Department of Computer Engineering

Structure & Syllabi

Honor Course

Data Science

w.e.f. Academic Year 2021-2022

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Department of Computer Engineering

Vision

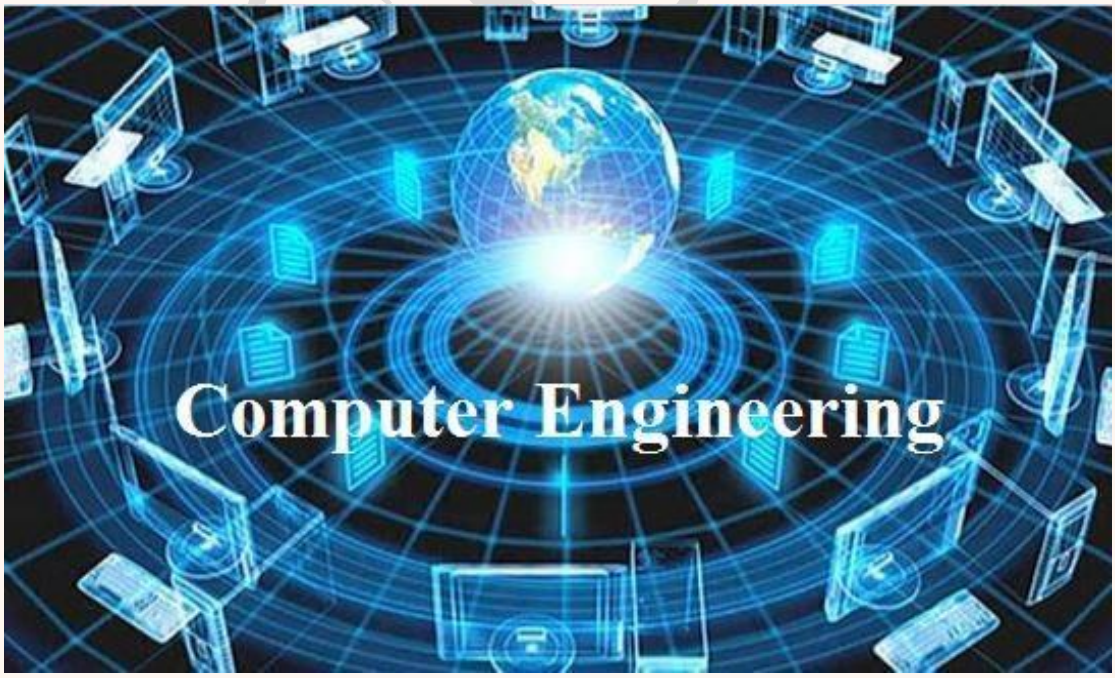
To create quality computer professionals through an excellent academic environment.

Mission of Department

M1. To empower students with the fundamentals of Computer Engineering for being successful professionals.

M2. To motivate the students for higher studies, research, and entrepreneurship by imparting quality education.

M3. To create social awareness among the students.



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Program Outcomes (POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and
with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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Program Specific Outcomes (PSOs)

Upon successful completion of UG course in Computer Engineering Technology, the students will attain following Program Specific Outcomes:

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PSO1: Domain Specialization:
Apply domain knowledge to develop computer-based solutions for Engineering Applications.

PSO2: Problem-Solving Skills:
Find solutions for complex problems by applying problem solving skills and standard practices and strategies in software project development.

PSO3: Professional Career and Entrepreneurship:
Incorporate professional, social, ethical, effective communication, and entrepreneurial practices into their holistic development.

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Highlights of the Syllabus

Curriculum of UG program for Computer Engineering is designed in association with

Academic Experts

Industry/Corporate Experts

Distinguished Alumni

Features of **Computer Engineering** curriculum are designed in association with the **Tata Consultancy Services.**

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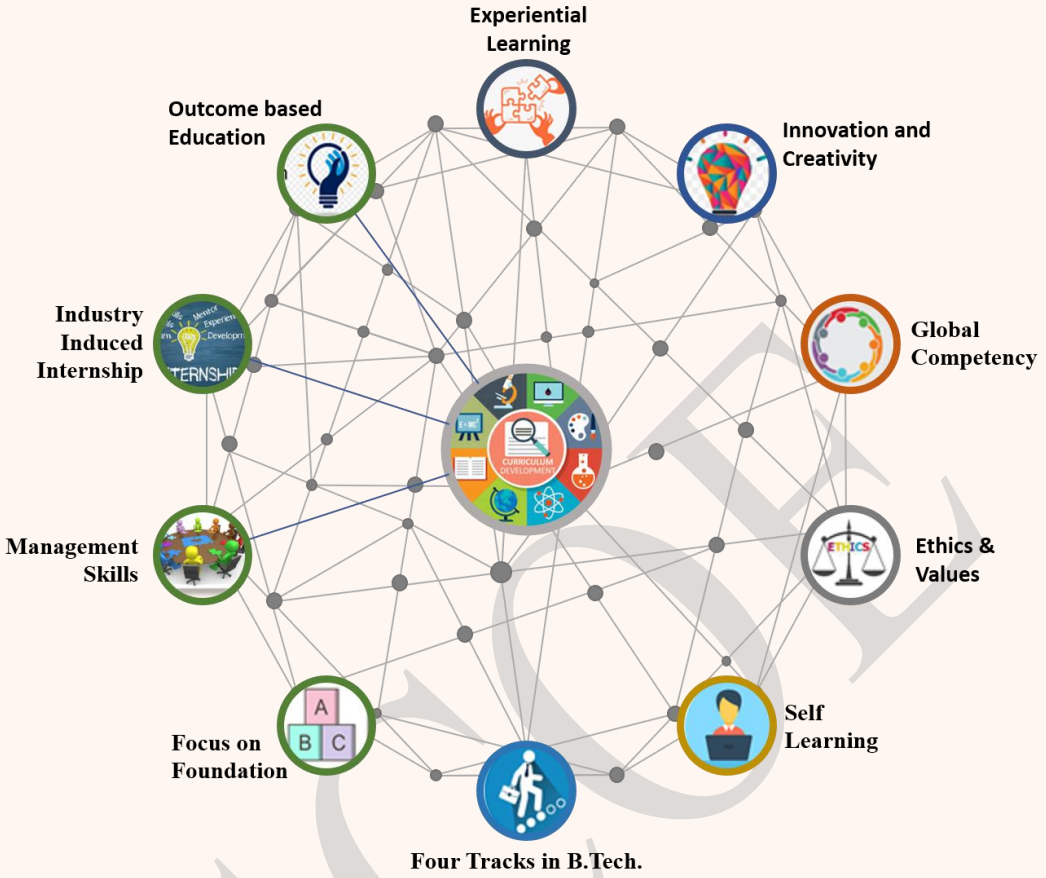
Experiential Learning
Outcome based Education
Innovation and Creativity
Industry Induced Internship
Global Competency
Management Skills
Ethics & Values
Focus on Foundation
Self Learning
Four Tracks in B.Tech.

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Unique features of the curriculum

1. **Curriculum centered at Outcome Based Education:**
   The new Curriculum is based on student-centered instruction models that focus on measuring student performance through outcomes. The outcomes include subject knowledge, industry required skills and attitudes.

2. **Emphasize on Fundamentals:**
   The nature of the new curriculum is rigorous and well prescribed so that the students can spend more time on preparation and self-study. The students have to learn core subjects, solve practical based assignments and must attempt periodical quizzes. This will benefit them to grasp and keep a strong hold on fundamentals of Engineering in the most effective way.

3. **Experiential Learning:**
   The curriculum emphasizes on hands-on sessions along with theoretical information. The new curriculum considers Problem Based Learning (PBL) as a teaching pedagogy and includes different subjects that encourage the students for hands on learning through virtual labs, mini-projects, etc. Accordingly, the curriculum maintains good balance between theory and laboratory credits.

4. **Promote Creativity and Innovation:**
   Along with experiential learning, the curriculum also motivates the students to inculcate creativity and innovation. Apart from conventional lab, the curriculum provides a freedom for students to perform industry assignments, pilot projects, innovative development, etc.

5. **Inculcating Ethics and Values:**
   To improvise student's behavior, the curriculum has included systematic courses on ethics and values. The moral principles can help students to make right decisions, lead their professional lives and become ethical citizen.

6. **Blend of Curricular and Noncurricular Activities**
   The curriculum also gives importance of different activities like co-curricular, extra-curricular, sports, culture, etc. This will help to do all round development of students in all possible ways.

7. **Four Tracks in B-Tech:**
   By offering various courses flexibility in choosing mentoring at work in specified field as:
   I. Industry Internship III. Entrepreneur

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II. Higher Studies and Research IV. In house Project

8. **Global Competence:**

The curriculum provides a unique opportunity for students to learn and engage in open and effective interaction with people from diverse and interconnected world. The combination of foreign languages (German, Japanese, English) and international internships in the curriculum help the students to build a capacity to examine global and intercultural issues and to propose perspectives and views.

9. **Industry Induced Internship Program**

To support ever demanding industry requirements, the curriculum has included an industry internship with an objective to learn technologies pertaining to their discipline and enhance their technical knowledge with a support of the live platform of Industry.

10. **Motivation for Self-Learning:**

The curriculum also offers a freedom to students to take the initiatives in their learning needs and set the goals with the help of online learning platforms like MOOCs, NPTEL, Swayam, etc.

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Computer Engineering (Honor Course)
Data Science
Structure

Course Code	Course	Teaching Scheme			Examination Schemes						Credits
		TH	Tut	Lab	Theory			Practical		Total	Total
					ISE (15)	MSE (25)	ESE (60)	TW	Lab		
T. Y. Sem V											
CSH3101	**Data Analytics**	4		-	15	25	60	-	-	100	4
T. Y. Sem VI											
CSH3102	**Data Science and Visualization**	3	-	2	15	25	60	25	25	150	4
CSH3103	**Conversational Systems for Business**	3	-	2	15	25	60	25	25	150	4
B.Tech. Sem VII/VIII											
CSH4101	**Advanced Social, Text and Media Analytics**	4	-	-	15	25	60	-	-	100	4
CSH4102	**Cognitive Science & Business Analytics**	4	-	-	15	25	60	-	-	100	4
Total		**18**	**-**	**4**	**75**	**125**	**300**	**50**	**50**	**600**	**20**

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T. Y. B. Tech (Honor Course)
Academic Year – 2021-2022 Semester -V
[CSH3101]: Data Analytics

Teaching Scheme: TH: - 4 Hours/Week	Credit TH:4	Examination Scheme: In Sem. Evaluation:15 Marks Mid Sem. Exam: 25 Marks End Sem. Exam : 60 Marks

Course Prerequisites : Computational Statistics, Machine Learning

Course Objective:

1. To obtain a comprehensive knowledge of various tools and techniques for data transformation and visualization.
2. To learn about the classification techniques.
3. To learn about the clustering techniques and prediction models.

Course Outcome:

After successful completion of the course, students will able to:

CO1: Explain data analytics lifecycle.
CO2: Apply preprocessing techniques on data.
CO3: Apply association rule for finding frequent patterns.
CO4: Describe and compare various classification algorithms.
CO4: Describe advanced classification algorithms.
CO5: Illustrate clustering algorithms for prediction and to derive insights.

Course Contents

UNIT-I	Data Analytics Lifecycle	6 Hours

Data Analytics Lifecycle Overview, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize, Global Innovation Network and Analysis (GINA). Data Connectivity & Integration: Data Sources & Types, Data import & Export, External Database Connectivity Extract Transform & Load (ETL), Data Preparation: Data Filtering / Recoding Techniques, Data Transformation Missing Values Treatment, Outlier Treatment, Data Sampling Techniques.

UNIT-II	Data Pre-processing	8 Hours

Types of Machine Learning, Data Preprocessing: Data Quality, Major Tasks in Data Preprocessing, Entity Identification Problem, Redundancy and Correlation Analysis, Tuple Duplication, Data Value Conflict Detection and Resolution, Data Reduction, Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection Regression and Log-Linear Models: Parametric Data Reduction, Histograms Clustering, Sampling, Data Cube Aggregation, Data Transformation Strategies

UNIT-II	Unsupervised Learning	8 Hours

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Clustering: Cluster Analysis and Types Partitioning Methods, k-Means, k-Medoids, Hierarchical Methods, BIRCH,DBSCAN, OPTICS,DENCLUE, Performance Evaluation of Clustering

Association Rule: Market Basket Analysis: Frequent Itemsets, Closed Itemsets and Association Rule, , Apriori Algorithm, A Pattern-Growth Approach for Mining Frequent Itemsets,
Case Study: Transactions in a Grocery Store.

UNIT-IV	Supervised Learning	8 Hours

Classification and Regression, Types of regression, Logistic Regression, types of Classification, Decision Tree Induction, Attribute Selection Measures, Tree Pruning, Bayes Classification Methods, Bayes' Theorem, Naive Bayesian Classification, Rule-Based Classification, Rule Extraction from a Decision Tree, Model Evaluation and Selection, Metrics for Evaluating Classifier Performance,
Comparing Classifiers Based on Cost–Benefit and ROC Curves, Techniques to Improve Classification Accuracy, Introducing Ensemble Methods, Bagging, Boosting and AdaBoost, Random Forests, Improving Classification Accuracy of Class-Imbalanced Data.

UNIT-V	Classification: Advanced Methods	8 Hours

Bayesian Belief Networks, Training Bayesian Belief Networks, Classification by Backpropagation, Neural Network and types, single layer perceptron, A Multilayer Feed-Forward Neural Network, Backpropagation neural network, Support Vector Machines, types of SVM, Kernel tricks , k-Nearest-Neighbor Classifiers,
Genetic Algorithms, Rough Set Approach, Fuzzy Set Approaches, Semi-Supervised Classification, Active Learning, Transfer Learning,

UNIT-VI	Visualization	8 Hours

Introduction to Data Visualization, Challenges of Data Visualization, Types of Data Visualization: Basic Charts Scatter Plots, Histogram, Advanced Visualization Techniques Like Streamline and Statistical Measures, Plots, Graphs, Networks, Hierarchies, Reports, Map .Principles of data visualization.Data visualization of multidimensional data,Data Analysing and Visualization using python

Text Books:

T1. "Data Mining: Concepts and Techniques provides the concepts and techniques", Jiawei Han, Micheline Kamber and Jian Pei.

T2. "Data Science and Big data Analytics, Discovering Analyzing, Visualization and Presenting Data", EMC^2 EMC Education Services

Reference Books:

R1. Giuseppe Bonaccorso, "Machine Learning Algorithms", Packt Publishing Limited, ISBN10: 1785889621, ISBN-13: 978-1785889622

R2. "Data Science and Machine Learning Mathematical and Statistical Methods", Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, RadislavVaisman https://people.smp.uq.edu.au/DirkKroese/DSML/DSML.pdf

R3. "Computational and Inferential Thinking", https://unglueit-files.s3.amazonaws.com/ebf/bf0313e7f8284a39bcb30a9acd2dba31.pdf

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T. Y. B. Tech (Computer Engineering)
Academic Year – 2021-2022 Semester -VI
[CSH3102]: Data Science and Visualization

Teaching Scheme:	Credit	Examination Scheme:
TH: -3 Hours/Week	TH: 3	In Sem. Evaluation:15 Marks
PR: -2 Hours/Week	PR: 1	Mid Sem. Exam : 25 Marks
		End Sem. Exam : 60 Marks
		Lab Evaluation : 50 Marks

Course Prerequisites : Machine Learning, Computational Statistics, Statistical Methods, Introduction to Probability statistics and Calculus.

Course Objective:

- To study data exploration techniques.
- To study different data visualization techniques and tools.
- To map element of visualization well to perceive information.
- To describe and use all the tools and libraries of python for data science.

Course Outcome:

After successful completion of the course, students will able to:

CO1: Evaluate machine learning models.

CO2: Explain basics of data science.

CO3: Apply different data visualization techniques to understand the data.

CO4: Model multidimensional data and visualize it using appropriate tool.

CO5: Analyze the data using suitable method; visualize using the open source tool.

Course Contents

UNIT-I	Evaluating Machine Learning Models	08 Hours

The Machine Learning Workflow, Classification Metrics, Ranking Metrics, Regression Metrics, Offline Evaluation Mechanisms: Hold-Out Validation, Cross Validation and Bootstrapping, Hyperparameter Tuning: Model Parameters Versus Hyperparameters, Hyperparameter Tuning Mechanism, Hyperparameter Tuning Algorithms, The Case for Nested Cross-Validation, The Pitfalls of A/B Testing.

UNIT II	Introduction to Data Science	08 Hours

Defining Data Science and Big Data, Recognizing Different Types of Data, Gaining Insight Into Data Science Process, Data Science Process: Overview, Different Steps, Machine Learning Definition and Relation with Data Science.

UNIT-III	Basics of Data Visualization	08 Hours

Introduction to Data Visualization, Challenges of Data Visualization, Definition and Types of Dashboard, Evolution of Dashboard, Dashboard Design and Principles, Display Media for Dashboard,

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Types of Data Visualization: Basic Charts Scatter Plots, Histogram, Advanced Visualization Techniques Like Streamline and Statistical Measures, Plots, Graphs, Networks, Hierarchies, Reports.		
UNIT-IV	**Principles of Data Visualization**	**08 Hours**
The Seven Stages of Visualizing Data: Why Data Display Requires Planning, Iteration and Combination, Principles, Getting Started with Processing: Sketching with Processing, Exporting and Distributing Your Work, Examples and Reference, Functions, Sketching and Scripting, Mapping: Drawing a Map, Locations on a Map, Data on a Map Using Your Own Data.		
UNIT-V	**Data visualization of multidimensional data**	**08 Hours**
Need of Data Modeling, Multidimensional Data Models, Mapping of High Dimensional Data Into Suitable Visualization Method-Principal Component Analysis, Clustering Study of High Dimensional Data, Visualization Tools.		
UNIT-VI	**Data Analysing and Visualization using python**	**08 Hours**
Data Analysis Libraries: Will Learn to Use Pandas Dataframes, Numpy Multi-Dimentional Arrays, and Scipy Libraries to Work with a Various Dataset, Pandas, An Open-Source Library: Load, Manipulate, Analyze and Visualize Various Datasets. Matplotlib, Scikit-Learn, Use of Scikit-Learn Machine Learning Algorithms to Build Smart Models and Make Predictions, Parameters for Comparison.		

Lab Contents

Guidelines for Assessment

1) Continuous assessment shall be based on experiments performed, submission of results of program in the form of report/journal, timely completion, attendance ,understanding, efficient codes, punctuality and neatness.
2) Practical/Oral examination shall be based on the practical's performed in the lab.
3) Lab assessment shall be based on continuous assessment and performance in Practical/Oral examination

List of Laboratory Assignments/Experiments

1	To study data science and machine learning basics.
2	Access an open source dataset "Titanic". Apply pre-processing techniques on the raw dataset.
3	Build training and testing dataset of assignment 1 to predict the probability of a survival of a person based on gender, age and passenger-class.
4	Use Netflix Movies and TV Shows dataset from Kaggle and perform following operation: a. Make a visualization showing the total number of movies watched by children b. Make a visualization showing the total number of standup comedies c. Make a visualization showing most watched shows d. Make a visualization showing highest rated show make a dashboard (DASHBOARD A) containing all of these above visualizations.
5	Explore New York City -311 Complaints and Housing datasets.
6	Analyze and visualize data using Python.
7	Perform feature engineering exercise using Python.
8	Build and validate predictive machine learning model using Python.

Text Books:

T3. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques" , 3rd

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Edition.
T4. Joel Grus, " Data Science from Scratch", O'Reilly Media Inc., ISBN: 97814919014273.
T5. Colin Ware, "Information Visualization Perception for Design", MK Publication.
T6. Kyran Dale, "Data Visualization with Python and JavaScript", Shroff Publisher/O'Reilly Publisher Publication.

Reference Books:

R4. Alice Zheng- Evaluating Machine Learning Models: A Beginner's Guide to Key Concepts and Pitfalls, O'Reilly Media, 2015, ISBN 1491932465, 9781491932469.
R5. Big data black book, Dream Tech Publication.
R6. Ben Fry- Visualizing Data. Released December 2007. Publisher(s): O'Reilly Media, Inc. ISBN: 9780596514556.
R7. Data Science Using Python and R by Chantal D. Larose and Daniel T. Larose, Wiley Publication.
R8. Python for Data Science and Visualization -Beginners to Pro, Udemy.

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Academic Year – 2021-2022 Semester -VI

[CSH3103]: COVERSATIONAL SYSTEMS FOR BUSINESS

Teaching Scheme:	Credit	Examination Scheme:
TH: - 3 Hours/Week	TH: 3	In Sem. Evaluation: 15 Marks
PR: - 2 Hours/Week	PR: 1	Mid Sem. Exam : 25 Marks
		End Sem. Exam : 60 Marks
		Lab Evaluation : 50 Marks

Course Prerequisites: Discrete mathematics , Machine Learning

Course Objective:

- To acquire knowledge on chatbots and its terminologies.
- To work with ML Concepts and different algorithms to build custom ML Model.
- To understand on Conversational experiences and provide better customer experiences.

Course Outcome:

After successful completion of the course, students will able to:

CO1: Describe the basics of Conversational systems.
CO2: Demonstrate Natural Language Processing Tasks.
CO3: Build Chatbot/Conversational AI systems.
CO4: Demonstrate the Role of ML/AI in Conversational Technologies.
CO5: Summarize the knowledge of conversational Analytics for business systems.

Course Contents

UNIT-I	Application of AI	05 Hours

Introduction: History and impact of AI, Properties of Human Conversation, **Underlying technologies:** Natural Language Processing, Artificial Intelligence and Machine Learning, NLG, Speech-To-Text, Text-To-Speech, Computer Vision etc.,**Introduction to Top players in Market** – Google, MS, Amazon &Market,trends, **Messaging Platforms (Facebook, WhatsApp) and Smart speakers** – Alexa, Google Home and other new channels,**Ethical and Legal Considerations in AI Overview.**

UNIT-II	Natural Language Processing	09 Hours

Introduction: Brief history, need of Chatbots: Business Prospective and Developer's Prospective, Basic Concepts, Phases of NLP, Application of chatbots etc.

General chatbot architecture, Basic concepts in chatbots: Intents, Entities, Utterances, Variables and Slots, Fulfillment, Spacy, Lexical Knowledge Networks (WordNet, Verbnet, PropBank, etc)

Lexical Analysis, Part-of-Speech Tagging, Stemming and Lemmatization, Named entity recognition, Dependency Parsing/Syntactic analysis, Semantic Analysis, similarity detection,Word Sense Disambiguation, Tokenization, Regular Expression, Information Extraction, Sentiment Analysis, Affective NLG

UNIT-III	Fundamentals of Conversational Systems	07 Hours

Fundamentals of Conversational Systems (NLU, DM and NLG), Chatbot framework & Architecture, Conversational Flow & Design, Intent Classification (ML and DL based techniques), Dialogue

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Management Strategies, Natural Language Generation(NLG), UX design, APIs and SDKs, Usage of Conversational Design Tools		
UNIT-IV	**Building a chatbot/Conversational AI Systems**	**09 Hours**
Introduction to popular chatbot frameworks – Google Dialog flow, Microsoft Bot Framework, Amazon Lex, RASA **Channels**: Facebook Messenger, Google Home, Alexa, WhatsApp, Custom Apps Overview of CE Testing techniques, A/B Testing, Introduction to Testing Frameworks - Botium /Mocha ,Chai Security & Compliance – Data Management, Storage, GDPR, PCI **Case Study:** Food ordering Bot on Facebook Messenger, Horoscope Bot		
UNIT-V	**Role of ML/AI in Conversational Technologies/ End to End Dialogue System**	**09 Hours**
Neural Network Approaches to Dialogue Modeling ,A Neural Conversational Model, Introduction to the Technology of Neural Dialogue, Word Embeddings, Recurrent Neural Networks (RNNs), Long Short-Term Memory Units, Retrieval-Based Response Generation, Task-Oriented Neural Dialogue Systems . Understanding on how Conversational Systems uses ML technologies in Automated Speech Recognition, NLP, Advanced Dialog management, Language Translation, Emotion/Sentiment Analysis, Information extraction ,etc. to effectively converse		
UNIT-VI	**Contact Centers & Conversational Analytics**	**05 Hours**
Contact Centers: Introduction to Contact centers – Impact & Terminologies, Case studies & Trends, How does a Virtual Agent/Assistant fit in here? **Overview on Conversational Analytics:** Conversation Analytics : The need of it, Introduction to Conversational Metrics, **Future – Where are we headed?** Summary, Robots and Sensory Applications overview ,XR Technologies in Conversational Systems , XR-Commerce,What to expect next? – Future technologies and market innovations overview		

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1) Continuous assessment shall be based on experiments performed, submission of results of program in the form of report/journal, timely completion, attendance ,understanding, efficient codes, punctuality and neatness.
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3) Lab assessment shall be based on continuous assessment and performance in Practical/Oral examination

List of Laboratory Assignments

1	NLP using Python : Write a python program using of any of the NLP libraries like NLTK, spaCy, Stanford NLP etc and solve the following: a. Extract the top 10 most common words in the given text excluding stopwords. b. Extract and print all the nouns present in the below text c. Find the similarity between any two text documents d. Detect if a text is positive or negative sentiment e. Extract all bigrams , trigrams (using ngrams) for a given document.
2	**Mini project :** Pick the cloud platform either GCP and create google dialog flow agent for

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	anyone of given use case or AWS Lex Bot/Alexa Skills a. Hotel Booking b. Salon Appointment Booking c. Customer Help Desk d. Shopping Assistant e. Insurance Bot
3	**Implement any one mini project:** **Mini project:** Case Study to build a ML Model using LSTM/any RNN and integrate with chatbot **OR** **Mini project:** Create a ML model using Google AutoML Natural Language. Train the model for different sentiments. Host model on GCP cloud and can be accessed as API.Connect your bot with ML model created on GCP cloud and every conversation sentence of the user as input to this model and user sentiments need to be calculated and displayed at the end of conversation. **OR** **Mini project:** Build a simple Emotion Text Analyzer Model with minimum 6 emotions to detect and host it in cloud GCP/AWS. Access the model as API and integrate with your bot. Calculate the emotions of their entire conversation and store it. Also based on the emotions send the response of the intent accordingly. Based on emotions exhibited by the user, if the user is less satisfied ask for suggestions to improve and record the same.

Text Books:

T1. Oisin Muldowney, "Chatbots: An Introduction And Easy Guide To Making Your Own", Paperback, 2017.

T2. Christopher Manning and Hinrich Schütze, " Foundations of Statistical Natural Language Processing", MIT Press. Cambridge, MA: May 1999.

T3. Sumit Raj, "Building Chatbots with Python: Using Natural Language Processing and Machine Learning", Paperback, 2019.

T4. Srini Janarthanam, Hands-On Chatbots and Conversational Ui Development: Build chatbots and voice user interfaces with Chatfuel, Dialogflow, Microsoft Bot Framework, Twilio, and Alexa Skills, Paperback, 2017.

Reference Books:

R1. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", O'reilly, ISBN No. 978-0596516499.

R2. Kory Becker, "Building Voice-Enabled Apps with Alexa", Paperback, Dreamtech Press,2018.

R3. Michael McTear**, "**Conversational AI: Dialogue Systems, Conversational Agents, and Chatbots (Synthesis Lectures on Human Language Technologies), Paperback, 2017.

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JSPM's
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(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)

Final Year B. Tech (Computer Engineering)
Academic Year – 2021-2022 Semester - VII/VIII
[CSH4101]: Advanced Social and Text Media Analytics

Teaching Scheme:	Credit	Examination Scheme:
TH: - 4 Hours/Week	TH: 4	In Sem. Evaluation: 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks
Course Prerequisites : Data Analytics, Data Visualization, Conversational Systems		
Course Objective: • Illustrate concepts of social media analytics		

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- Identify the components of a strategic social media plan and effectively develop one that creates value for any organization
- Understand the link between qualitative and quantitative methods of social network analysis

Course Outcome:

After successful completion of the course, students will able to:

CO1: Familiarize the learners with the concept of social media analytics and explains its significance.
CO2: Explain text mining and analytics.
CO3: Illustrate word association mining.
CO4: Enable the learners to develop skills required for analysing the effectiveness of social media for business purposes.
CO5: Apply the techniques of social media analytics.

Course Contents

UNIT-I	Introduction to Social Media Analytics (SMA)	07 Hours

Introduction to Social Media Analytics (SMA): Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas Network fundamentals and models: The social networks perspective - nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks. Information visualization.

UNIT-II	Text Mining and Analytics	07 Hours

Overview Text Mining and Analytics, Natural Language Content Analysis, Text Representation, Preprocess and vectorize text into high-dimensional feature representations, Perform document classification and topic modeling, Build a dialog framework to enable chatbots and language-driven interaction.

UNIT-III	Topic Mining and Analysis	07 Hours

Syntagmatic Relation Discovery: Entropy, Conditional Entropy, Mutual Information, Topic Mining and Analysis: Motivation and Task Definition, Term as Topic, Probabilistic Topic Models, Probabilistic Topic Models: Overview of Statistical Language Models

UNIT-IV	Social Media Competitor Analysis	07 Hours

Comprehensive competitor analysis using SEMrush and other tools, Understand the competitor strategy, Frame own strategy to achieve your marketing objectives, Social media channels and rationale, Content Management

UNIT-V	Collecting and Extracting Social Media Data	07 Hours

Introduction, parameters, demographics. Analysing page audience. Reach and Engagement analysis. Post- performance on FB. Social campaigns. Measuring and Analysing social campaigns, defining goals and evaluating outcomes, Network Analysis. (LinkedIn, Instagram, YouTube Twitter etc. Google analytics. Introduction. (Websites).

UNIT-VI	Social Media Processing Techniques	07 Hours

Processing and Visualizing Data, Influence Maximization, Link Prediction, Collective Classification, Applications in Advertising and Game Analytics Introduction to Python Programming, Collecting and analyzing social media data; visualization and exploration, tools for social media analytics.

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T1. Matthew Ganis, Avinash Kohirkar, "Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media", Pearson Publication.
T2. Jim Sterne, "Social Media Metrics: How to Measure and Optimize Your Marketing Investment Media Analytics", Wiley Publication.
T3. Benjamin Bengfort, Rebecca Bilbro, Tony Ojeda, " Applied Text Analysis with Python", O'Reilly Media, Inc. ISBN: 9781491963043

Reference Books:

R1. Schaffer, Neal (2013). Maximize Your Social. New Jersey: John Wiley & Sons.

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RAJARSHI SHAHU COLLEGE OF ENGINEERING
TATHAWADE, PUNE-33
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)

Final Year B. Tech (Computer Engineering)
Academic Year – 2021-2022 Semester -VII/VIII
[CSH4102]: Cognitive Science and Analytics

Teaching Scheme:	Credit	Examination Scheme:
TH: - 4 Hours/Week	TH:4	In Sem. Evaluation:15 Marks Mid Sem. Exam: 25 Marks End Sem. Exam : 60 Marks

Course Prerequisites : Machine Learning ,Computational Statistics , BCVS ,

Course Objective:

1. To understand the basic concept of Cognitive Science
2. To understand the perception and attention of cognitive process
3. Understanding the Role of Business Analyst and Data Science in business.
4. Necessity of data analytics in business intelligence
5. Understand date management and data science project life cycle

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6. To understand the application of business analysis

Course Outcome:

After successful completion of the course, students will able to:

CO1: Illustrate the perception and attention model
CO2: Explain the basics of business analysis and Data Science
CO3: Apply the concepts of business analytics
CO4: Identify and describe business problems in terms of analytical model
CO5. Illustrate the application of business analysis in different domain

Course Contents

UNIT-I	Introduction to Cognitive Science	6 Hours
The Complexity of Congnition, Relationship between brain activity and cognition, Psychometric Test(IQ and BIG Five),Reaction time(RT), mental Rotation, Neurons, Neuronal communication, Neuron Information processing		
UNIT-II	**Perception and attention**	**8 Hours**
Bottom up and top down processing, Object recognition, Gestalt laws, Heuristics for perceiving, Perception and attention, early and late selection model. The cocktail phenomenon, Visual studies, spotlight model of visual attention		
UNIT-III	**Introduction to Business Analytics**	**8 Hours**
What is business analytics? Historical Overview of data analysis, Data Scientist vs. Data Engineer vs. Business Analyst, Career in Business Analytics, What is data science, Why Data Science, Applications for data science, Data Scientists Roles and Responsibility, Statistics Vs Data Mining Vs, Data Analytics Vs, Data Science		
UNIT-IV	**Types of Data Analytics**	**7 Hours**
Business Analytics (BA) – Need, Components (Business Context, Technology, Data Science,Types (Descriptive, Predictive and Prescriptive), Business Intelligence versus Business Analytics, Transaction Processing v/s Analytic Processing (OLTP v/s OLAP , OLAP Operations, Data models for OLTP (ER model) and OLAP		
UNIT-V	**Analytics in Industry**	**7 Hours**
Data: Data Collection, Data Management, Big Data Management, Organization/sources of data, Importance of data quality, Dealing with missing or incomplete data, Data Visualization, Data Classification Data Science Project Life Cycle: Business Requirement, Data Acquisition, Data Preparation, Hypothesis and Modeling, Evaluation and Interpretation, Deployment, Operations, Optimization.		
UNIT-VI	**Application of Business Analysis**	**6 Hours**
Application of Business Analysis: Retail Analytics, Marketing Analytics, Financial Analytics, Healthcare Analytics, Supply Chain Analytics		

Text Books:

T1. Essentials of Business Analytics: An Introduction to the methodology and its application, Bhimasan karam Pochiraju, Sridhar Seshadri, Springer

T2. Introduction to Machine Learning with Python: A Guide for Data Scientists 1st Edition,by Andreas C. Müller, Sarah Guido, O'Reilly

T3. Introduction to Data Science, Laura Igual Santi Seguí, Springer

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Reference Books:

R1. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, PearsonEducation India

R2. An Introduction to Business Analytics, Ger Koole, Lulu.com, 2019

R3. Gardner, The Mind's New Science, Gardner, Howard E. The mind's new science ,A history of the cognitive revolution. Basic books, 2008.

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