



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited A++ Grade by NAAC | 12B Status by UGC | Approved by AICTE

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SCHOOL OF COMPUTING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

1.1.3 Courses having focus on employability/ entrepreneurship/ skill development

B.E Computer Science and Engineering With Specialization In Artificial Intelligence and Machine Learning			
Employability			
S.No	Course Code	Course Name	Page No
	SCSA1514	Data modelling and Predictive Analytics	2
	SMTA1605	Exploratory Data Analysis and Time Series	4
	SCSA1606	Predictive and Advanced Analytics	5
	SCSB1251	Artificial Intelligence Search methods and Reasoning	6
Skill Development			
	SCSA2507	Human Computer Interaction Lab	7
	SCSA2608	AI and Visualization lab	8
Entrepreneurship			
	S611APT1	Professional Training - I	
	S611AIPROJ	Interdisciplinary Project	

SCSA1514	DATA MODELING AND PREDICTIVEANALYTICS	L	T	P	Credits	Total Marks
		3	*	0		

COURSE OBJECTIVES

- To learn fundamentals and concept behind data modeling.
- To understand the concepts of advanced data modeling techniques.
- To study data, its type and visualization techniques.
- To learn predictive analytics and apply the learnt data models.
- To build predictive data model and learn the reasons to build the same.

UNIT 1 DATA MODELING: BASICS

9 Hrs.

Importance – Features – Performance – Data Model: Conceptual, Logical and Physical Data Models – Three Schema Architecture – Organizing the Data Modeling task – Roles – Responsibilities – Maintenance – Distributed Data: Replication – Partitioning – Transaction – Case Study: Advanced Normalization forms

UNIT 2 DATA MODELING: ADVANCED

9 Hrs.

Conceptual Data Modeling – Design – Learning – Usage of patterns and Generic model – Types: Bottom-Up Modeling – Top-Down Modeling – Hierarchy – Network – Chain – Evaluation, Comparison and Testing of Model – Modeling for Data Warehouse and Data Mart – Case Study: Enterprise Data Model Development

UNIT 3 PREDICTIVE ANALYTICS: ALL ABOUT DATA

9 Hrs.

Data: Structured, Unstructured, Static, Streamed – Attitudinal, Behavioral, Demographic data – Data-Driven and User-Driven Analytics – 4 V's in data – Keyword-based and Semantic-based Search – Visualization of raw data – Online marketing retail implementation – Content and Text Analysis – Case Study: PA in Fight, Fraud and Crime

UNIT 4 PREDICTIVE ANALYTICS: APPLYING DATA MODELS

9 Hrs.

Model, Simulation and Categorization of data – Raw data to matrix conversion – Associating similar data – Birds flocking and Ant colony approaches – Preprocessing, structuring data – Building Predictive model – Developing and Testing model – Case Study: Google Search queries as Epidemic Predictors

UNIT 5 PREDICTIVE ANALYTICS: BUILDING PREDICTIVE DATA MODELS

9 Hrs.

Visualization: Benefits – Complexity reduction – Evaluation – Visualizing: Hidden Groupings, Data Classification Results, Outliers in data, Decision Tree and Predictions – Ten reasons to implement Predictive Analytics – Ten steps to build Predictive Analytics model – Case Study: Birds Flocking behavior Data Visualization

COURSE OUTCOMES

Max. 45 Hrs.

On completion of the course, student will be able to

CO1 - List out different types of data models along with its roles and responsibilities. CO2 -

Implement conceptual data modeling design and types of modeling.

CO3 - List out the types of data and techniques to analyze the data. CO4 -

Apply different data models for predictive data analysis.

CO5 -Design and build predictive analytics model and list out ten reasons to implement the same. CO6 -

Apply predictive data model on real world data.

TEXT / REFERENCE BOOKS

1. “Data Modeling Essentials” Third Edition by Graeme C. Simsion and Graham C. Witt.

2. “Designing Data-Intensive Applications: The big ideas behind reliable, scalable and maintainable systems” by Martin Kleppmann.
3. “Predictive Analytics for Dummies” by A. Wiley Brand.
4. “Predictive Analytics: The power to predict who will click, buy, lie or die” by Eric Siegel

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A :10 Questions of 2 marks each-No choice

20 Marks

PART B :2 Questions from each unit with internal choice, each carrying 16 marks

80 Marks

SCSA2507	HUMAN COMPUTER INTERACTION LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- Learn fundamentals of design principles and paradigms
- Identify the tools for designing interactive systems
- Apply the design principles in real time applications
- Analyze the design requirements for different users/environments
- Design the prototype

LIST OF EXPERIMENTS

1. Design a drop-down list or a menu in a GUI keeping in view the serial position effect
2. Design of a Mobile Keypad focusing on size, layout and devilling(a minimum of two different layouts)
3. Design of different icons in Graphical user Interface (a minimum of four different icons)
4. Design a menu structure for ordering house- hold items from a mall directly to your home through a mobile phone interface. Categorize the items into menus and submenus. (make use of Hick's Law)
5. Design a UI for ATM Interface
6. Design a prototype of a TV remote Control Panel
7. Design a UI prototype of an Automatic vending machine for Drinks
8. Create an interactive player prototype using ProtoPie
9. Design a Mobile banking application using balsamiq design software
10. Design a Web Interface for Online banking system
11. Design a prototype design for a online mobile payment application using figma
12. Interactive Exercise : Perform Analysis on any one of the following applications with respect to the Principles of Universal Design.
 - Google Meet,
 - Amazon Prime Video
 - Google Pay

COURSE OUTCOMES

On completion of the course the student would be able to

- CO1 : Understand the fundamentals of interactive design
- CO2 : Apply the design rules and principles in web/mobile applications
- CO3 : Identify the available to to design the problem
- CO4 : Analyze the user requirements for designing the application
- CO5: Design the system
- CO6 : Develop the prototype with the help of available UX/UI tools

SMTA1605	EXPLORATORY DATA ANALYSIS AND TIME SERIES	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the basic statistical tools for analysis & interpretation of qualitative & quantitative data.
- To introduce basic concepts of Statistics and to provide Statistical techniques for data analysis.
- To understand various components of time series.

UNIT I: INTRODUCTION TO DATA ANALYSIS

9 Hrs.

Introduction – collection, classification and tabulation of data – Concept of primary and secondary data – Data - quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio – Data visualization - Bar diagram, pie chart, histogram, frequency curve and frequency polygon – Ogives

UNIT II: DESCRIPTIVE STATISTICS

9 Hrs.

Data summarization – Mean, Median and Mode – Measures of dispersion – Range, Quartile deviation and standard deviation – coefficient of variation – skewness and kurtosis

UNIT III: BIVARIATE DATA

9 Hrs.

Definition, scatter diagram, simple, partial and multiple correlation (3 variables only), rank correlation. Simple linear regression, principle of least squares and fitting of polynomials and exponential curves

UNIT IV: INTRODUCTION TO TIME SERIES

9 Hrs.

Introduction to times series data - application of time series in various fields - Components of a times series, Decomposition of time series - Trend - types of Trends

UNIT V: ANALYSIS OF TIME SERIES

9 Hrs.

Measure of trend – Graphical method, Semi Average method, Moving Average method and Least Square method – Measurement of Seasonal Variation – Simple Average method, Ratio Trend method and Ratio Moving Average method

COURSE OUTCOMES:

CO1: Identify, classify and tabulate the data. Construct various frequency charts. CO2:

Evaluate the various measures of central tendency and measures of variation.

CO3: Evaluate the Karl Pearson's correlation coefficient, Spearman's correlation coefficient and Regression Equations.

Explore the relationship between correlation and regression. Fitting of straight line by least squares.

CO4: Empathize the students about the importance of Time series and components of Time series. CO5: Explain the various methods to measure the trend

CO6: Explore the methods designed to measure the seasonal variation.

TEXT / REFERENCE BOOKS

1. Veerarajan.T, Probability, Statistics and Random Process, Tata McGraw Hill, 3rd edition, Tata McGraw Hill, 2017.
2. David S. Moore, George P. McCabe, Bruce A. Craig. Introduction to the practice of statistics, 7th edition, W.H. Freeman and Company, New York 2011.
3. J. N. Kapur and H. C. Saxena, Treatment and Content as in Mathematical Statistics, 20th Edition, S. Chand & Co. Ltd., New Delhi, 2010.
4. Stephen Bernstein Schaum's Outline of Elements of Statistics I: Descriptive Statistics and Probability, McGraw-Hill, 1998.
5. P. R. Vittal, Mathematical Statistics, Margham Publications, 2002.

SCSA1606	PREDICTIVE AND ADVANCED ANALYTICS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To learn the concepts and applications of data mining
- To understand and prepare the data
- To study the model development techniques.
- To explore the Automated Models for Categorical and Continuous targets
- To analyze the performance in different models

UNIT 1 INTRODUCTION TO DATA MINING INTRODUCTION 9 Hrs.

What is Data Mining? Concepts of Data mining, Technologies Used, Data Mining Process, KDD Process Model, CRISP – DM, Mining on various kinds of data, Applications of Data Mining, Challenges of Data Mining.

UNIT 2 DATA UNDERSTANDING AND PREPARATION 9 Hrs.

Introduction, Reading data from various sources, Data visualization, Distributions and summary statistics, Relationships among variables, Extent of Missing Data. Segmentation, Outlier detection, Automated Data Preparation, Combining data files, Aggregate Data, Duplicate Removal, Sampling DATA, Data Caching, Partitioning data, Missing Values.

UNIT 3 MODEL DEVELOPMENT & TECHNIQUES 9 Hrs.

Data Partitioning- Model selection, Model Development Techniques, Neural networks, Decision trees, Logistic regression, Discriminant analysis, Support vector machine, Bayesian Networks, Linear Regression, Cox Regression, Association rules.

UNIT 4 MODEL EVALUATION AND DEPLOYMENT 9 Hrs.

Introduction, Model Validation, Rule Induction Using CHAID, Automating Models for Categorical and Continuous targets, Comparing and Combining Models, Evaluation Charts for Model Comparison, MetaLevel Modeling

UNIT 5 DEPLOYING MODEL 9 Hrs.

Assessing Model Performance, Updating a Model, Bias, Variance, and model complexity, Bias-variance trade off, Optimism of the training error rate, Estimate of In-sample prediction error

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1 :** Understand the process of formulating business objectives, data selection/collection
- CO2 :** Successfully design, build, evaluate models
- CO3 :** Implement predictive models for various business applications.
- CO4 :** Compare the underlying predictive modeling techniques.
- CO5 :** Select appropriate predictive modeling approaches to identify cases to progress with.
- CO6 :** Deploy model and assess the performance

TEXT/REFERENCE BOOKS

1. Predictive & Advanced Analytics (IBM ICE Publication)
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning-Data Mining, Inference, and Prediction, Second Edition, Springer Verlag, 2009.
3. C.M.Bishop –Pattern Recognition and Machine Learning, Springer, 2006
4. L.Wasserman-All of statistics

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100

Exam Duration: 3Hrs

PART A: 10 questions of 2 marks each –No choice

20 Marks

PART B: 2 questions from each unit of internal choice; each carrying 16 marks

80 Marks

SCSA2608	AI AND VISUALIZATION LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- Understanding the AI algorithms.
- Apply ML algorithms for classifying the data
- identify the pattern in text data.
- Visualize the data using different different data visualization approaches.

SUGGESTED LIST OF EXPERIMENTS

1. Techniques for Data Preprocessing:
Mean Removal, Scaling, Normalization
2. Classification Techniques:
Naïve Bayes Classifier, SVM, Logistic Regression, Decision Tree, Random Forest
3. K-Means Clustering algorithm
4. NLTK – implementation of Tokenization, Stemming, and Lemmatization
5. Building a Bag of Words Model in NLTK
6. Topic Modeling: Identifying Patterns in Text Data
7. Analyzing Sequential Data by Hidden Markov Model (HMM)
8. Concept of Heuristic Search in AI
9. A Bot to Play Tic Tac Toe
10. Single - Layer Neural Networks, Multi-Layer Neural Networks
11. Building Linear Regressor using ANN
12. Image Classifier: An Application of Deep Learning

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1:** To use appropriate tools for analyzing text data
CO2: Classify the data according to the customer requirement
CO3: Analyze the time series data semantics of a text document.
CO4: Predict the hidden pattern using the given dataset.
CO5: Apply deep learning algorithms for a given application.
CO6: Design an intelligent system using AI algorithms

SCSB1251	ARTIFICIAL INTELLIGENCE SEARCH METHODS AND REASONING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- ▶ To understand the various characteristics of intelligent agents.
- ▶ To learn the different search strategies in AI.
- ▶ To understand the knowledge in solving AI problems.
- ▶ To learn the concepts of learning and communication in AI.
- ▶ To know about the various applications of AI.

UNIT 1 **BASIC SCIENCE BEHIND AI** 9 Hrs.
 Intelligence - Memory - Computation - Learning - AI's Foundation and History - Intelligent Agents: Features - Behavior in the environment - Rationality - Nature and its Structure - Case Study: AI Programming Languages History: LISP - Prolog - Python.

UNIT 2 **SEARCHING TOWARDS SOLUTION** 9 Hrs.
 Searching Strategies: Informed Search: BFS - DFS - Depth Bounded DFS - Uninformed Search: Heuristic Functions - Hill Climbing Search - Best First Search - Local Maxima - Solution Space Search - Adversarial Search - Constraint Satisfaction Problem - Case Study: N-Queens Problem.

UNIT 3 **KNOWLEDGE: ROLE AND REPRESENTATION** 9 Hrs.
 Knowledge - Definition and Management- Types: Declarative and Procedural Knowledge - Knowledge Engineering behind Logical Agents: Propositional Logic - First Order Logic - Inference: Forward and Backward Chaining - Ontological Engineering - Case Study: Ontology based knowledge representation.

UNIT 4 **APPROACHES BEHIND PLANNING AND REASONING** 9 Hrs.
 Algorithm for Planning as State Space Search - Analysis of Planning Approach - Reasoning: Bayes Rule - Bayesian Network and its approximation - Hidden Markov Model - Kalman Filters - Decision Networks - Case Study: Wumpus World Problem.

UNIT 5 **DECODING AND LEARNING INTELLIGENCE** 9 Hrs.
 Learning Algorithms: Classification and Regression with Linear Model - Non-Parametric Models - Ensemble Learning - Explanation Based Learning - Learning with Hidden Variables - AI Real Time Applications - Case Study: Nature Inspired Computation.

Max. 45 Hrs.

COURSE OUTCOMES

- On completion of the course the student will be able to
- CO1** • An ability to identify, analyze the search algorithm for the AI problems.
 - CO2** • Represent a problem using first order logic.
 - CO3** • Provide the knowledge-based agent to solve the problem.
 - CO4** • Understand the Informed search strategies.
 - COS** - Apply the Bayes rule to solve the problem for societal concern.
 - COG** • Design user centric applications that use AI concepts.

TEXT/ REFERENCE BOOKS

1. Stuart J. Russel, Peter Norvig, "Artificial Intelligence a Modern Approach", 3rd Edition, Pearson Education, 2009.
2. Elaine Rich, Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009.
3. -Tim JoIB ' "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and ar:tlett Py>llshers, nc., 1st dlt1on, 2U -
4. David L. Poole and Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, 2nd Edition, 2010.
5. Ertel, Wolfgang, Introduction to Artificial Intelligence, 1st Edition , 2017.

*END SEMESTER EXAMINATION QUESTION PAPER PATTERN***Max.Marks:100**

PART A: 10 questions of 2 marks each -No choice
PART B: 2 questions from each unit of internal choice; each carrying 16 marks

Exam Duration: 3 Hrs.**20 Marks****80 Marks**

