Ability of students to understand concepts of ethical hacking tools and techniques.
- CO 2** Ability of students to learn aspects of security, importance of data gathering, foot printing and system hacking.
- CO 3** Ability of students to learn and analyze advanced concepts such as DDoS Attacks, Buffer Overflows, SQL Injection, Cross Site Scripting, Virus Creation.
- CO 4** Apply and use ethical hacking techniques to real world problems.

UNIT-I

Introduction to Ethical Hacking, Hacking Laws, Foot-printing, Reconnaissance, Scanning, System Hacking Cycle, Enumeration, Cracking Password, Types of password attacks, Trojans and Backdoors, Types of Trojans, Viruses, Worms, Rootkits.

UNIT-II

Sniffers, Types of Sniffing, Phishing, Methods of Phishing, Types of Phishing Attacks, Process of Phishing, Denial of Service, Classification of DoS attacks, Bots and Botnets, Botnets Life Cycle, System and Network Vulnerability.

UNIT-III

Ping of Death attack, Session Hijacking, Spoofing vs Hijacking, Session Hijacking Levels, Network Level Hijacking, 3-way handshake, IP Spoofing, RST Hijacking, TCP/IP Hijacking, SQL Injection, Cross Site Scripting.

UNIT-IV

Dark web, Darknet and Tor, Layers of Web, Uses of Deep Web, Ethical use of Darknet, How to access Darknet safely, Accessing the Deep Web. Authentication: RSA SecurID Token, Biometrics, Hacking Wireless Networks, Tools for ethical hacking.

Textbook(s):

1. S. McClure, J. Scambray and G. Kurtz, "Hacking Exposed 7: Network Security Secrets & Solutions", Tata McGraw Hill Publishers, 3rd Ed., 2012.
2. Sean-Philip Oriyano, "CEH v9: Certified Ethical Hacker Version 9", 1st Ed., Wiley & Sons, 2016.

References:

1. M.T. Simpson, N. Antill, "Hands-On Ethical Hacking and Network Defense", 3rd Ed., Cengage Learning, 2016.
2. Rafay Baloch, "A Beginner's Guide to Ethical Hacking", 1st Ed., CRC Press, 2014.

Ethical Hacking Lab

L	P	C
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Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	CS-EAE	CS-EAE-5	CS-425P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Ethical Hacking) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
1. Introduction to ethical hacking; fundamentals of computer networking; TCP/IP protocol stack.
2. Setup a honeypot and monitor the honeypot on network.
3. Write a script or code to demonstrate SQL injection attacks.
4. Create a social networking website login page using phishing techniques.
5. Write a code to demonstrate DoS attacks.
6. Install rootkits and study a variety of options.
7. Study of techniques used for web-based password capturing.
8. Install jCrypt tool (or any other equivalent) and demonstrate Asymmetric, Symmetric Crypto algorithms, Hash and Digital/PKI signatures studied in theory (Network Security and Management).
9. Implement passive scanning, active scanning, session hijacking, cookies extraction using Burp Suite tool.
10. Case studies: various attack scenarios and their remedies.

7th Semester Syllabus — CSE

Emerging Area Specialization: Full Stack Development (FSD)

Compiled from: Handbook of B.Tech. Programmes offered by USICT at Affiliated Institutions of the University.

Applicable from Batch Admitted in Academic Session 2021-22 Onwards

Principles of Entrepreneurship Mindset

L	P	C
2	-	2

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
All	7	HS/MS	HS/MS	MS-401

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

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5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To understand basic aspects of establishing a business in a competitive environment.
2. To apply the basic understanding to examine the existing business ventures.
3. To examine various business considerations such as marketing, financial and teaming etc.
4. To assess strategies for planning a business venture.

Course Outcomes (CO)

- CO 1** Understand basic aspects of establishing a business in a competitive environment.
- CO 2** Apply the basic understanding to examine the existing business ventures.
- CO 3** Examine various business considerations such as marketing, financial and teaming etc.
- CO 4** Assess strategies for planning a business venture.

UNIT-I

Entrepreneurial perspective: Foundation, Nature and development of entrepreneurship, importance of entrepreneurs, Entrepreneurial Mind, Individual entrepreneur, Types of entrepreneurs, Entrepreneurship in India.

UNIT-II

Beginning Considerations: Creativity and developing business ideas; Creating and starting the venture; Building a competitive advantage; Opportunity recognition, Opportunity assessment; Legal issues.

UNIT-III

Developing Financial Plans: Sources of Funds, Managing Cash Flow, Creating a successful Financial Plan, Developing a business plan.

UNIT-IV

Developing Marketing Plans: Developing a powerful Marketing Plan, E-commerce, Integrated Marketing Communications. Leading Considerations: Developing Team, Inviting candidates to join team, Leadership model.

Textbook(s):

1. Robert D Hisrich, Michael P Peters & Dean A Shepherd, "Entrepreneurship", 10th Edition, McGraw Hill Education, 2018.

References:

1. Norman M. Scarborough and Jeffery R. Cornwell, "Essentials of Entrepreneurship and Small Business Management", 8th Edition, Pearson, 2016.
2. Rajiv Roy, "Entrepreneurship", 2nd Edition, Oxford University Press, 2011.
3. Sangeeta Sharma, "Entrepreneurship Development", 1st Edition, Prentice-Hall India, 2016.
4. John Mullins, "The New Business Road Test: What entrepreneurs and investors should do before launching a lean start-up", 5th Edition, Pearson Education, 2017.
5. Charantimath, "Entrepreneurship Development and Small Business Enterprise", Pearson Education.

Data Science

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE	7	PCE	PCE-4	CIE-405T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To introduce the students about the knowledge and overview of R or Octave statistical package, data transformation and merging, data visualization and illustration of techniques through R or Octave.
2. To understand statistical techniques like regression analysis and structural equation modelling.
3. To promote deeper understanding of forecasting, time series data analysis and auto regression models.
4. To provide overview of support vector machine, linear discriminant analysis and clustering techniques.

Course Outcomes (CO)

- CO 1** Develop relevant programming abilities.
- CO 2** Demonstrate proficiency with statistical analysis of data.
- CO 3** Develop the ability to build and assess data-based models.
- CO 4** Execute statistical analyses with professional statistical software.

UNIT-I

Overview of R or Octave statistical package. Introduction to R, Variables, Comments, Data Types, Strings, Operators, If-Else, Loops, Functions, Vectors, Lists, Arrays, Data Frames. Data Pre-processing, Data Scales, Similarity and Dissimilarity measures, sampling and quantization of data, filtering, Data transformation and merging, Data visualization, PCA, Correlation, Chi-Square test. Illustration of these techniques through R or Octave.

UNIT-II

Regression Analysis, linear, generalized, regularized regression, Cross-validation, Training and Testing data set, Overview of nonlinear regression, Overview of Ridge regression, Latent variables, Structure Equation Modelling. Illustration of these techniques through R or Octave.

UNIT-III

Forecasting, time series data analysis, Stationarity, Seasonality, recurrent models, autoregressive models. Illustration of these techniques through R or Octave.

UNIT-IV

Classification, Linear discriminant analysis, overview of support vector machine, Decision trees, Clustering, Clustering techniques. Illustration of these techniques through R or Octave.

Textbook(s):

1. Runkler, Thomas A., "Data Analytics: Models and Algorithms for Intelligent Data Analysis", Springer, 2012.
2. Friedman, Jerome, Trevor Hastie, and Robert Tibshirani, "The Elements of Statistical Learning", Vol. 1, New York: Springer Series in Statistics, 2001.

References:

1. Zuur, Alain, Elena N. Ieno, and Erik Meesters, "A Beginner's Guide to R", Springer, 2009.
2. Hansen, Jesper Schmidt, "GNU Octave: Beginner's Guide: Become a Proficient Octave User by Learning this High-level Scientific Numerical Tool from the Ground Up", Packt Publishing Ltd, 2011.

Data Science Lab

L	P	C
-	2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE	7	PCE	PCE-4	CIE-405P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Data Science) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
1. Installation of R, basic syntax of R.
2. Describing data, viewing and manipulating data using R.
3. To plot the probability distribution curve through R software.
4. To perform chi square test on various data sets.
5. To use Python as a programming tool for the analysis of data structures.
6. To perform various operations such as data storage, analysis and visualization through R software.
7. To perform descriptive statistics analysis and data visualization in Python.
8. To perform Principal Component Analysis on datasets using R software.
9. To perform linear regression on datasets using R software.
10. To perform Data Aggregation and Group-Wise Operations.
11. To edit and execute programs involving Flow Controls.
12. To edit and execute programs involving functions.

Data Warehousing and Data Mining

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE	7	PCE	PCE-5	CIE-425T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To understand the need of data warehousing for data analysis.
2. To understand and apply OLAP operations.
3. To identify the need of various data mining techniques.
4. To apply various data mining techniques.

Course Outcomes (CO)

- CO 1** Able to understand the ETL Process.
- CO 2** Able to understand and apply OLAP operations for data analysis.
- CO 3** Able to apply supervised learning based data mining techniques.
- CO 4** Able to apply unsupervised learning based data mining techniques.

UNIT-I

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. Data pre-processing: Data cleaning, Data transformation, ETL Process, ETL tools. Defining the business requirements: Dimensional analysis, information packages – a new concept, requirements gathering methods, requirements definition: scope and content.

UNIT-II

Principles of Dimensional Modelling: 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 is the answer, 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

Data Mining Basics: What is Data Mining, Data Mining Defined, The knowledge discovery process (KDD Process), Data Mining Applications – The Business Context of Data Mining, Data Mining for Process Improvement, Data Mining as a Research Tool, Data Mining for Marketing, Benefits of data mining. Major Data Mining Techniques: Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, KNN Algorithm.

UNIT-IV

Cluster detection, K-means Algorithm, Outlier Analysis, memory-based reasoning, link analysis, Mining Association Rules in Large Databases: Association Rule Mining, genetic algorithms, neural networks. Data mining tools.

Textbook(s):

1. Paul Raj Poonia, "Fundamentals of Data Warehousing", John Wiley & Sons, 2004.
2. Kamber and Han, "Data Mining Concepts and Techniques", Hart Court India P. Ltd., Elsevier, 2nd Edition, 2001.

References:

1. W. H. Inmon, "Building the Operational Data Store", 2nd Edition, John Wiley, 1999.
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson.
3. Shmueli, "Data Mining for Business Intelligence: Concepts, Techniques and Applications in Microsoft Excel with XLMiner", Wiley Publications.

Data Warehousing and Data Mining Lab

L	P	C
-	2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE	7	PCE	PCE-5	CIE-425P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Data Warehousing and Data Mining) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
1. Study of ETL process and its tools.
2. Program of Data warehouse cleansing to input names from users (inconsistent) and format them.
3. Program of Data warehouse cleansing to remove redundancy in data.
4. Introduction to WEKA tool.
5. Implementation of Classification technique on ARFF files using WEKA.
6. Implementation of Clustering technique on ARFF files using WEKA.
7. Implementation of Association Rule technique on ARFF files using WEKA.
8. Implementation of Visualization technique on ARFF files using WEKA.
9. Perform Data Similarity Measure (Euclidean, Manhattan Distance).
10. Perform Apriori algorithm to mine frequent item-sets.
11. Develop different clustering algorithms like K-Means, K-Medoids Algorithm, Partitioning Algorithm and Hierarchical clustering.
12. Apply Validity Measures to evaluate the quality of clustering.

PHP Programming and MySQL

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	FSD-EAE	FSD-EAE-3	FSD-435T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. Learn how to take a static website and turn it into a dynamic website run from a database using PHP and MySQL.
2. Analyze the basic structure of a PHP web application and be able to install and maintain the web server, compile, and run a simple web application.
3. Learn how databases work and how to design one, as well as how to use phpMyAdmin to work with MySQL.
4. Learn different ways of connecting to MySQL through PHP, and how to create tables, enter data, select data, change data, and delete data. Connect to SQL Server and other data sources.

Course Outcomes (CO)

- CO 1** Interpret the server side scripting PHP and create dynamic web pages.
- CO 2** Outline the advanced concepts of PHP and design web pages to authenticate users.
- CO 3** Develop server side programs using PHP and accessing database through PHP.
- CO 4** Design web pages to authenticate users using Cookies.

UNIT-I

Introduction to PHP: Evaluation of PHP, Basic Syntax, Defining variable and constant, PHP Data type, Operator and Expression, Decisions and loop: Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with HTML. Function: What is a function, Define a function, Call by value and Call by reference, Recursive function. String: Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function.

UNIT-II

Array: Anatomy of an Array, Creating index based and Associative array, Accessing array Element, Looping with Index based array, Looping with associative array using each() and foreach(), Some useful Library function. Handling HTML Form with PHP: Capturing Form Data, Dealing with Multi-value field, and Generating File uploaded form, redirecting a form after submission.

UNIT-III

Working with file and Directories: Understanding file & directory, Opening and closing a file, Copying, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading. Session and Cookie: Introduction to Session Control, Session Functionality, What is a Cookie, Setting Cookies with PHP, Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.

UNIT-IV

Introduction to RDBMS: Connection with MySQL Database, Performing basic database operations (DML) (Insert, Delete, Update, Select), Setting query parameter, Executing query, Join (Cross joins, Inner joins, Outer Joins, Self joins).

Textbook(s):

1. Dave W Mercer, Allan Kent, Steven D Nowicki, David Mercer, Dan Squier, Wankyu Choi, "Beginning PHP".
2. Rasmus Lerdorf and Kevin Tatore, "Programming PHP".

References:

1. "Learning PHP, MySQL", books by O'Reilly Press.
2. "PHP, MySQL and Apache" by Julie C Meloni, Pearson Education.

PHP Programming and MySQL Lab

L	P	C
-	2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	FSD-EAE	FSD-EAE-3	FSD-435P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (PHP Programming and MySQL) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
1. Install and configure PHP, web server, MySQL; write a program to print "Welcome to PHP"; write a simple PHP program using expressions and operators.
2. Write a PHP program to demonstrate the use of Decision making control structures (if, if-else, switch).
3. Write a PHP program to demonstrate the use of Looping structures (while, do-while, for, foreach).
4. Write a PHP program for creating and manipulating Indexed, Associative, and Multidimensional arrays.
5. Write a PHP program to calculate length of a string and count words without using string functions; demonstrate use of built-in string functions.
6. Write a simple PHP program to demonstrate use of Simple function and Parametrized function.
7. Develop a web page with data validation.
8. Write a simple PHP program to set cookies and read them; demonstrate session management.
9. Develop a simple application to enter data into a database, and to retrieve and present data from a database.
10. Develop a simple application to update and delete table data from a database.

Mobile App Development

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	FSD-EAE	FSD-EAE-4	FSD-437T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To introduce students to the fundamentals of mobile app development and its significance in the digital era.
2. To familiarize students with the Android and iOS platforms as key mobile app development platforms.
3. To provide students with hands-on experience in designing, developing, testing, and deploying mobile applications.
4. To expose students to advanced subjects in mobile app development, such as cross-platform development and upcoming trends.

Course Outcomes (CO)

- CO 1** Understand the importance and principles of mobile app development; identify and explain the characteristics and features of the Android and iOS platforms.
- CO 2** Develop mobile applications using programming languages relevant to the platforms, and design user-friendly and visually appealing mobile app interfaces.
- CO 3** Implement data storage, synchronization, and location-based services in mobile apps; test and debug mobile applications for optimal performance and functionality.
- CO 4** Demonstrate knowledge and understanding of cross-platform app development frameworks and stay updated with emerging trends and future directions in mobile app development.

UNIT-I

Introduction to Mobile App Development: Overview, history, and importance, Mobile platforms and operating systems: Android and iOS, Mobile app development tools and environments, Introduction to programming languages for mobile app development. User Interface Design and Development: UI design principles for mobile apps, UI components and layouts, designing for multiple screen sizes and resolutions, Implementing navigation and user interaction.

UNIT-II

Mobile App Development Technologies: Mobile app architecture and components, Backend integration and API consumption, Data storage and synchronization, Location-based services and mapping.

UNIT-III

Mobile App Testing and Deployment: Testing methodologies for mobile apps, Debugging and error handling, App store submission and deployment process, App performance optimization and analytics.

UNIT-IV

Advanced Topics in Mobile App Development: Mobile app security and privacy considerations, Cross-platform app development frameworks (e.g., React Native, Flutter), Emerging trends and future directions in mobile app development.

Textbook(s):

1. "Android Programming: The Big Nerd Ranch Guide" by Bill Phillips and Chris Stewart.
2. "iOS Programming: The Big Nerd Ranch Guide" by Christian Keur and Aaron Hillegass.
3. "Head First Android Development: A Brain-Friendly Guide" by Dawn Griffiths and David Griffiths.
4. "Beginning iOS Cloud and Database Development: Build Data-Driven Cloud Apps for iOS" by Thomas P. Fitzpatrick.

References:

1. "Learning Swift: Building Apps for macOS, iOS, and Beyond" by Jonathon Manning, Paris Buttfield-Addison, and Tim Nugent.
2. "Beginning Android Programming with Kotlin" by Jerome DiMarzio.
3. "Designing Interfaces: Patterns for Effective Interaction Design" by Jenifer Tidwell.
4. "iOS Human Interface Guidelines: Creating a Great User Experience" by Apple Inc.
5. "Android Studio Development Essentials: Android 10 Edition" by Neil Smyth.
6. "Test-Driven Development with Python" by Harry Percival.
7. "Mobile App Development with React Native: Build iOS and Android Apps with JavaScript" by Johnathan Horton and Muhammed Murtaza.
8. "Mobile Design and Development: Practical concepts and techniques for creating mobile sites and web apps" by Brian Fling.

Mobile App Development Lab

L	P	C
-	2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	FSD-EAE	FSD-EAE-4	FSD-437P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Mobile App Development) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
 1. Setting up the Development Environment: install Android Studio and Xcode; create a basic "Hello World" app for Android and iOS.
 2. User Interface Design and Development: design a UI using XML for Android and Interface Builder for iOS; implement navigation between multiple screens.
 3. Database Integration in Mobile Apps: create a SQLite database with CRUD operations in Android; implement Core Data framework in iOS.
 4. Web Services and API Consumption: retrieve data from a RESTful API in Android; consume a web service using URLSession in iOS.
 5. Location-Based Services and Mapping: implement location tracking with Google Maps API in Android; integrate MapKit in iOS.
 6. Cross-Platform App Development: develop a mobile app using React Native and another using Flutter.
 7. Testing and Debugging: perform unit testing on an Android app using JUnit; debug and test an iOS app using Xcode debugger and XCTest.
 8. App Deployment and Performance Optimization: package and deploy apps to Google Play Store and the App Store; optimize performance.
 9. Augmented Reality (AR) Integration: integrate AR features using ARCore (Android) or ARKit (iOS).
 10. IoT Integration in Mobile Apps: connect a mobile app with IoT devices such as smart home devices, sensors, or wearables.

Web and Mobile Application Testing and Deployment

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	FSD-EAE	FSD-EAE-5	FSD-439T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To introduce students to the concepts, methodologies, and best practices of web and mobile application testing and deployment.
2. To familiarize students with performance testing, optimization, and security considerations in web and mobile application development.
3. To equip students with the knowledge and skills to implement continuous integration, delivery, and deployment processes.
4. To enhance students' ability to effectively test, deploy, and maintain web and mobile applications in various environments.

Course Outcomes (CO)

- CO 1** Demonstrate a clear understanding of the importance of testing and deployment in the software development life cycle, and apply functional testing techniques to ensure quality and reliability of web and mobile applications.
- CO 2** Perform performance testing, analyze results, and optimize web and mobile applications for better performance; conduct security testing to identify vulnerabilities and implement necessary countermeasures.
- CO 3** Implement continuous integration, delivery, and deployment pipelines for efficient software development and deployment, and apply industry best practices for deploying web and mobile applications in different environments.
- CO 4** Develop the ability to use appropriate tools and technologies for web and mobile application testing and deployment, and collaborate effectively in teams to test, deploy, and maintain web and mobile applications.

UNIT-I

Introduction to Web and Mobile Application Testing and Deployment: Overview of web and mobile application testing and deployment, Importance of testing and deployment in the software development life cycle, Testing methodologies and strategies, Deployment models and techniques. Functional Testing of Web and Mobile Applications: Introduction to functional testing, Test case design techniques, Test automation frameworks and tools, Cross-browser and cross-platform testing, Mobile application testing.

UNIT-II

Performance Testing and Optimization: Performance testing concepts and objectives, Load testing and stress testing, Performance measurement and profiling tools, Performance optimization techniques, Mobile performance testing considerations.

UNIT-III

Security Testing and Deployment Best Practices: Introduction to security testing, Security vulnerabilities and threats, Security testing techniques and tools, Secure deployment best practices, Compliance and regulatory considerations.

UNIT-IV

Continuous Integration, Delivery, and Deployment: Introduction to continuous integration, delivery, and deployment, Continuous integration and build automation tools, Continuous delivery pipelines, Deployment strategies and techniques, Monitoring and error tracking in production.

Textbook(s):

1. "Software Testing: Principles and Practices" by Srinivasan Desikan and Gopalaswamy Ramesh.
2. "Agile Testing: A Practical Guide for Testers and Agile Teams" by Lisa Crispin and Janet Gregory.
3. "Software Testing" by Yogesh Singh, Cambridge University Press.

References:

1. "Effective Software Testing: 50 Specific Ways to Improve Your Testing" by Elfriede Dustin, et al.
2. "Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation" by Jez Humble and David Farley.
3. "Selenium WebDriver Recipes in Python" by Zed A. Shaw.
4. "Hands-On Mobile App Testing" by Daniel Knott.
5. "The Art of Application Performance Testing" by Ian Molyneaux.
6. "Web Performance Tuning: Speeding Up the Web" by Patrick Killelea.
7. "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" by Dafydd Stuttard and Marcus Pinto.
8. "OWASP Testing Guide" by The Open Web Application Security Project (OWASP).
9. "How to Break Software: A Practical Guide to Testing" by James A. Whittaker.
10. "Performance Testing Guidance for Web Applications" by Microsoft Corporation.
11. "Software Security: Building Security In" by Gary McGraw.
12. "Continuous Integration: Improving Software Quality and Reducing Risk" by Paul M. Duvall.

Web and Mobile Application Testing and Deployment Lab

L	P	C
-	2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	FSD-EAE	FSD-EAE-5	FSD-439P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Web and Mobile Application Testing and Deployment) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
1. Introduction to Web Technologies: create a simple web page using HTML, style it with CSS, and add interactivity using JavaScript.
2. Web Application Testing: test a web application for functional and non-functional requirements; perform unit, integration, and regression testing.
3. Mobile Application Development: build a simple mobile application using a cross-platform framework such as React Native or Flutter.
4. Mobile Application Testing: test a mobile application for usability, performance, compatibility, and security.
5. Web Application Deployment: deploy a web application on a cloud hosting platform like AWS or Heroku.
6. Continuous Integration and Deployment: set up a CI/CD pipeline using tools like Jenkins, Travis CI, or GitLab CI/CD.
7. Performance Testing for Web Applications: perform load testing, stress testing, and optimize the performance of a web application.
8. Security Testing for Web and Mobile Applications: introduce fundamentals of security testing for web and mobile applications.

7th Semester Syllabus — CSE

Emerging Area Specialization: Machine Learning & Data Analytics (MLDA)

Compiled from: Handbook of B.Tech. Programmes offered by USICT at Affiliated Institutions of the University.

Applicable from Batch Admitted in Academic Session 2021-22 Onwards

Principles of Entrepreneurship Mindset

L	P	C
2	-	2

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
All	7	HS/MS	HS/MS	MS-401

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To understand basic aspects of establishing a business in a competitive environment.
2. To apply the basic understanding to examine the existing business ventures.
3. To examine various business considerations such as marketing, financial and teaming etc.
4. To assess strategies for planning a business venture.

Course Outcomes (CO)

- CO 1** Understand basic aspects of establishing a business in a competitive environment.
- CO 2** Apply the basic understanding to examine the existing business ventures.
- CO 3** Examine various business considerations such as marketing, financial and teaming etc.
- CO 4** Assess strategies for planning a business venture.

UNIT-I

Entrepreneurial perspective: Foundation, Nature and development of entrepreneurship, importance of entrepreneurs, Entrepreneurial Mind, Individual entrepreneur, Types of entrepreneurs, Entrepreneurship in India.

UNIT-II

Beginning Considerations: Creativity and developing business ideas; Creating and starting the venture; Building a competitive advantage; Opportunity recognition, Opportunity assessment; Legal issues.

UNIT-III

Developing Financial Plans: Sources of Funds, Managing Cash Flow, Creating a successful Financial Plan, Developing a business plan.

UNIT-IV

Developing Marketing Plans: Developing a powerful Marketing Plan, E-commerce, Integrated Marketing Communications. Leading Considerations: Developing Team, Inviting candidates to join team, Leadership model.

Textbook(s):

1. Robert D Hisrich, Michael P Peters & Dean A Shepherd, "Entrepreneurship", 10th Edition, McGraw Hill Education, 2018.

References:

1. Norman M. Scarborough and Jeffery R. Cornwell, "Essentials of Entrepreneurship and Small Business Management", 8th Edition, Pearson, 2016.
2. Rajiv Roy, "Entrepreneurship", 2nd Edition, Oxford University Press, 2011.
3. Sangeeta Sharma, "Entrepreneurship Development", 1st Edition, Prentice-Hall India, 2016.
4. John Mullins, "The New Business Road Test: What entrepreneurs and investors should do before launching a lean start-up", 5th Edition, Pearson Education, 2017.
5. Charantimath, "Entrepreneurship Development and Small Business Enterprise", Pearson Education.

Data Science

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
All	7	PCE-4	PCE-4	CIE-405T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To introduce the students about the knowledge and overview of R or Octave statistical package, data transformation and merging, data visualization and illustration of techniques through R or Octave.
2. To understand statistical techniques like regression analysis and structural equation modelling.
3. To promote deeper understanding of forecasting, time series data analysis and auto regression models.
4. To provide overview of support vector machine, linear discriminant analysis and clustering techniques.

Course Outcomes (CO)

- CO 1** Develop relevant programming abilities.
- CO 2** Demonstrate proficiency with statistical analysis of data.
- CO 3** Develop the ability to build and assess data-based models.
- CO 4** Execute statistical analyses with professional statistical software.

UNIT-I

Overview of R or Octave statistical package. Introduction to R, Variables, Comments, Data Types, Strings, Operators, If-Else, Loops, Functions, Vectors, Lists, Arrays, Data Frames. Data Pre-processing, Data Scales, Similarity and Dissimilarity measures, sampling and quantization of data, filtering, Data transformation and merging, Data visualization, PCA, Correlation, Chi-Square test. Illustration of these techniques through R or Octave.

UNIT-II

Regression Analysis, linear, generalized, regularized regression, Cross-validation, Training and Testing data set, Overview of nonlinear regression, Overview of Ridge regression, Latent variables, Structure Equation Modelling. Illustration of these techniques through R or Octave.

UNIT-III

Forecasting, time series data analysis, Stationarity, Seasonality, recurrent models, autoregressive models. Illustration of these techniques through R or Octave.

UNIT-IV

Classification, Linear discriminant analysis, overview of support vector machine, Decision trees, Clustering, Clustering techniques. Illustration of these techniques through R or Octave.

Textbook(s):

1. Runkler, Thomas A., "Data Analytics: Models and Algorithms for Intelligent Data Analysis", Springer, 2012.
2. Friedman, Jerome, Trevor Hastie, and Robert Tibshirani, "The Elements of Statistical Learning", Vol. 1, New York: Springer Series in Statistics, 2001.

References:

1. Zuur, Alain, Elena N. Ieno, and Erik Meesters, "A Beginner's Guide to R", Springer, 2009.
2. Hansen, Jesper Schmidt, "GNU Octave: Beginner's Guide: Become a Proficient Octave User by Learning this High-level Scientific Numerical Tool from the Ground Up", Packt Publishing Ltd, 2011.

Data Science Lab

L	P	C
-	2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
All	7	PCE-4	PCE-4	CIE-405P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Data Science) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
1. Installation of R, basic syntax of R.
2. Describing data, viewing and manipulating data using R.
3. To plot the probability distribution curve through R software.
4. To perform chi square test on various data sets.
5. To use Python as a programming tool for the analysis of data structures.
6. To perform various operations such as data storage, analysis and visualization through R software.
7. To perform descriptive statistics analysis and data visualization in Python.
8. To perform Principal Component Analysis on datasets using R software.
9. To perform linear regression on datasets using R software.
10. To perform Data Aggregation and Group-Wise Operations.
11. To edit and execute programs involving Flow Controls.
12. To edit and execute programs involving functions.

Data Warehousing and Data Mining

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
All	7	PCE-5	PCE-5	CIE-425T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To understand the need of data warehousing for data analysis.
2. To understand and apply OLAP operations.
3. To identify the need of various data mining techniques.
4. To apply various data mining techniques.

Course Outcomes (CO)

- CO 1** Able to understand the ETL Process.
- CO 2** Able to understand and apply OLAP operations for data analysis.
- CO 3** Able to apply supervised learning based data mining techniques.
- CO 4** Able to apply unsupervised learning based data mining techniques.

UNIT-I

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. Data pre-processing: Data cleaning, Data transformation, ETL Process, ETL tools. Defining the business requirements: Dimensional analysis, information packages – a new concept, requirements gathering methods, requirements definition: scope and content.

UNIT-II

Principles of Dimensional Modelling: 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 is the answer, 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

Data Mining Basics: What is Data Mining, Data Mining Defined, The knowledge discovery process (KDD Process), Data Mining Applications – The Business Context of Data Mining, Data Mining for Process Improvement, Data Mining as a Research Tool, Data Mining for Marketing, Benefits of data mining. Major Data Mining Techniques: Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, KNN Algorithm.

UNIT-IV

Cluster detection, K-means Algorithm, Outlier Analysis, memory-based reasoning, link analysis, Mining Association Rules in Large Databases: Association Rule Mining, genetic algorithms, neural networks. Data mining tools.

Textbook(s):

1. Paul Raj Poonia, "Fundamentals of Data Warehousing", John Wiley & Sons, 2004.
2. Kamber and Han, "Data Mining Concepts and Techniques", Hart Court India P. Ltd., Elsevier, 2nd Edition, 2001.

References:

1. W. H. Inmon, "Building the Operational Data Store", 2nd Edition, John Wiley, 1999.
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson.
3. Shmueli, "Data Mining for Business Intelligence: Concepts, Techniques and Applications in Microsoft Excel with XLMiner", Wiley Publications.

Data Warehousing and Data Mining Lab

L	P	C
-	2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
All	7	PCE-5	PCE-5	CIE-425P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Data Warehousing and Data Mining) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
1. Study of ETL process and its tools.
2. Program of Data warehouse cleansing to input names from users (inconsistent) and format them.
3. Program of Data warehouse cleansing to remove redundancy in data.
4. Introduction to WEKA tool.
5. Implementation of Classification technique on ARFF files using WEKA.
6. Implementation of Clustering technique on ARFF files using WEKA.
7. Implementation of Association Rule technique on ARFF files using WEKA.
8. Implementation of Visualization technique on ARFF files using WEKA.
9. Perform Data Similarity Measure (Euclidean, Manhattan Distance).
10. Perform Apriori algorithm to mine frequent item-sets.
11. Develop different clustering algorithms like K-Means, K-Medoids Algorithm, Partitioning Algorithm and Hierarchical clustering.
12. Apply Validity Measures to evaluate the quality of clustering.

Supervised and Deep Learning

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	MLDA	MLDA-EAE-3	ML-463T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To introduce students to the fundamentals of Supervised Learning and Deep Learning techniques and algorithms.
2. To enable students to develop skills in implementing supervised and deep learning algorithms using Python programming language and popular machine learning libraries.
3. To equip students with the ability to evaluate the performance of supervised and deep learning models and select the appropriate models for specific problems.
4. To provide students with hands-on experience in working with real-world supervised and deep learning projects.

Course Outcomes (CO)

- CO 1** Develop a deep understanding of the concepts and applications of Supervised Learning and Deep Learning techniques and algorithms.
- CO 2** Develop proficiency in using Python programming language and popular machine learning libraries to implement supervised and deep learning models.
- CO 3** Demonstrate the ability to evaluate the performance of supervised and deep learning models and select the appropriate models for specific problems.
- CO 4** Gain hands-on experience in working with real-world supervised and deep learning projects, including image recognition, text analysis, and time-series analysis.

UNIT-I

Introduction to Machine Learning, Types of Machine Learning, Supervised Learning Basics, Regression and Classification, Linear Regression, Logistic Regression, Model Evaluation Metrics.

UNIT-II

Introduction to Deep Learning, Artificial Neural Networks, Activation Functions, Loss Functions, Optimization Algorithms, Backpropagation Algorithm, Regularization Techniques.

UNIT-III

Introduction to CNNs, CNN Architecture, Convolution and Pooling Layers, Object Detection, Image Segmentation, Transfer Learning, Introduction to RNNs, RNN Architecture, Long Short-Term Memory (LSTM), Gated Recurrent Unit (GRU), Text Generation, Language Translation.

UNIT-IV

Generative Adversarial Networks (GANs), Autoencoders, Reinforcement Learning, Natural Language Processing (NLP), Sentiment Analysis, Time Series Analysis.

Textbook(s):

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", 2nd Edition, O'Reilly Media, 2019. ISBN: 978-1492032649.
2. Francois Chollet, "Deep Learning with Python", 1st Edition, Manning Publications, 2017. ISBN: 978-1617294433.

References:

1. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron.
2. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville.
3. "Pattern Recognition and Machine Learning" by Christopher M. Bishop.
4. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, "Deep Learning", 1st Edition, MIT Press, 2016. ISBN: 978-0262035613.
5. Andrew Ng, "Machine Learning Yearning", eBook, 2018.
6. Sebastian Raschka and Vahid Mirjalili, "Python Machine Learning", 3rd Edition, Packt Publishing, 2019. ISBN: 978-1789955750.

Supervised and Deep Learning Lab

L	P	C
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Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	MLDA	MLDA-EAE-3	ML-463P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Supervised and Deep Learning) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
1. Linear regression: Implement linear regression on a dataset and evaluate the model's performance.
2. Logistic regression: Implement logistic regression on a binary classification dataset and evaluate the model's performance.
3. k-Nearest Neighbors (k-NN): Implement k-NN algorithm on a dataset and evaluate the model's performance.
4. Decision Trees: Implement decision trees on a dataset and evaluate the model's performance.
5. Random Forest: Implement random forest algorithm on a dataset and evaluate the model's performance.
6. Support Vector Machines (SVM): Implement SVM on a dataset and evaluate the model's performance.
7. Naive Bayes: Implement Naive Bayes algorithm on a dataset and evaluate the model's performance.
8. Gradient Boosting: Implement gradient boosting algorithm on a dataset and evaluate the model's performance.
9. Convolutional Neural Networks (CNN): Implement CNN on an image classification dataset and evaluate the model's performance.
10. Recurrent Neural Networks (RNN): Implement RNN on a text classification dataset and evaluate the model's performance.
11. Long Short-Term Memory Networks (LSTM): Implement LSTM on a time-series dataset and evaluate the model's performance.
12. Autoencoders: Implement autoencoders on an image dataset and evaluate the model's performance.
13. Generative Adversarial Networks (GANs): Implement GANs on an image dataset and evaluate the model's performance.
14. Transfer Learning: Implement transfer learning on an image dataset and evaluate the model's performance.
15. Reinforcement Learning: Implement reinforcement learning on a game environment and evaluate the model's performance.

Unsupervised Learning

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	MLDA	MLDA-EAE-4	ML-465T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To learn about unsupervised learning and clustering algorithms.
2. To learn about Gaussian mixture models and linear dimensional reduction methods.
3. To learn about autoencoders and generative adversarial networks.
4. To learn about outlier detection, density estimation methods and unsupervised learning networks.

Course Outcomes (CO)

- CO 1** Applying clustering algorithms for real world data.
- CO 2** Applying dimensional reduction techniques for feature extraction, and learning Gaussian mixture models.
- CO 3** Learn about Autoencoders and Generative Adversarial Networks.
- CO 4** Applying outlier and novelty detection, density estimation methods to real world data, and learn about unsupervised learning networks.

UNIT-I

Unsupervised learning – Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning. Clustering – Clustering as a Machine Learning task, Different types of clustering techniques, Partitioning methods, Hierarchical clustering, Density-based methods: DBSCAN. Biclustering: Spectral co-clustering, spectral biclustering. Finding Pattern using Association Rule – Definition of common terms, Association rule, Apriori algorithm.

UNIT-II

Gaussian Mixture Models: Gaussian mixture, Variational Bayesian Gaussian mixture. Manifold learning: Introduction, Isomap, Locally Linear Embedding, Modified Locally Linear Embedding, Spectral embedding, MDS (Multi-Dimensional Scaling), t-distributed Stochastic Neighbor Embedding (t-SNE). Decomposing signals in components (matrix factorization problems): PCA (Principal Component Analysis), Factor Analysis, Kernel Principal Component Analysis (kPCA), Truncated Singular Value Decomposition and Latent Semantic Analysis, Independent Component Analysis (ICA), Non-negative Matrix Factorization (NMF/NNMF), Latent Dirichlet Allocation (LDA).

UNIT-III

Autoencoders: Architecture, Layers in autoencoder, training of autoencoder, Sparse Coding, Undercomplete Autoencoders, Regularized Autoencoders, Stochastic Encoders and Decoders, Denoising Autoencoders, Contractive Autoencoders, Applications of Autoencoders. Generative Adversarial Networks: Generative vs Discriminative Modeling, Probabilistic Generative Model, Generative Adversarial Networks (GAN), GAN challenges: Oscillation Loss, Mode Collapse, Uninformative Loss, Hyperparameters, Tackling GAN challenges, Wasserstein GAN, Cycle GAN, Neural Style Transfer.

UNIT-IV

Novelty and outlier detection: Overview of outlier detection methods, Novelty detection, outlier detection. Density estimation: Histograms and kernel density estimation. Unsupervised Learning Networks: Kohonen Self-Organizing Feature Maps – architecture, training algorithm, Kohonen Self-Organizing Motor Map, Restricted Boltzmann Machine (neural network model).

Textbook(s):

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (India) Private Limited, 2013.
2. Benyamin Ghogogh, Mark Crowley, Fakhri Karray, Ali Ghodsi, "Elements of Dimensionality Reduction and Manifold Learning", Springer.

References:

1. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer-Verlag New York, 1st Edition, 2006.
2. Kevin Murphy, "Machine Learning: A Probabilistic Perspective".
3. Jennifer Grange, "Machine Learning for Absolute Beginners: A Simple, Concise & Complete Introduction to Supervised and Unsupervised Learning Algorithms", Kindle.

Unsupervised Learning Lab

L	P	C
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Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	MLDA	MLDA-EAE-4	ML-465P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Unsupervised Learning) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
1. Setting up the Jupyter Notebook and Executing a Python Program.
2. Installing Keras, TensorFlow, PyTorch, Pandas, NumPy etc. libraries and making use of them.
3. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same dataset for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.
4. Program to demonstrate k-means clustering algorithm.
5. Program to demonstrate DBSCAN clustering algorithm.
6. Program to demonstrate PCA and LDA on the Iris dataset.
7. Compare the performance of PCA and Autoencoders on a given dataset.
8. Build a Generative Adversarial model for fake (news/image/audio/video) prediction.
9. Outlier detection in a time series dataset using RNN.
10. Anomaly detection using a Self-Organizing Network.

Machine Learning and Data Analytics Frameworks

L	P	C
3	-	3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	MLDA	MLDA-EAE-5B	ML-469T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. This course provides the fundamental concepts in data science.
2. Learn the basics of statistical data analysis with examples.
3. Basics of Machine Learning and statistical measures.
4. Compile and visualize data using statistical functions.

Course Outcomes (CO)

- CO 1** Impart the knowledge of data classification, process of big data technology, user roles and skills in data science.
- CO 2** Understand how data is analysed and visualized using statistical functions.
- CO 3** Analyze the methodologies of data science.
- CO 4** Introduce the concepts of data modelling techniques using Machine Learning for Data Analytics.

UNIT-I

Introduction and Concepts, Differentiating algorithmic and model based frameworks, Regression: Ordinary Least Squares, Ridge Regression, and Lasso Regression.

UNIT-II

Linear Discriminant Analysis, Quadratic Discriminant Analysis, Support Vector Machine (SVM), Bias-Variance Dichotomy, Model Validation Approaches, Neural Networks, Clustering, Association Rule Mining, Deep Learning Concepts.

UNIT-III

Data Analytics – Relation: Data Science, Analytics and Big Data Analytics. Data Science Components – Big Data technology – Data Science user-roles and skills – Data Science use cases. Statistical methods: Descriptive Statistics, Probability Distributions (Binomial, Poisson, Normal), Sampling Distributions (Chi-squared, t, F), Estimation.

UNIT-IV

Prescriptive analytics: Creating data for analytics through Active Learning, Creating data for analytics through Reinforcement Learning, Test of Hypothesis, ANOVA.

Textbook(s):

1. Dr. Bharti Motwani, "Data Analytics with R", Wiley Publication.
2. V. Bhuvaneswari (2016), "Data Analytics with R", Bharathiar University.

References:

1. Thomas W. Miller, "Modelling Techniques in Predictive Analytics", Pearson.
2. A. C. Müller & S. Guido, "Introduction to Machine Learning with Python", O'Reilly.

Machine Learning and Data Analytics Frameworks Lab

L	P	C
-	2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
EAE	7	MLDA	MLDA-EAE-5B	ML-469P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Machine Learning and Data Analytics Frameworks) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.
1. R as a calculator application – using with and without R objects on console, using mathematical functions on console, and writing an R script to create R objects for a calculator application saved to disk.
2. Descriptive statistics in R – finding basic descriptive statistics using summary, str, quartile functions on mtcars & cars datasets; finding subsets of a dataset using subset() and aggregate() functions on the iris dataset.
3. Reading and writing different types of datasets – reading .txt/.csv data from web and disk and writing to a specific disk location; reading Excel data sheets in R; reading XML datasets in R.
4. Visualizations – finding data distributions using box and scatter plots; finding outliers using plots; plotting histograms, bar charts and pie charts on sample data.
5. Correlation and covariance – finding the correlation matrix; plotting correlation to visualize relationships in the iris dataset; analysis of covariance (ANOVA) for categorical variables in the iris dataset.
6. Regression model – import data from web storage and perform logistic regression to find relationships between variables affecting a student's admission based on GRE score, GPA and rank; check model fit.
7. Multiple regression model – apply multiple regression where the data has a continuous independent variable, on the dataset above.
8. Regression model for prediction – apply regression model techniques to predict data on the dataset above.
9. Classification model – install a relevant package for classification, choose a classifier, and evaluate its performance.
10. Clustering model – apply clustering algorithms for unsupervised classification and plot the cluster data using R visualizations.

CSE-AIML – Semester VII

Syllabus for Subjects on the Timetable

Compiled from: Handbook of B.Tech. Programmes offered by USICT at Affiliated Institutions of the University

Data Science

Data Science			
L	P	C	
3		3	

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	7	PCE	PCE-4	CIE-405T
MAE	7	OAE-MAE	OAE-1	MAO-417T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To introduce the students about the knowledge and overview of R or Octave statistical package, data transformation and merging, data visualization and illustration of techniques through R or Octave.
2. To understand statistical techniques like regression analysis and structural equation modelling.
3. To promote deeper understanding of forecasting, time series data analysis and auto regression models.
4. To provide overview of support vector machine, linear discriminant analysis and clustering techniques.

Course Outcomes (CO)

- CO 1** Develop relevant programming abilities.
- CO 2** Demonstrate proficiency with statistical analysis of data.
- CO 3** Develop the ability to build and assess data-based models.
- CO 4** Execute statistical analyses with professional statistical software.

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	3	3	-	2	-	-	-	-	-	2
CO 2	3	2	2	3	-	3	-	-	-	-	-	2
CO 3	2	2	3	3	-	3	-	-	-	-	-	2
CO 4	3	3	2	3	-	3	-	-	--	-	-	2

UNIT- I

Overview of R or Octave statistical package.

Introduction to R, Variables, Comments, Data Types, Strings, Operators, If-Else, Loops, Functions, Vectors, Lists, Arrays, Data Frames

Data Pre-processing, Data Scales, Similarity and Dissimilarity measures, sampling and quantization of data, filtering, Data transformation and merging, Data visualization, PCA, Correlation, Chi-Square test. Illustration of These techniques through R, or Octave.

UNIT- II

Regression Analysis, linear, generalized, regularized regression, Cross-validation, Training and Testing data set, Overview of nonlinear regression, Overview of Ridge regression, Latent variables, Structure Equation modelling. Illustration of These techniques through R, or Octave.

UNIT- III

Forecasting, time series data analysis, Stationarity, Seasonality, recurrent models, autoregressive models. Illustration of These techniques through R, or Octave.

UNIT- IV

Classification, Linear discriminant analysis, overview of support vector machine, Decision trees, Clustering, Clustering techniques. Illustration of These techniques through R, or Octave.

Text Books:

1. Runkler, Thomas A., "Data Analytics: Models and Algorithms for Intelligent Data Analysis", Springer, 2012.
2. Friedman, Jerome, Trevor Hastie, and Robert Tibshirani, "The elements of statistical learning". Vol. 1. New York: Springer Series in Statistics, 2001.

References Books:

1. Zuur, Alain, Elena N. Ieno, and Erik Meesters. "A Beginner's Guide to R". Springer, 2009.
2. Hansen, Jesper Schmidt, "GNU Octave: Beginner's Guide: Become a Proficient Octave, User by Learning this High-level Scientific Numerical Tool from the Ground Up", Packt Publishing Ltd, 2011.

Data Science Lab			
	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/IT/CST/ITE	7	PCE	PCE-4	CIE-405P
MAE	7	OAE-MAE	OAE-1	MAO-417P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Data Science) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Installation of R, basic syntax of R.
2. Describing data, viewing and manipulating data using R.
3. To plot the probability distribution curve through R software.
4. To perform chi square test on various data sets.
5. To use Python as a programming tool for the analysis of data structures.
6. To perform various operations such as data storage, analysis and visualization through R software.
7. To perform descriptive statistics analysis and data visualization in python.
8. To perform Principal Component Analysis on datasets using R software.
9. To perform linear regression on datasets using R software.
10. To perform Data Aggregation and GroupWise Operations.
11. To edit and execute programs involving Flow Controls.
12. To edit and execute programs involving functions.

Data Warehousing and Data Mining

Data Warehousing and Data Mining			
L	P	C	
3		3	

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/CST	7	PCE	PCE-5	CIE-425T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

- | | |
|----|--|
| 1. | To understand the need of data warehousing for data analysis |
| 2. | To understand and apply OLAP operations |
| 3. | To identify the need of various data mining techniques. |
| 4. | To apply various data mining techniques. |

Course Outcomes (CO)

- | | |
|-------------|---|
| CO 1 | Able to understand ETL Process. |
| CO 2 | Able to understand and apply OLAP operations for data analysis. |
| CO 3 | Able to apply supervised learning based data mining techniques. |
| CO 4 | Able to apply unsupervised learning based data mining techniques. |

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	3	2	2	2	-	-	-	3	2	2	3
CO 2	3	3	2	2	2	-	-	-	3	2	2	3
CO 3	3	3	2	3	3	-	-	-	3	2	2	3
CO 4	3	3	2	3	3	-	-	-	3	2	2	3

UNIT-I

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.

Data pre-processing: Data cleaning, Data transformation ETL Process. ETL tools.

Defining the business requirements: Dimensional analysis, information packages – a new concept, requirements gathering methods, requirements definition: scope and content.

UNIT-II

Principles of Dimensional Modelling: 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 is the answer, 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

Data Mining Basics: What is Data Mining, Data Mining Defined, The knowledge discovery process (KDD Process), Data Mining Applications- The Business Context of Data Mining, Data Mining for Process Improvement, Data Mining as a Research Tool, Data Mining for Marketing, Benefits of data mining, Major Data Mining Techniques: Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, KNN Algorithm.

UNIT - IV

Cluster detection, K- means Algorithm, Outlier Analysis, memory-based reasoning, link analysis, Mining Association Rules in Large Databases: Association Rule Mining, genetic algorithms, neural networks. Data mining tools.

Textbook(s):

1. Paul Raj Poonia, "Fundamentals of Data Warehousing", John Wiley & Sons, 2004
2. Kamber and Han, "Data Mining Concepts and Techniques", Hart Court India P. Ltd. Elsevier, 2nd Ed, 2001

References:

1. W. H. Inmon, "Building the operational data store", 2nd Ed., John Wiley, 1999.
2. Pang- Ning Tan, Michael Steinbach, Viach, Vipin Kumar, Introduction to Data Mining, Pearson
3. Shmueli, "Data Mining for Business Intelligence : Concepts, Techniques and Applications in Microsoft Excel with XLMiner", Wiley Publications

Data Warehousing and Data Mining Lab			
L	P	C	
	2	1	

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE/CST	7	PCE	PCE-5	CIE-425P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Data Warehousing and Data Mining) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Study of ETL process and its tools.
2. Program of Data warehouse cleansing to input names from users (inconsistent) and format them.
3. Program of Data warehouse cleansing to remove redundancy in data.
4. Introduction to WEKA tool.
5. Implementation of Classification technique on ARFF files using WEKA.
6. Implementation of Clustering technique on ARFF files using WEKA.
7. Implementation of Association Rule technique on ARFF files using WEKA.
8. Implementation of Visualization technique on ARFF files using WEKA.
9. Perform Data Similarity Measure (Euclidean, Manhattan Distance).
10. Perform Apriori algorithm to mine frequent item-sets.
11. Develop different clustering algorithms like K-Means, KMedoids Algorithm, Partitioning Algorithm and Hierarchical
12. Apply Validity Measures to evaluate the quality of Data

Principles of Entrepreneurship Mindset

Principles of Entrepreneurship Mindset			
L	P	C	
2		2	

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
All	7	HS/MS	MS	MS-401

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain up to 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

- | | |
|----|--|
| 1. | To understand basic aspects of establishing a business in a competitive environment |
| 2. | To apply the basic understanding to examine the existing business ventures |
| 3. | To examine various business considerations such as marketing, financial and teaming etc. |
| 4. | To assess strategies for planning a business venture |

Course Outcomes (CO)

- | | |
|-------------|---|
| CO 1 | Understand basic aspects of establishing a business in a competitive environment |
| CO 2 | Apply the basic understanding to examine the existing business ventures |
| CO 3 | Examine various business considerations such as marketing, financial and teaming etc. |
| CO 4 | Assessing strategies for planning a business venture |

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	2	2	1	2	-	2	-	-	1	2	3	2
CO 2	2	2	1	2	-	2	-	-	1	2	3	2
CO 3	2	2	1	2	-	2	-	-	1	2	3	2
CO 4	2	2	1	2	-	2	-	-	1	2	3	2

UNIT-I

Entrepreneurial perspective: Foundation, Nature and development of entrepreneurship, importance of entrepreneurs, Entrepreneurial Mind, Individual entrepreneur Types of entrepreneurs, Entrepreneurship in India

UNIT-II

Beginning Considerations: Creativity and developing business ideas; Creating and starting the venture; Building a competitive advantage; Opportunity recognition, Opportunity assessment; Legal issues

UNIT-III

Developing Financial Plans: Sources of Funds, Managing Cash Flow, Creating a successful Financial Plan, Developing a business plan

UNIT - IV

Developing Marketing Plans: Developing a powerful Marketing Plan, E-commerce, Integrated Marketing Communications

Leading Considerations: Developing Team, Inviting candidates to join team, Leadership model

Textbook(s):

1. Robert D Hisrich, Michael P Peters & Dean A Shepherd, "Entrepreneurship" 10th Edition, McGraw Hill Education, 2018

References:

1. Norman M. Scarborough and Jeffery R. cornwell, "Essentials of entrepreneurship and small business management" 8th Edition, Pearson, 2016
2. Rajiv Roy, "Entrepreneurship", 2nd Edition, Oxford University Press, 2011
3. Sangeeta Sharma, "Entrepreneurship Development", 1st Edition, Prentice-Hall India, 2016
4. John Mullins, "The New Business Road Test: What entrepreneurs and investors should do before launching a lean start-up" 5th Edition, Pearson Education, 2017
5. Charantimath, Entrepreneurship Development and Small Business Enterprise, Pearson Education.

Pattern Recognition and Computer Vision

Pattern Recognition and Computer Vision				L	P	C
				3		3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE-AIML	7	PC	PC	ML-411T
EAE	7	AIML-EAE	AIML-EAE-5	ML-411T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. Understand the in-depth concept of Pattern Recognition
2. Implement Bayes Decision Theory
3. Understand the in-depth concept of Perception and related Concepts
4. Understand the concept of ML Pattern Classification

Course Outcomes (CO)

- CO 1** Discuss various concepts of pattern recognition
- CO 2** Understanding various algorithms
- CO 3** Explain and apply various computer vision techniques
- CO 4** Describe the concept of shape analysis and filtering

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	2	3	3	-	2	-	-	1	3	2
CO 2	3	3	1	1	1	-	1	1	-	2	2	1
CO 3	3	2	3	3	2	-	2	-	-	2	3	1
CO 4	1	2	3	2	2	-	1	-	-	1	2	2

UNIT-I

Induction Algorithms. Rule Induction. Decision Trees. Bayesian Methods. The Basic Naive Bayes Classifier. Naive Bayes Induction for Numeric Attributes. Correction to the Probability Estimation. Laplace Correction. No Match. Other Bayesian Methods. Other Induction Methods. Neural Networks. Genetic Algorithms. Instance-based Learning. Support Vector Machines.

UNIT-II

About Statistical Pattern Recognition. Classification and regression. Features and Feature Vectors, and Classifiers. Pre-processing and feature extraction. The curse of dimensionality. Polynomial curve fitting. Model complexity. Multivariate non-linear functions. Bayes' theorem. Decision boundaries. Parametric methods. Sequential parameter estimation. Linear discriminant functions. Fisher's linear discriminant. Feed-forward network mappings.

UNIT-III

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture.

UNIT – IV

Binary shape analysis – connectedness – object labelling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

Textbook(s):

1. Pattern Classification, Richard O. Duda, Peter E. Hart, and David G. Stork. Wiley, 2000, 2nd Edition
2. D. L. Baggio et al., Mastering OpenCV with Practical Computer Vision Projects, Packt Publishing, 2012.

References:

1. Pattern Recognition, Jürgen Beyerer, Matthias Richter, and Matthias Nagel. 2018
2. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012

Pattern Recognition and Computer Vision Lab	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE-AIML	7	PC	PC	ML-411P
EAE	7	AIML-EAE	AIML-EAE-5	ML-411P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Pattern Recognition and Computer Vision) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Write a MATLAB/Python function that computes the value of the Gaussian distribution $N(m,s)$ at given vector X and plot the effect of varying mean and variance to the normal distribution.
2. Implementation of Gradient descent.
3. Implementation of Linear Regression using Gradient descent.
4. Comparison of classification accuracy of SVM and CNN for the dataset.
5. Implementation basic Image Handling and processing operations on the image.
6. Implementation of Geometric Transformation.
7. Implementation of Perspective Transformation.
8. Implementation of Camera Calibration
9. Compute Fundamental Matrix.

Reinforcement Learning and Deep Learning

Reinforcement Learning and Deep Learning			
L	P	C	
3		3	

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE-AIML	7	PC	PC	ML-409T
EAE	7	AIML-EAE	AIML-EAE-4	ML-409T

Marking Scheme:

- Teachers Continuous Evaluation: 25 marks
- Term end Theory Examinations: 75 marks

Instructions for paper setter:

- There should be 9 questions in the term end examinations question paper.
- The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
- Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
- The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
- The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

- To introduce the foundation of Reinforcement learning foundation and Q Network algorithm)
- To understand policy optimization ,recent advanced techniques and applications of Reinforcement learning
- To introduce the concept of deep learning and neural network
- To understand the concept of NLP and computer vision in deep learning

Course Outcomes (CO)

- | | |
|-------------|---|
| CO 1 | Learn how to define RL tasks and the core principals behind the RL, including policies, value functions, deriving Bellman equations and underst and work with approximate solution(deep Q Network based algorithms) |
| CO 2 | Learn the policy gradient methods from vanilla to more complex cases and learn application and advanced techniques in Reinforcement Learning |
| CO 3 | Apply neural networks for problem solving |
| CO 4 | Able to Analyse images and have basic understanding of NLP in deep learning |

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	3	3	3	2	2	-	-	-	-	2
CO 2	3	2	3	3	3	2	2	-	-	-	-	2
CO 3	3	2	3	3	3	2	2	-	-	-	-	2
CO 4	3	2	3	3	3	2	2	-	-	-	-	2

UNIT-I

Reinforcement Learning Foundation: Introduction to Reinforcement learning and its terms,Features and elements of RL, Defining RL Framework and Markov Decision Process , Polices, Value Functions and Bellman Equations, Exploration vs. Exploitation, Code Standards and Libraries used in RL (Python/Keras/Tensorflow)

Tabular Methods and Q-networks: Planning through the use of Dynamic Programming and Monte Carlo, Temporal-Difference learning methods (TD(0), SARSA, Q-Learning), Deep Q-networks (DQN, DDQN, Dueling DQN, Prioritised Experience Replay)

UNIT-II

Policy Optimization: Introduction to policy-based methods, Vanilla Policy Gradient, REINFORCE algorithm and stochastic policy search, Actor-critic methods (A2C, A3C), Advanced policy gradient (PPO, TRPO, DDPG),

Model-Based RL: Model-based RL approach

Recent Advances and Applications: Meta-learning, Multi-Agent Reinforcement Learning, Partially Observable Markov Decision Process, Applying RL for real-world problems

UNIT-III

Introduction to Deep learning: Introduction to deep learning and its application, Examples of deep learning

Introduction to Neural Network: Introduction to Neural Network its types and application, Introduction to keras, Introduction to ANN Perceptron and its uses, Multilayer perceptron and deep neural network, Activation function and its working TanH function, sigma, relu etc, Feed forward network, Cost function, Backpropagation, Gradient Descent, Regularization and dropout technique, Batch normalization.

Types of Neural Network: Convolutional Neural network, CNN Pooling, CNN Layers, Flattening and Full connection, Preparing a fully connected neural network, Introduction to RNN, Deep RNN, Long Short Term Memory, GRU, Transfer Learning,

UNIT – IV

Deep Learning for Natural Language Processing: Introduction to NLP and Vector Space Model of Semantics Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model (CBOW), Glove, Evaluations and Applications in word similarity, analogy reasoning

Deep Learning for Computer Vision: Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models. Attention models for computer vision tasks.

Textbook(s):

1. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", 2nd Edition, MIT Press, 2019
2. Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. "Deep learning." MIT press, 2016.
3. Antonio Gulli and Sujit Pal, "Deep learning with Keras"

References:

1. Wiering, Marco, and Martijn Van Otterlo. "Reinforcement learning: Adaptation, Learning, and Optimization" (2012)
2. Daniel Slater, Gianmario Spacagna and Peter Roelants, "Python Deep Learning", Packt Publication.

Reinforcement Learning and Deep Learning Lab	L	P	C
		2	1

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
CSE-AIML	7	PC	PC	ML-409P
EAE	7	AIML-EAE	AIML-EAE-4	ML-409P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Reinforcement Learning and Deep Learning) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Setting up the Spyder IDE Environment and Executing a Python Program
2. Installing Keras, Tensorflow and Pytorch libraries and making use of them
3. Implement Q-learning with pure Python to play a game
 - Environment set up and intro to OpenAI Gym
 - Write Q-learning algorithm and train agent to play game
 - Watch trained agent play game
4. Implement deep Q-network with PyTorch
5. Python implementation of the iterative policy evaluation and update.
6. Chatbot using bi-directional LSTMs
7. Image classification on MNIST dataset (CNN model with fully connected layer)
8. Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU
9. Applying the Deep Learning Models in the field of Natural Language Processing
10. Applying the Convolution Neural Network on computer vision problems

Machine Learning

Machine Learning			
	L	P	C
	3		3

Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
ECE	6	PCE	PCE-3	ECE-350T
EAE	6	MLDA-EAE	MLDA-EAE-2C	ML-342T
CSE/IT/CST/ITE	7	PCE	PCE-5	CIE-421T
CSE-AIML	7	PC	PC	ML-407T
EAE	7	AIML-EAE	AIML-EAE-3	ML-407T

Marking Scheme:

1. Teachers Continuous Evaluation: 25 marks
2. Term end Theory Examinations: 75 marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Objectives :

1. To understand the need of machine learning
2. To learn about regression and feature selection
3. To understand about classification algorithms
4. To learn clustering algorithms

Course Outcomes (CO)

- CO 1** To formulate machine learning problems
- CO 2** Learn about regression and feature selection techniques
- CO 3** Apply machine learning techniques such as classification to practical applications
- CO 4** Apply clustering algorithms

Course Outcomes (CO) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	3	3	3	3	2	2	-	-	-	-	2
CO 2	3	3	3	3	3	2	2	-	-	-	-	2
CO 3	3	3	3	3	3	2	2	-	-	-	-	2
CO 4	3	3	3	3	3	2	2	-	-	-	-	2

UNIT-I

Introduction: Machine learning, terminologies in machine learning, Perspectives and issues in machine learning, application of Machine learning, Types of machine learning: supervised, unsupervised, semi-supervised learning. Review of probability, Basic Linear Algebra in Machine Learning Techniques, Dataset and its types, Data preprocessing, Bias and Variance in Machine learning, Function approximation, Overfitting

UNIT-II

Regression Analysis in Machine Learning: Introduction to regression and its terminologies, Types of regression, Logistic Regression

Simple Linear regression: Introduction to Simple Linear Regression and its assumption, Simple Linear Regression Model Building, Ordinary Least square estimation, Properties of the least-squares estimators and the fitted regression model, Interval estimation in simple linear regression, Residuals

Multiple Linear Regression: Multiple linear regression model and its assumption, **Interpret Multiple Linear Regression Output (R-Square, Standard error, F, Significance F, Coefficient P values), Access the fit of multiple linear regression model** (R squared, Standard error)

Feature Selection and Dimensionality Reduction: PCA, LDA, ICA

UNIT-III

Introduction to Classification and Classification Algorithms: What is Classification? General Approach to Classification, k-Nearest Neighbor Algorithm, Random Forests, Fuzzy Set Approaches

Support Vector Machine: Introduction, Types of support vector kernel – (Linear kernel, polynomial kernel, and Gaussian kernel), Hyperplane – (Decision surface), Properties of SVM, and Issues in SVM.

Decision Trees: Decision tree learning algorithm, ID-3 algorithm, Inductive bias, Entropy and information theory, Information gain, Issues in Decision tree learning.

Bayesian Learning - Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm

Ensemble Methods: Bagging, Boosting and AdaBoost and XBoost,

Classification Model Evaluation and Selection: Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value, Lift Curves and Gain Curves, ROC Curves, Misclassification Cost Adjustment to Reflect Real-World Concerns, Decision Cost/Benefit Analysis

UNIT – IV

Introduction to Cluster Analysis and Clustering Methods: The Clustering Task and the Requirements for Cluster Analysis, Overview of Some Basic Clustering Methods: k-Means Clustering, k-Medoids Clustering, Density-Based Clustering: DBSCAN - Density-Based Clustering Based on Connected Regions with High Density, Gaussian Mixture Model algorithm, Balance Iterative Reducing and Clustering using Hierarchies (BIRCH), Affinity Propagation clustering algorithm, Mean-Shift clustering algorithm, ordering Points to Identify the Clustering Structure (OPTICS) algorithm, Agglomerative Hierarchy clustering algorithm, **Divisive Hierarchical**, Measuring Clustering Goodness

Textbook(s):

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (India) Private Limited, 2013.
2. M. Gopal, "Applied Machine Learning", McGraw Hill Education

References:

1. C. M. BISHOP (2006), "Pattern Recognition and Machine Learning", Springer-Verlag New York, 1st Edition
2. R. O. Duda, P. E. Hart, D. G. Stork (2000), Pattern Classification, Wiley-Blackwell, 2nd Edition

Machine Learning Lab			
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Discipline(s) / EAE / OAE	Semester	Group	Sub-group	Paper Code
ECE	6	PCE	PCE-3	ECE-350P
EAE	6	MLDA-EAE	MLDA-EAE-2C	ML-342P
CSE/IT/CST/ITE	7	PCE	PCE-5	CIE-421P
CSE-AIML	7	PC	PC	ML-407P
EAE	7	AIML-EAE	AIML-EAE-3	ML-407P

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory Examinations: 60 marks

Instructions:

1. The course objectives and course outcomes are identical to that of (Machine Learning) as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 10 experiments must be performed by the students, they may be asked to do more. Atleast 5 experiments must be from the given list.

1. Introduction to JUPYTER IDE and its libraries Pandas and NumPy
2. Program to demonstrate Simple Linear Regression
3. Program to demonstrate Logistic Regression
4. Program to demonstrate Decision Tree – ID3 Algorithm
5. Program to demonstrate k-Nearest Neighbor flowers classification
6. Program to demonstrate Naïve- Bayes Classifier
7. Program to demonstrate PCA and LDA on Iris dataset
8. Program to demonstrate DBSCAN clustering algorithm
9. Program to demonstrate K-Medoid clustering algorithm
10. Program to demonstrate K-Means Clustering Algorithm on Handwritten Dataset