



SRI CHANDRASEKHARENDRASARASWATHI VISWA MAHAVIDYALAYA

(Deemed to be University U/S 3 of UGC Act 1956) (Accredited with "A" Grade by NAAC)
Enathur, Kanchipuram - 631561

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CURRICULUM AND SYLLABUS FOR FULL TIME

**B.E. (Hons.) Computer Science and Engineering
with Specialization in Artificial Intelligence and
Data Science**

(Applicable for students admitted from 2025-2026 onwards)

**B.E. (Hons.) Computer Science and Engineering with
Specialization in Artificial Intelligence and Data Science**

These regulations are applicable to the students admitted from the AY 2025-26 Onwards.

**CHOICE BASED CREDIT SYSTEM FOR B.E. (HONS.) CSE with AIDS FULL-TIME
PROGRAMME CREDITS**

Theory courses: Courses with 4/3 credits will be assigned 3 Lectures and 2/1 Tutorial hours per week.

Practical courses: Courses with 2 credits will be assigned 4 hours of lab/practical work per week

From semester III to VII, the honors. Credits distribution as follows

Sl.No	Semester	Credits
1.	III	3
2.	IV	5
3.	V	3
4.	VI	3
5.	VII	5
Total		19

For the award of the Hons./Minor degree, a student has to earn a minimum of **19** credits.

DURATION OF THE PROGRAMME

A student is normally expected to complete B.E. (HONS.) CSE with AIDS programme in four years and in any case, not more than seven years from the time of admission.

REGISTRATION FOR COURSES

A newly admitted student will automatically be registered for all the courses prescribed for the first year, without any option.

All other students shall submit a completed registration form indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late registration, with the approval of the Dean on the recommendation of the Head of the Department, along with a late fee will be done, up to the last working day.

Registration for the project work shall be done only for the final semester.

ASSESSMENT

The break-up of assessment and examination marks for theory subjects is as follows.

First Assessment Test	:	15 Marks
Second Assessment Test	:	15 Marks
Assignment & Attendance (seminars, group discussion)	:	10 Marks
Total (Internal Marks)	:	40 Marks
End semester Examination (External Marks)	:	60 Marks
Total (Internal + External)	:	100 Marks

The break-up of the assessment and examination marks for practical is as follows.

Observations	:	15 Marks
Model Test	:	15 Marks
Record book & Attendance	:	10 Marks
Total (Internal Marks)	:	40 Marks
End semester Examination (External Marks)	:	60 Marks
Total (Internal + External)	:	100 Marks

The project work will be assessed for 40 marks by a committee consisting of the Guide and the Head of the Department. The Head of the Department shall be the Chairman. 60 marks are allotted for the project viva voce examination at the end of the semester.

WITHDRAWAL FROM A COURSE

A student can withdraw from the course at any time before a date fixed by the Head of the Department prior to the second assessment, with the approval of the Dean on the recommendation of the Head of the Department.

TEMPORARY BREAK OF STUDY

A student can take a one-time temporary break of study covering the current year/semester and/or the next semester with the approval of the Dean on the recommendation of the Head of the Department, not later than seven days after the completion of the mid-semester test. However, the student must complete the entire program within the maximum period of seven years.

SUBSTITUTE ASSESMENT

A student, who has missed, for genuine reasons accepted by the Head of the Department, one or more of the assessments of a course other than the end semester examination, may take a substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the commencement of the end-semester examination.

A student who wishes to have a substitute assessment for a missed assessment must apply to the concerned faculty member within a week from the date of the missed assessment.

ATTENDANCE REQUIREMENTS

To be eligible to appear for the examination in a particular course, a student must put in a minimum of 80% of attendance in the course. However, if the attendance is 70% or above but less than 80% in any course, the authorities can permit the student to appear for the examination in the course on payment of the prescribed condonation fee.

A student who withdraws from or does not meet the minimum attendance requirement in the course must re-register for and repeat the course.

PASSING AND DECLARATION OF EXAMINATION RESULTS

All assessments of all the courses on the absolute mark basis will be considered and passed by the results passing board in accordance with the rules of the University. Thereafter, the Controller of Examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average & cumulative grade point average and prepare the grade cards.

90 to 100 marks	-	Grade 'S'
80 to 89 marks	-	Grade 'A'
70 to 79 marks	-	Grade 'B'
60 to 69 marks	-	Grade 'C'
55 to 59 marks	-	Grade 'D'
50 to 54 marks	-	Grade 'E'
less than 50 marks	-	Grade 'F'
Insufficient attendance	-	Grade 'I'
Withdrawn from the course	-	Grade 'W'

A student who obtains less than 50 marks out of 100 in the subject or less than 24 out of 60 in External exam or is absent for the examination will be awarded Grade 'F'.

A student who earns a grade of S, A, B, C, D or E for a course is declared to have successfully completed that course and earned the credits for that course. Such a course cannot be repeated by the student.

A student who obtains letter grade F in a course has to reappear for the examination in that course.

The following grade points are associated with each letter grade for calculating the grade point average.

S - 10; A-9; B-8; C-7; D-6; E-5; F-0

A student can apply for revaluation of one or more of his /her examination answer papers within a week from the date of issue of Grade sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.

After results are declared, Grade cards will be issued to the students. The Grade card will contain the list of courses registered during the year/semester, the grades scored and the grade point average (GPA) for the year/semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the Year/Semester, divided by the sum of the number of credits for all courses taken in that year/semester. CGPA is similarly calculated considering all the courses taken from the time of admission.

After successful completion of the program, the Degree will be awarded with the following classification based on CGPA:

For First Class with Distinction, the student must pass all the courses in the first attempt and obtain a CGPA of 8.25 or above.

For First Class, the student must pass within four years from the time of admission and obtain a CGPA of 6.5 or above.

For Second Class, the student must pass within seven years from the time of admission.

B.E. (Hons.) Computer Science and Engineering with Specialization in Artificial Intelligence and Data Science

Honors Course						
Sl.No	Semester	Course Title	L	T	P	C
1.	III	AI and Machine Learning	3	0	0	3
2.	IV	Applied Data Science and Visualization	3	0	4	5
3.	V	Natural Language Processing	3	0	0	3
4.	VI	Web and Social Media Analytics	3	0	0	3
5.	VII	Mining Massive Dataset with Lab	3	0	4	5
Total						19

III – SEMESTER

Course Code												L	T	P	C
Course Title	AI & MACHINE LEARNING											3	0	0	3
PRE-REQUISITES															
Basic understanding of Mathematics and Python Programming															
OBJECTIVES															
•	To Understand fundamentals, history, and structure of intelligent agents in Artificial Intelligence.														
•	TO Learn problem-solving methods, search techniques, and algorithms including local and adversarial search														
•	To Understand basics of Machine Learning, regression models, and supervised learning concepts														
•	To Study ensemble methods, classification algorithms, and unsupervised learning techniques like clustering														
•	To Explore real-world AI applications including neural networks, SVMs, and systems in healthcare and education														
COURSE OUTCOMES															
At the end of course, the students will be able to															
1.	Implement fundamental AI algorithms and intelligent agent models to solve basic problems.														
2.	Apply appropriate search strategies, including uninformed and informed search techniques, for problem-solving.														
3.	Understand and apply machine learning algorithms such as regression, k-NN, Naive Bayes, and decision trees for classification and prediction tasks.														
4.	Analyze and utilize ensemble learning methods like bagging, boosting, and stacking to improve model performance.														
5.	Apply AI and machine learning techniques to real-world applications, including optimization and case studies such as neural networks and recommender systems.														
POs and COs MAPPING TABLES															
	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO 01	1	2	-	-	-	-	-	-	-	1					
CO 02	2	3	2	1	3	3	3	3	1	1	3				
CO 03	2	2	2	-	-	-	-	1	1						
CO 04	1	2	2	1	-	-	-	-	-	-					
CO 05	2	2	1	2	2	-	-	2	2	-					
LEGEND:1-LOW, 2 - MEDIUM, 3-HIGH															
UNIT - I	INTRODUCTION TO ARTIFICIAL INTELLIGENCE														9
Introduction--Definition --Foundation and History of AI - Future of Artificial Intelligence - Intelligent Agents- Environments - Structure of Agents - Typical Intelligent Agents															
UNIT - II	PROBLEM SOLVING AND SEARCH TECHNIQUES														9

Problem solving Methods - Search Strategies- Uninformed - Best First Search, Depth First Search- Informed – Best first Search –A* search algorithm. – Local search Algorithm - Genetic Algorithm Adversarial Search		
UNIT - III	MACHINE LEARNING FUNDAMENTALS	9
Introduction - Types of Machine Learning – Basic Concepts in Machine Learning – Machine Learning Process - Supervised Learning- Linear Models for Regression – Linear Basis Function Models –Regression – Common Regression Algorithms		
UNIT - IV	ENSEMBLE LEARNING TECHNIQUES AND UNSUPERVISED LEARNING	9
Introduction to Ensemble learning - bagging ,boosting and stacking, Regression Techniques - Supervised Learning - Linear Models for Classification – k-Nearest Neighbors -Naive Bayes, Maximum margin classifier- Decision Tree – Unsupervised Learning Introduction- Clustering Techniques		
UNIT - V	AI CASE STUDIES AND APPLICATIONS	9
Case Studies: Neural Networks - Support Vector Machines - Recommender Systems- Education Adaptive learning - Healthcare systems.		
TEXT BOOKS		
1.	Stuart Russell, Peter Norvig - <i>Artificial Intelligence: A Modern Approach</i> , Pearson Education; Fourth Edition, 2020. (Unit I & II)	
2.	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron; second edition , 2019 (Unit III & IV)	
3.	Artificial Intelligence by Rich and Knight, The McGraw Hill, 2017.	
4.	Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Fourth Edition, 2020.	
5.	Artificial Intelligence: Foundations of Computational Agents – David Poole & Alan Mackworth (UNIT V)	
REFERENCES		
1.	M. Tim Jones - <i>Artificial Intelligence: A Systems Approach (Computer Science)</i> , Jones and Bartlett Publishers, First Edition, 2008.	
2.	Tom Mitchell, “Machine Learning”, McGraw-Hill, 2017.	
WEB RESOURCES		
1	https://nptel.ac.in/courses/106102220	
2	https://nptel.ac.in/courses/106105077	
LEARNING OUTCOMES		
1.	Understand the fundamental concepts of Artificial Intelligence, intelligent agents, and machine learning techniques.	
2.	Apply problem-solving methods and search algorithms to solve computational and real-world problems.	
3.	Implement supervised and unsupervised machine learning algorithms for classification and prediction tasks.	
4.	Analyze and evaluate machine learning models, including ensemble techniques, to improve performance.	
5.	Design AI-based solutions with consideration for real-world constraints, ethical practices, and emerging technologies.	
PREPARED BY		
Dr.R.SIVARAMAKRISHNAN & Mrs.R.RADHIKA		

IV – SEMESTER

Course Code												L	T	P	C
Course Title	APPLIED DATA SCIENCE AND VISUALIZATION											3	0	0	5
PRE-REQUISITES															
Basic Mathematics, Basic programming knowledge, Problem-solving skills, Data structures and Python programming.															
OBJECTIVES															
•	Understand data science concepts and basic numerical computing.														
•	Apply data cleaning, transformation, and feature engineering.														
•	Learn Implement and evaluate basic ML models														
•	Create effective visualizations using Python libraries and interpret insights through analytical techniques.														
•	Explore visualization tools (Plotly, Tableau, Power BI) and understand ethical principles in data-driven decision making.														
COURSE OUTCOMES															
At the end of course, the students will be able to															
1.	Apply basic data science concepts and perform numerical computing using NumPy.														
2.	Perform data preprocessing techniques including cleaning, imputation, transformation, and feature engineering.														
3.	Implement supervised and unsupervised machine learning algorithms and evaluate model performance.														
4.	Create and interpret data visualizations using Python libraries for analytical insights														
5.	Apply visualization tools and explain ethical principles in data-driven decision making.														
POs and COs MAPPING TABLES															
	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO 01	3	2	1	1	2	-	-	-	-	-	-	-			
CO 02	2	3	2	2	2	-	-	-	-	-	-	-			
CO 03	3	3	3	2	2	-	-	-	-	-	-	-			
CO 04	2	2	2	3	3	-	-	-	-	-	-	-			
CO 05	2	2	1	1	2	3	2	3	2	2	-	2			
LEGEND:1-LOW, 2 - MEDIUM, 3-HIGH															
UNIT - I	DATA SCIENCE FOUNDATIONS & NUMERICAL COMPUTING													9	
Introduction to Data Science: lifecycle, applications, real-world use cases, Data types: structured, semi-structured, unstructured data, Data acquisition methods and sources, NumPy for numerical computing: arrays, vectorized operations, Basic data operations and transformations, Introduction to datasets and exploratory analysis concepts.															
UNIT - II	DATA PREPROCESSING													9	

Data cleaning: handling missing values and outliers, Imputation techniques: mean, median, mode, and KNN-based imputation, Data transformation: normalization and scaling, Feature engineering: encoding categorical variables, Pandas for data manipulation and analysis, Dimensionality reduction: PCA basics.		
UNIT - III	MACHINE LEARNING FUNDAMENTALS	9
Supervised learning: Regression techniques ,classification techniques. Unsupervised learning: k-means clustering, hierarchical clustering. Model evaluation: accuracy, precision, and recall. Model evaluation: F1-score and confusion matrix. Overfitting, underfitting, and cross-validation strategies.		
UNIT - IV	DATA VISUALIZATION TECHNIQUES	9
Introduction to data visualization and its importance, Principles of effective visualization: clarity, accuracy, and storytelling, Basic plots: bar charts, line charts, pie charts, histograms, scatter plots, Advanced visualizations: heatmaps, correlation matrix, distribution plots, pair plots, Visualization using Python libraries: Matplotlib and Seaborn.		
UNIT - V	VISUAL ANALYTICS, DASHBOARDS & ETHICAL FOUNDATIONS	9
Introduction to interactive visualization using Plotly, Overview of dashboards and tools: Tableau and Power BI, Concepts of visual analytics and data-driven decision making, Ethical principles: fairness, transparency, accountability, and privacy.		
LIST OF EXPERIMENTS		
UNIT - I	DATA SCIENCE FOUNDATIONS & NUMERICAL COMPUTING	
1.	Perform NumPy operations: array creation, indexing, slicing, and vectorized computations.	
2.	Load and explore a dataset; perform basic data analysis and summary statistics.	
UNIT - II	DATA PREPROCESSING	
3.	Handle missing data using imputation techniques (mean, median, mode, KNN).	
4.	Apply data transformation (normalization, scaling) and feature encoding using Pandas.	
UNIT - III	MACHINE LEARNING FUNDAMENTALS	
5.	Implement supervised learning (regression and classification) and evaluate model performance.	
6.	Perform clustering using K-means and hierarchical methods; analyze results.	
7.	Demonstrate overfitting and underfitting using cross-validation techniques and evaluate using confusion matrix and F1-score.	
UNIT - IV	DATA VISUALIZATION TECHNIQUES	
8.	Create basic plots (bar, line, pie, histogram, scatter) using Matplotlib.	
9.	Generate advanced visualizations (heatmap, correlation matrix, pair plot, distribution plot) using Seaborn.	
UNIT - V	VISUAL ANALYTICS, DASHBOARDS & ETHICS	
10.	Develop interactive visualizations using Plotly and design a simple dashboard.	
Lab Tools and Environments (optional)		
Programming Environment: Python, Jupyter Notebook, Google Colab		

Core Libraries: NumPy, Pandas, Matplotlib, Seaborn, Scikit-learn, Plotly	
Data Handling & Storage (Optional): SQLite - lightweight database for small applications MySQL / PostgreSQL - structured data storage and querying	
Visualization & Dashboard Tools (Optional): Plotly - interactive visualizations Tableau - dashboard design and visual analytics Power BI - business intelligence and reporting	
Cloud & Collaboration Platforms: (optional) Google Colab - cloud-based Python environment for ML experiments Kaggle - datasets, notebooks, and competitions GitHub - version control and project collaboration	
Frameworks (basic exposure): (optional) Scikit-learn - core machine learning algorithms TensorFlow - deep learning framework Keras - high-level neural network API	
Data Formats & APIs: (optional) CSV, Excel - structured datasets JSON, XML - semi-structured data formats REST APIs - accessing real-time data Open datasets (Kaggle, UCI Repository)	
TEXT BOOKS	
1.	Provost, F., & Fawcett, T., Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking, O'Reilly Media, 1st Edition, 2013. (Unit I)
2.	VanderPlas, J., Python Data Science Handbook: Essential Tools for Working with Data, O'Reilly Media, 1st Edition, 2016. (Unit II)
3.	Müller, A. C., & Guido, S., Introduction to Machine Learning with Python: A Guide for Data Scientists, O'Reilly Media, 1st Edition, 2016. (Unit III)
4.	Knafllic, C. N., Storytelling with Data: A Data Visualization Guide for Business Professionals, Wiley, 1st Edition, 2015. (Unit IV)
5.	Martens, D., Data Science Ethics, Oxford University Press, 1st Edition, 2022. (Unit V)
REFERENCES	
1.	James, G., Witten, D., Hastie, T., & Tibshirani, R., An Introduction to Statistical Learning: with Applications in Python, Springer, 2nd Edition, 2021.
2.	O'Neil, Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy, New York, NY, USA: Crown Publishing, 2016.
3.	Nelli, Python Data Analytics: With Pandas, NumPy, and Matplotlib, Apress, 3rd Edition, 2023.
4.	Wilke, C. O., Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures, O'Reilly Media, 1st Edition, 2019.
5.	Géron, A., Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, O'Reilly Media, 2nd Edition, 2019.
LEARNING OUTCOMES	
By the end of this course, learners will be able to:	

1.	Use NumPy and Pandas for numerical computing and basic data analysis.
2.	Perform data preprocessing including cleaning, imputation, transformation, and feature engineering.
3.	Apply machine learning techniques for regression, classification, and clustering tasks.
4.	Create and interpret visualizations using Python libraries for data analysis.
5.	Utilize visualization tools and evaluate ethical issues in data-driven decision making.
PREPARED BY	
Ms.R.Preethi, Assistant Professor	