COURSE PLAN

Rev. No 9 Dated: September 2024

SoCS

Cluster	ARTIFICIAL INTELLIGENCE
Program	B.TECH CSE
Course	DEEP LEARNING
Course Code	CSAI3125P
No. of credits	5
Semester	5
Session	Aug 25- Dec 25
Academic Year	2025-26

COURSE PLAN

Prerequisite	**Applied Machine Learning - CSAI2016P**	
Credit	**5**	
Lecture	**Tutorial**	**Practical**
4	**0**	**1**

A. The expected Program Outcome are:

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**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.
PO3	**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.
PO4	**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.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**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.
PO7	**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.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**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.
PO11	**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.
PO12	**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.

B. Expected Program specific Outcome are:

PSO1	Perform system and application programming using computer system concepts, concepts of Data Structures, algorithm development, problem solving and optimizing techniques.
PSO2	Apply software development and project management methodologies using concepts of front-end and back-end development and emerging technologies and platforms.

PSO3	Exhibit a commitment to ethical practices, societal responsibilities, and continuous learning, contributing to the advancement of technology and addressing challenges in diverse computing domains.

C. **The expected Course Outcomes are:**

CO 1	To know the concepts of neural networks.
CO 2	Discuss the deep learning concepts corresponding to different applications.
CO 3	Comprehend the contemporary techniques in deep learning.
CO 4	Analyse the concept of convolutional neural networks, recurrent neural networks, generative. deep learning and its usage.

D. CO-PO Relationship Matrix

Indicate the relationships by1- Slight (low) 2- Moderate (Medium) 3-Substantial (high)

Program Outcomes / Course Outcomes	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO2**	**PSO3**
CO 1	1		1												3
CO 2	1		1												3
CO 3	1		1		1										3
CO 4	1		2		1										3
Average	1		1.2		0.4										3

E. Course Outcomes assessment plan:

Components / Course Outcomes	Assignment	Test/Quiz	Mid Semester	End Semester	Any other
CO 1		√	√	√	☐
CO 2		√		√	☐
CO3		√	√	√	☐
CO4		√	√	√	☐

List of Experiments

Experiment 1: Implement a single neuron with two or more weighted inputs for AND gate and understand its functioning.

Experiment 2: Implement an FFNN for the XOR or AND operation for several layers and the number of neurons.

Experiment 3: Implementation of Backpropagation and Optimization by implementing SGD, Momentum, and Adam Optimizer.

Experiment 4: Understanding how the Loss function is calculated by implementing Activation Functions & Loss Functions (implementation + plots).

Experiment 5: Implementation of MLP

Experiment 6: Implementing CNN: Convolution, Pooling, Feature Maps Visualization

Experiment 7: Image Classification using CNN

Experiment 8: Transfer Learning with pretrained networks like ResNet/GoogleNet

Experiment 9: Object Detection using R-CNN/YOLO

Experiment 10: Text Sentiment Classification using Sequence Models like RNN & LSTM

Experiment 11: Implementation of Generative Models like Autoencoders & GANs

Experiment 12: Mini- Project (Team based)

Experiment 13: Mini- Project (Team based)

Experiment 14: Mini- Project (Team based)

Experiment 15: Mini-Project Evaluation

Total Lab hours 30

References*

Textbooks	1. **I**ntroduction to Deep Learning (Neural Networks) (IBM ICE Publication). 2. Deep Learning for Computer Vision" by Rajalingappaa Shanmugamani 3. Deep Learning" by Charu C. Aggarwal
Reference books	1. Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville 2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron
Web Resources	
Journals	
MOOCs, online courses	

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme: Continuous Assessment

Components	Quiz & Viva	Performance & Lab Report
Weightage (%)	50 %	50 %

SUGGESTIONS FOR FACULTY

- Faculty should keep track of the students with low attendance and counsel them regularly.
- The course coordinator will arrange to communicate the short attendance (as per UPES policy) cases to the students and their parents monthly.
- Topics covered in each class should be recorded in the table of RECORD OF CLASS TEACHING (Suggested Format).
- Internal assessment marks should be communicated to the students twice in a semester.
- The file will be audited by respective IQAC members for theory as well as for lab as per schedule.
- The faculty is required to maintain these files for a period of at least three years.
- This register should be handed over to the head of department, whenever the faculty member goes on long leave or leaves the Colleges/University.
- For labs, continuous evaluation format (break-up given in the guidelines for result preparation in the same file) should be followed.
- The department should monitor the actual execution of the components of continuous lab evaluation regularly.
- Instructor should maintain record of experiments conducted by the students in the lab weekly.
- Instructor should promote students for self-study and to make concept diary, due weightage in the internal should be given under faculty assessment for the same.
- Course outcome assessment: To assess the fulfilment of course outcomes two different approaches have been decided. Degree of fulfillment of course outcomes will be assessed in different ways through direct assessment and indirect assessment. In Direct Assessment, it is measured through quizzes, tests, assignment, Mid-term and/or End-term examinations. It is suggested that each examination is designed in such a way that it can address one or two outcomes (depending upon the course completion). Indirect assessment is done through the student survey which needs to be designed by the faculty (sample format is given below) and it shall be conducted towards the end of course completion. The evaluation of the achievement of the Course Outcomes shall be done by analyzing the inputs received through Direct and Indirect Assessments and then corrective actions suggested for further improvement.

- At the completion of the course, course attainment and other documents should be shared with the program coordinator for computation of Program attainment.
- At the completion of the course Faculty members are suggested to share the innovative teaching techniques along with the course plan (format provided by IQAC).
- Faculties are encouraged to share the master/expert classes evidence (as per the event report format)
- Faculties are also encouraged to include MOOCs,,SWAYAM any other online content and share the evidence of MOOCs courses /online courses referred (as per the event report format).
- Faculties are encouraged to share the evidence related to interventions or initiatives focusing the unique/slow and Fast Leaners along with Course Completion files.

INDIRECT ASSESSMENT

Sample format for Indirect Assessment of Course outcomes:

NAME:
ENROLLMENT NO:
SAP ID:
COURSE:
PROGRAM:

Please rate the following aspects of course outcomes of ----------.

Use the scale 1-3*

Course Outcomes	Statement	1	2	3
CO1				
CO2				
CO3				
CO4				
CO5				
CO6				

CO7				

1.

* 1 WEAK 2 MODERATE 3 STRONG