

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - VI/ Third Year
Subject Title:	Big Data on Cloud
Subject Code:	16-ITM304-3C
Pre-requisite:	SQL, Data Warehousing/Data Processing, and Database Knowledge

Course Objective:

- To study the basic technologies that forms the foundations of Big Data.
- To study the security and management aspects of cloud computing with a view to rapid prototyping of complex applications.
- To understand the specialized aspects of Data Extraction, Transformation, and loading.
- To study different types of algorithms and data processing techniques.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents

Sr. No	Topic	Total Hours	Weight (%)
1	Introduction to Cloud Computing & Big Data • Cloud characteristics • Cloud delivery models • Cloud deployment models • Cloud infrastructure and management • Cloud security • Prominent cloud vendors and their services • Big Data characteristics and benefits • Data storage technologies and storing data on Amazon S3	3	10
2	Data Extraction, Data Processing and Knowledge Extraction • Data extraction process and tools • Change Data Capture (CDC) • Distributed data processing • Different data processing engines • ETL using Amazon Glue • Data processing using Amazon	10	25

	• Data querying using Amazon Athena • Redshift data warehouse • Association rule mining • Apriori algorithm • Noise and outlier detection • Data pre-processing techniques • Sampling techniques • Similarity/dissimilarity measures		
3	Classification and Clustering of Big Data • Supervised and unsupervised learning • Collaborative filtering • Big Data analytics • Streaming data clustering • Feature extraction • Subspace clustering	6	20
4	In-Memory Computation • In-memory computation using Spark • Spark context • RDD and Data Frames • Transformations and actions • Data lineage	6	15
5	Real-time Data Processing • Real-time vs batch processing • Advantages and tools • Use cases • Using Amazon Kinesis and Spark streaming	5	10
6	Data Governance • Purpose of data governance • Metadata management • Data quality • Privacy and security • Data orchestration using AWS Data Pipeline	4	10
7	Data Architectures and Modelling • Characteristics of modern data architecture • Enterprise data architecture • Data modelling • Conceptual, logical and physical data modelling	3	10

List of Reference Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg, Andrzej Goscinski. Released March 2011. Publisher(s): Wiley. ISBN: 9780470887998
2. Cloud Computing: A Practical Approach. Front Cover · Toby Velte, Anthony Velte, Robert C. Elsenpeter. McGraw Hill Professional, Oct 22, 2009
3. Cloud Application Architectures. by George Reese. Released April 2009. Publisher(s): O'Reilly Media, Inc. ISBN: 9780596156367
4. John Rhoton, "Cloud Computing Explained: Implementation Handbook for Enterprises," Recursive Press, 2009, ISBN:0956355609
5. Cloud Computing(1st Edition) Fundamentals, Industry Approach and Trends by Rishabh Sharma Paperback, Published 2015 by Wiley India
6. Kailash Jayaswal, Jagannath Kallakurchi, Donald J Houde, Dr. Deven Shah Cloud Computing: Black Book Dreamtech Publications 2012 (ISBN 978-93-5119418-7)
7. Programming Google App Engine with Java. by Dan Sanderson. Released June 2015. Publisher(s): O'Reilly Media, Inc. ISBN: 9781491903452
8. Cloud Computing For Dummies. Front Cover. Judith S. Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper. John Wiley & Sons, Nov 16, 2009
9. Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More., Kris Jamsa, Jones & Bartlett Publishers, Paper back edition,2013.

List of Suggested titles of Experiments:

1. Develop a hello world program web application and deploy it on the Google app engine
2. Develop a web application which displays the current date and time in a formatted way.
3. Develop a web application which is customized version of the practical no 2, which relates the clock with Google accounts. Each user will get different view based on the preferences and the user's time zone.
4. Develop a web application for task management. Create a form to enter summary, URL and description of task and a button to insert a task in the task list. Use JPA (Java Persistence API) for the persistence and Sends the selected todo to yourself via email as a reminder
5. Develop a simple Java web application for Google App Engine--a guestbook that lets users post messages to a public message board.
6. Create a book class as entity and make the object persistence using JPA. Demonstrate the saving, fetching and deleting objects operations.
7. Create an employee class as entity and makes the objects persistence using JPA. Demonstrate transaction processing in the data store using JPA.
8. JPA includes a SQL-like query language called JPQL, perform the practical no 6 with JPQL also.
 1. Perform the practical no 7 with JPQL[list the employees having salary between a particular range]

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand concepts of Cloud Computing	1 Remembering 2. Understanding
CLO2	Understand virtualization techniques and Service Level Agreement	2 Understanding 3 Applying
CLO3	Estimate cost for Cloud Computing implementation	2 Understanding 3 Applying 4 Analyze
CLO4	Understand and analyze architecture of cloud computing	2 Understanding 3 Applying 4 Analyze
CLO5	Deploying application in cloud environment	2. Understanding 3 Applying 4 Analyze 5 Evaluate

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	M									L		M	L	M	L	
CLO2	M	H			H					M		L	M	M	H	
CLO3	L	L	L	M	L					H	H		M	L	M	L
CLO4	H	H	M	M	M				L	M	L	M	M	L	M	H
CLO5	M	M	H	L	M				M	H	H		M	M	L	H

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - VI/ Third Year
Subject Title:	Intelligent Game Design
Subject Code:	16-ITM305-3C
Pre-requisite:	Basics of Python Programming, Python Data Analysis

Course Objective: This course enables the students:

- Students will be able understand Unity Engine and its uses
- Ensures that they can implement Design Principles
- Ensures that the student understand Unity Production Pipeline
- Ensures that the students understand Unity Asset pipeline

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Definition of a Game and History of Game Design • What is a game and where is it used? • The game creator and the gamer, stakeholders and skill sets required in game design and development • Different formats for games and the history of game design over the years	7	20
2	Principles of Intelligent Game Design (Goals, Challenges, Feedback) • Goals - needs, social interaction, recognition, success • Challenges - risks, creating conflicts and obstacles • Feedback - rewards, punishments	8	25
3	Game Design and Development Process • Process overview from goal setting to testing • User study and research • The big idea • Game mechanics • Storytelling and storyboarding	7	20

	- Character design and development - heroes, enemies, and non-player characters (NPCs) - Environment design and Level design - Game prototyping and testing		
4	Game Technology (Game Engines, AR, VR, and AI) - Game Engines - a contrast between Unity, Unreal, and Cry - Application of AI and new technologies in gaming	8	15
5	Applications of Games and Roles for Gaming Professionals - Gaming Industry overview - role of games in entertainment, advertising, healthcare, education, social impact - Skills sets and roles for game designers, developers and producers in the industry	10	20

List of Reference Books:

1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016.
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002.
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009.
4. Allan Fowler-AR Game DevelopmentI, 1st Edition, A press Publications, 2018, ISBN 978-1484236178.
5. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016),ISBN-10: 933257849
6. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.
7. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice", Addison Wesley, USA, 2005.
8. Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Meging Real and Virtual Worlds", 2005.
9. Burdea, Grigore C and Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, India, 2003.
10. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381.
11. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449

List of Suggested titles of Experiments:

Implement the following in the Game Design Software:

1. Create a 3D Level with the following setups implemented.
2. Skyboxes
3. Terrains with detailing with rocks, trees, grass, fog, water surface.
4. Object meshes with colliders
5. Lights and Shadows.
6. Create a 3D Level setups implemented:
7. Compile the Scripts and bake the navigation mesh for setting up playable area.
8. Create a 2d platform as per given brief.
9. Create a 3d side scroller for the 3D Level Design.
10. Create an Environmental Open world scene - Medieva Introduction to Matplotlib and Line Plots

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the components of the virtual reality system	3 Applying 4 Analyzing
CLO2	Describe various input and output devices used for virtual reality	5 Evaluating
CLO3	Apply the different modelling concepts to visual virtualization	4 Analyzing 2 Understanding
CLO4	Analyze the performance of given simple applications related to virtual reality	3 Applying
CLO5	Understand the concepts of the augmented reality system	2 Understanding

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	M	H	L	M	L							L	M	M	M	
CLO2	M				H					M		M	L	H	H	
CLO3	H	L	M	H	M				L	L	M	L	M	L	M	M
CLO4	M	H	M	L	L				M	M	L	M	M	M	L	L
CLO5	H	M	L	M	M				L	M	M	M	H	H	M	M

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - VI/ Third Year
Subject Title:	Design Thinking
Subject Code:	16-ITM306-3C
Pre-requisite:	-

Course Objective: This course provides an introduction to the basic concepts and techniques of engineering and reverses engineering, the process of design, analytical thinking and ideas, basics and development of engineering drawing, application of engineering drawing with computer aide.

- To explain the concept of design thinking for product and service development
- To explain the fundamental concept of innovation and design thinking
- To discuss the methods of implementing design thinking in the real world.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents

Sr. No	Topic	Total Hours	Weight (%)
1	Understanding Design thinking Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping	6	15
2	Tools for Design Thinking Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design	6	20
3	Design Thinking in IT Design Thinking to Business Process modelling – Agile in Virtual collaboration environment – Scenario based Prototyping	8	25
4	DT For strategic innovations Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design	8	25
5	Design thinking workshop Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test	6	15

List of Reference Books:

1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition, 2013.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
4. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013
5. Yousef Haik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.
6. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author)

List of Suggested Activities:

1. Recognize the importance of Design Thinking.
2. Identify the steps in the DT process.
3. Recognize the steps in the empathize phase of DT.
4. Identify the steps required to conduct an immersion activity.
5. Conduct an immersion activity and fill up the DT question template.
6. Recognize the steps to create personas in the define phase of DT.
7. Create personas in the define phase of DT.
8. Recognize the steps to create problem statements in the define phase of DT.
9. Define the problem statements in the define phase of DT.
10. Recognize the steps in the ideate phase of DT.
11. Apply the steps in the ideate phase of DT.
12. Recognize how doodling can help to express ideas.
13. Recognize the importance storytelling in presenting ideas and prototypes.
14. Recognize the importance of the prototype phase in DT.
15. Create a prototype.
16. Recognize the importance of service value proposition.
17. Create a value proposition statement.
18. Recognize the best practices of the testing phase in DT.
19. Test a prototype created through a DT process.
20. Recognize how DT can help in functional work.
21. Recognize how Agile and DT complement each other to deliver customer satisfaction.

Online Resources:

1. Understanding Design thinking WF NEN https://www.youtube.com/watch?v=7oPZg_FR-ys
2. Design Thinking and Innovation at Apple Wei Li <https://www.youtube.com/watch?v=ir3E-TEUk48>
3. Stanford Webinar- Design Thinking = Method, Not Magic
<https://www.youtube.com/watch?v=vSuK2C89yjA>
4. Stanford Design Thinking Virtual Crash Course <https://online.stanford.edu/>
5. So Many Uses- activity to spark creativity and design
<https://www.youtube.com/watch?v=5MFZTOK3e7s>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Appreciate various design process procedure	1 Remembering 2. Understanding
CLO2	Generate and develop design ideas through different technique	2 Understanding 3 Applying
CLO3	Identify the significance of reverse Engineering to Understand products	2 Understanding
CLO4	Draw technical drawing for design ideas	2 Understanding 3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	L											M			M	H
CLO2	M	H	M	L	M				M	L		L			M	L
CLO3	H	M	L	L								M			L	M
CLO4	M	M	H	M	L				L	M		M			H	M

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - VI/ Third Year
Subject Title:	Cyber Forensics
Subject Code:	16-ITE307-3C
Pre-requisite:	Basic knowledge of computer science concepts, including operating systems and networking

Course Objective:

- To comprehend the process of Digital Forensics and its importance in solving digital cases.
- To explore digital evidence preservation and extraction techniques.
- To understand the international legal framework for cybercrime law and the collection of digital evidence.
- To assess the significance of Digital Forensic readiness

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction: Computer Forensics Fundamentals – Types of Computer Forensics Technology – Types of Computer Forensics Systems – Vendor and Computer Forensics Services.	6	15
2	Computer forensics evidence and capture: Data Recovery – Evidence Collection and Data Seizure-Duplication and Preservation of Digital Evidence-Computer Image Verification and Authentication.	8	15
3	Computer forensic analysis: Discover of Electronic Evidence Identification of Data – Reconstructing Past Events – Fighting against Macro Threats – Information Warfare Arsenal – Tactics of the Military – Tactics of Terrorist and Rogues – Tactics of Private Companies	10	20
4	Information warfare: Arsenal – Surveillance Tools – Hackers and Theft of Components – Contemporary Computer Crime-Identity Theft and Identity Fraud – Organized Crime & Terrorism – Avenues Prosecution and Government Efforts – Applying the First Amendment to Computer Related Crime-The Fourth Amendment and other Legal Issues.	8	30

5	Computer forensic cases: Developing Forensic Capabilities – Searching and Seizing Computer Related Evidence –Processing Evidence and Report Preparation – Future Issues.	4	20
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List of Reference Books:

1. John R. Vacca, “Computer Forensics: Computer Crime Scene Investigation”, Cengage Learning, 2nd Edition, 2005.
2. Marjie T Britz, “Computer Forensics and Cyber Crime: An Introduction”, Pearson Education, 2nd Edition, 2008.
3. MariE-Helen Maras, “Computer Forensics: Cybercriminals, Laws, and Evidence”, Jones & Bartlett Learning; 2nd Edition, 2014.
4. Chad Steel, “Windows Forensics”, Wiley, 1st Edition, 2006.
5. Majid Yar, “Cybercrime and Society”, SAGE Publications Ltd, Hardcover, 2nd Edition, 2013.
6. Robert M Slade, “Software Forensics: Collecting Evidence from the Scene of a Digital Crime”, Tata McGraw Hill, Paperback, 1st Edition, 2004.

List of Suggested titles of Experiments:

1. Creating a Forensic Image using FTK Imager/Encase Imager
2. Data Acquisition: - Perform data acquisition using: - USB Write Blocker + FTK Imager
3. Forensics Case Study : Solve the Case study (image file) provide in lab using Encase Investigator or Autopsy
4. Capturing and analyzing network packets using Wireshark (Fundamentals) : - Identification the live network - Capture Packets - Analyze the captured packets
5. Analyze the packets provided in lab and solve the questions using Wireshark : - What web server software is used by www.snopes.com? - About what cell phone problem is the client concerned? - According to Zillow, what instrument will Ryan learn to play? - How many web servers are running Apache?
6. Using Sysinternals tools for Network Tracking and Process Monitoring : - Check Sysinternals tools - Monitor Live Processes - Capture RAM - Capture TCP/UDP packets - Monitor Hard Disk - Monitor Virtual Memory - Monitor Cache Memory
7. Recovering and Inspecting deleted files - Check for Deleted Files - Recover the Deleted Files - Analyzing and Inspecting the recovered files
8. Acquisition of Cell phones and Mobile devices
9. Email Forensics - Mail Service Providers - Email protocols - Recovering emails - Analyzing email header
10. Web Browser Forensics . -Web Browser working -Forensics activities on browser -Cache / Cookies analysis -Last Internet activity

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	The students investigate the cyber forensics with standard operating procedures and recover the data from the hard disk with legal procedure	1 Remembering 2. Understanding 3 Applying
CLO2	Evaluate the effectiveness of available digital forensics tools and use them in a way that optimizes the efficiency and quality of digital forensics investigations.	2 Understanding 3 Applying 4 Analyze 5 Evaluate
CLO3	Create a method for gathering, assessing and applying new and existing legislation and industry trends specific to the practice of digital forensics.	2 Understanding 3 Applying 4 Analyze
CLO4	Able to analyze the role of digital forensics in the field of information assurance and cyber security and recognize the opportunities to benefit from and support the goals of those fields.	2 Understanding 3 Applying 4 Analyze

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	M	H	M	M	H	H						M	M	H	H	
CLO2	L	M	L	L	H					M		L	L	H	L	M
CLO3	M	L	M	M	M	L	M	M		L		M	M	M	M	M
CLO4	M	L	M	H	H	M	L	H		M		H	H	L	L	L

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - VI/ Third Year
Subject Title:	Natural Language Processing
Subject Code:	16-ITE308-3C
Pre-requisite:	Intermediate Python, Neural network basics, Basic probability, Object-oriented programming basics, Deep learning framework proficiency

Course Objective: The objective of this course is to provide students with a comprehensive understanding of natural language processing (NLP) techniques and applications. The course aims to develop students' skills in processing and analyzing human language data, building language models, and developing NLP applications

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction to Natural Language Processing: Overview of natural language processing and its significance, Language Processing and Python: Computing with Language: Texts and Words, A Closer Look at Python: Texts as Lists of Words, Computing with Language: Simple Statistics, Back to Python: Making Decisions and Taking Control, Automatic Natural Language Understanding	8	15
2	Accessing Text Corpora and Lexical Resources: Accessing Text Corpora, Conditional Frequency Distributions, Lexical Resources, WordNet Processing Raw Text: Accessing Text from the Web and from Disk, Strings: Text Processing at the Lowest Level, Text Processing with Unicode, Regular Expressions for Detecting Word Patterns, Useful Applications of Regular Expressions, Normalizing Text, Regular Expressions for Tokenizing Text, Segmentation, Formatting: From Lists to Strings. Categorizing and Tagging Words: Using a Tagger, Tagged Corpora,	10	25

	Mapping Words to Properties Using Python Dictionaries, Automatic Tagging, N-Gram Tagging, Transformation-Based Tagging, How to Determine the Category of a Word		
3	Learning to Classify Text: Supervised Classification, Evaluation, Naive Bayes Classifiers. Deep Learning for NLP: Introduction to Deep Learning, Convolutional Neural Networks, Recurrent Neural Networks, Classifying Text with Deep Learning.	10	25
4	Extracting Information from Text: Information Extraction, Chunking, Developing and Evaluating Chunkers, Recursion in Linguistic Structure, Named Entity Recognition, Relation Extraction. Analyzing Sentence Structure: Some Grammatical Dilemmas, What's the Use of Syntax. Context-Free Grammar, Parsing with Context-Free Grammar,	8	20
5	Advanced Topics in Natural Language Processing: Question answering and information retrieval, Dialogue systems and conversational agents, Neural network architectures for NLP tasks	4	15

List of Reference Books:

1. Daniel Jurafsky and James H. Martin "Speech and Language Processing", 3rd edition, Prentice Hall, 2009
2. "Natural Language Processing with Python" by Steven Bird, Ewan Klein, and Edward Loper, O'Reilly, 2009.
3. Christopher D. Manning and Hinrich Schütze, "Foundations of Natural Language Processing", 6th Edition, The MIT Press Cambridge, Massachusetts London, England, 2003
4. Nitin Indurkha, Fred J. Damerau "Handbook of Natural Language Processing", Second Edition, CRC Press, 2010.
5. James Allen "Natural Language Understanding", Pearson Publication 8th Edition. 2012.
6. Chris Manning and Hinrich Schütze, "Foundations of Statistical Natural Language Processing", 2nd edition, MIT Press Cambridge, MA, 2003.
7. Hobson Lane, Cole Howard, Hannes Hapke, "Natural language processing in action" MANNING Publications, 2019.
8. Alexander Clark, Chris Fox, Shalom Lappin, "The Handbook of Computational Linguistics and Natural Language Processing", Wiley-Blackwell, 2012
9. Rajesh Arumugam, Rajalingappa Shanmugamani "Hands-on natural language processing with python: A practical guide to applying deep learning architectures to your NLP application". PACKT publisher, 2018.

List of Suggested titles of Experiments:

➤ **Python Packages**

Students are expected to know/ learn the following Python NLP packages.

1. NLTK (www.nltk.org/ (<http://www.nltk.org/>))
2. Spacy (<https://spacy.io/>)
3. TextBlob (<http://textblob.readthedocs.io/en/dev/>
4. Gensim (<https://pypi.python.org/pypi/gensim>)
5. Pattern (<https://pypi.python.org/pypi/Pattern>)

➤ **Datasets:**

1. NLTK includes a small selection of texts from the Project Gutenberg electronic text archive, which contains some 25,000 free electronic books, hosted at <http://www.gutenberg.org/>.
2. The Brown Corpus contains text from 500 sources, and the sources have been categorized by genre, such as news, editorial, and so on (<http://icame.uib.no/brown/bcmlos.html>).
3. Wikipedia Articles Or any other dataset of your choice Reference: Jacob Perkins. Python 3 Text Processing with NLTK 3 Cookbook. Packt Publishing. 2014

➤ **Exercises:**

1. Text segmentation: Segment a text into linguistically meaningful units, such as paragraphs, sentences, or words. Write programs to segment text (in different formats) into tokens (words and word-like units) using regular expressions. Compare an automatic tokenization with a gold standard
2. Part-of-speech tagging: Label words (tokens) with parts of speech such as noun, adjective, and verb using a variety of tagging methods, e.g., default tagger, regular expression tagger, unigram tagger, and n-gram taggers.
3. Text classification: Categorize text documents into predefined classes using Naïve Bayes Classifier and the Perceptron model
4. Chunk extraction, or partial parsing: Extract short phrases from a part-of-speech tagged sentence. This is different from full parsing in that we're interested in standalone chunks, or phrases, instead of full parse trees
5. Parsing: parsing specific kinds of data, focusing primarily on dates, times, and HTML. Make use of the following preprocessing libraries: • dateutil which provides datetime parsing and timezone conversion • lxml and BeautifulSoup which can parse, clean, and convert HTML • charade and UnicodeDammit which can detect and convert text character encoding
6. Sentiment Analysis: Using Libraries TextBlob and nltk, give the sentiment of a document.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Apply the principles and Process of Human Languages such as English and other Indian Languages using computers.	1 Remembering 2. Understanding
CLO2	Realize semantics and pragmatics of English language for text processing Create CORPUS linguistics based on digestive approach (Text Corpus method)	2 Understanding 3 Applying 4 Analyze
CLO3	Perform POS tagging for a given natural language and Select a suitable language modelling technique based on the structure of the language	2 Understanding 3 Applying 4 Analyze
CLO4	Demonstrate the state-of-the-art algorithms and techniques for text-based processing of natural language with respect to morphology.	2 Understanding 3 Applying
CLO5	Develop a Statistical Methods for Real World Applications and explore deep learning based NLP.	2. Understanding 3 Applying 4 Analyze 5 Evaluate

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	M	M			M					M			M	L	M	
CLO2	L	L	M	L	L					L			M	M	M	M
CLO3	M	M	M	M	L					M			M	L	L	M
CLO4	H	L	L	M	M					L			M	M	L	M
CLO5	H	H	H	H	H					H	M	H	H	M	H	H

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - VI/ Third Year
Subject Title:	Hybrid Application Development
Subject Code:	16-ITE309-3C
Pre-requisite:	HTML, CSS, and JavaScript.

Course Objective:

- Understand the fundamentals of mobile application development.
- Gain insights into the historical evolution and significance of mobile devices.
- Acquire principles of user interface (UI) and user experience (UX) design for mobile applications.
- Develop a foundational understanding of mobile app programming.
- Explore debugging and testing practices for mobile applications.
- Explore mobile app development using iOS and Android.
- Develop proficiency in building applications that run on multiple platforms.
- Understand best practices for app deployment, maintenance, and update.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	50	25	-	25	100

Subject Contents

Sr. No	Topic	Total Hours	Weight (%)
1	Introduction and overview of different type of Mobile app and Web application • Introduction to Hybrid Mobile app • Overview of Cordova.JS • Overview of PWA (Progressive Web app) • Installation of Ionic, Cordova and necessary supports.	6	15
2	Architecture of Angular framework • Introduction to Angular and Angular CLI • Module, Component and Routing • Creating first Angular app • Overview of ES6 (latest Javascript)	8	20

3	How Angular works with Data and Event - Data binding and Events - Angular Directives (*ngIf, *ngFor) - Dynamic Styling with ngClass and ngStyle.	6	20
4	Data binding across the view (component) - Communication between components - Introduction of Service - Pipes (Date pipe)	4	20
5	Understanding of Ionic framework - Introduction of Ionic framework - Creating introductory project in Ionic - Generating Splash and Icon using Ionic CLI.	4	15
6	Ionic page structure and Ionic Elements - Ion-Card, Ion-Button, Date time picker & Grid - Infinite Scroll, Ion-Icon, Ion-List & Modal	5	10

List of Reference Books:

1. Beginning Hybrid Mobile Application Development Released January 2016 Publisher(s): Apress
ISBN: 9781484213148
2. Ionic: Hybrid Mobile App Development by Rahat Khanna, Sani Yusuf, Hoc Phan 2017.
3. Mobile App Development with Ionic 2: No. 2 (1st Edition - 25 April 2017. ISBN-13: 978) Author
Chris Griffith.
4. Building Progressive Web Apps: Bringing the Power of Native to the Browser Tal Ater O'Reilly
Media 2017
5. Swift Programming: The Big Nerd Ranch Guide Mikey Ward, Matthew Mathias, John Gallagher
Big Nerd Ranch Guides 2020.
6. Flutter and Dart Cookbook: Developing Full-Stack Applications for the Cloud Richard Rose
O'Reilly Media
2023.

List of Suggested titles of Experiments:

1. Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed. Insert a horizontal line between the job title and the phone number.
2. Develop an Android application using controls like Button, TextView, EditText for designing a calculator having basic functionality like Addition, Subtraction, Multiplication, and Division.
3. Create a SIGN Upton activity with Username and Password. Validation of password should happen
4. Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds.
5. Write a program to create an activity with two buttons START and STOP. On pressing of the START button, the activity must start the counter by displaying the numbers from One and the counter must keep on counting until the STOP button is pressed. Display the counter
6. Create two files of XML and JSON type with values for City Name, Latitude, Longitude, Temperature, and Humidity. Develop an application to create an activity with two buttons to parse the XML and JSON files which when clicked should display the data in their respective layouts side by side.
7. Develop a simple application with one Edit Text so that the user can write some text in it. Create a button called “Convert Text to Speech” that converts the user input text into voice.
8. Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Analyze and Synthesize the underlying structures of Software/Mobile architectures to provide effective solutions for Software/Mobile Applications.	4 Analyze 5 Evaluate
CLO2	Work in single and multi-disciplinary groups to Evaluate, Interpret and manage the requirements necessary for successfully test and deploy the project/application.	1 Remembering 2 Understanding 3 Applying
CLO3	Develop professional, Communicational and Ethical skills required to cater to the technological, social trends in the industry	2 Understanding 3 Applying
CLO4	Understand and Evaluate the advanced programming constructs and tools to Devise sustainable and robust solutions.	1 Remembering 2 Understanding 4 Analyze
CLO5	Apply mathematical and engineering principles to develop solutions that fulfills ones social responsibility.	1 Remembering 4 Analyze 5 Evaluate

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CLO1	H	M	M	L	L							M	H	H	M	
CLO2	M	L	M	M					M	M	M	M	M	H	M	L
CLO3						M		M	M	H	L	M		M	L	H
CLO4	M	M	M	L	M					L		H	H	M	M	L
CLO5	H		H	H		M	M	M				M	M	M	M	

H: High, M: Medium, L: Low

Branch Name:	Bachelor of Science (Information Technology)
Program Code:	ET110
Semester/Year:	Semester - VI/ Third Year
Subject Title:	Social Media and Blog Writing
Subject Code:	16-AEC223-3C
Pre-requisite:	Basic Internet usage

Course Objective: To familiarize students with writing skills for the different kinds of media. To equip them with practical knowledge for the evolving writing ecology and empower them for employment.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
00	00	04	02	-	-	25	25	50

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	The Basics of Writing and Types of Writing - The basics of writing mechanics – Grammar, vocabulary, phrases and clauses - How to write – construction of clear, simple and precise sentences. - Writing for the reader – Role of reader and broadening the Reader – Response theory. - Different kinds of writing – Fiction, Non-fiction (including historical writing, travel writing, memoirs), scientific writing, journalistic writing	8	15	
2	Exploring the New Avenues for Writing - Differences between traditional print writing (Newspapers, magazines, books etc.) and writing in the age of the internet – need to adapt to change. - Different forms of media – Print, social media websites, blogs, online platforms etc. - Understanding writing for different media through examples.	10	25	
3	Customizing Online Writing Based on the Online Platform: Long forms of writing- language, writing style, content, vocabulary focus, title, introduction and conclusion – film review, blog posts, scientific writing, e –magazines- with a minimum of two examples each.	10	25	

	- Shorter forms of writing – language, writing style, content, vocabulary, focus, caption – Twitter feeds/poems, fanfiction, instagram stories, facebook posts etc – with a minimum of two examples each. - Photo and Video writing – language, writing style, content, vocabulary, focus, caption, introduction and conclusion, synchronizing content – Video logging, photo blogging etc		
4	Journalistic and Ad Writing: - Comparing Print and online writing – for newspapers, magazines, journals. - Understanding the evolving dynamics of the adspace - including pop up ads, scrolls, flash ads- change in language, font, style and incorporating doodling with ad writing	8	20
5	Writing and Publishing: - Students must undergo hands-on –training from a recognized print/digital media. - Publish an article in a print/digital media.	8	15

List of Reference Books:

1. How Images think – Burnett 2004.
2. Online Journalism – Reporting, Writing and Editing for New Media – Richard Craig 2005 CENGAGE Learning.
3. Broadcast News Handbook – Writing, Reporting, Producing in a converging Media –C.A. Juggle,Forrest Carr and Suzanne Huffman McGraw-Hill, 2011
4. Writing Machines –Katherine Hayles 2002.
5. Writing For The Media ; Author, Sunny Thomas ; Publisher, Vision Books, 1997 ; ISBN, 8170942993, 9788170942993
6. The Language of New Media –Lev Manovich (MIT Press, 2001)
7. How to start Vlogging: A complete Beginner's Guide –Derrick Hayes 2019
8. Twitter for success: Achieve writing success 25 words at a time –Angela Booth 2nd edition (22 December 2011);
9. Blogging for beginners: Learn how to start and maintain a successful blog the simple way –Terence Lawfield 2015.
10. Writing New Media: Theory and Applications for Expanding the Teaching of Composition. January 2004. Authors: Anne Frances Wysocki

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Comprehend how to write with clarity, purpose and precision	1 Remembering 2. Understanding 3 Applying
CLO2	Understand how to modify writing styles based on the media employed	2 Understanding 3 Applying
CLO3	Use these skills to pursue higher education in other allied fields	3 Applying 4 Analyze
CLO4	Could use the knowledge to take up freelance writing assignments/projects and other related employment.	3 Applying 4 Analyze 5 Evaluate

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CLO1	L	L	M						M	L	M	H	M	L		
CLO2	M	M	L		H				H	M	L	L	L	M		
CLO3	L	M	L	M					L	M	M	L	M	L	M	L
CLO4	M	M	L	M	H		L	L	M	L	M	M	H	M	L	H

H: High, M: Medium, L: Low