

**Title of the Course:** DEEP LEARNING

**Semester:** Autumn 2024

**Code and Credit Structure:** IT641 (3-0-2-4)

**Course Placement:** M.Sc. Data Science

**Aims and objectives:**

There is a global boom in artificial intelligence and extensive data analysis, and there is an increase in demand for expertise in data science, machine learning, artificial intelligence, and deep learning. To keep pace with the need, our broad objective of this course is to

- Familiarize the student with various deep-learning techniques for mining the knowledge from available data
- Data preprocessing and posthoc analysis for deep learning-based modelling and analysis
- Update the student with the latest or possible future technologies in deep learning to adapt for lifelong learning and global acceptance in industries or academia.
- Perform research and innovation in artificial intelligence and data analytics to solve various problems of industrial and social relevance

**Course Outline:**

Content
Introduction to the deep learning, Linear Regression, logistic regression
Artificial neural network (ANN), Gradient Descent based Optimization
Regularization and Ensemble Approach
Data transformation, data representation and encoding, data dimensionality reduction, feature extraction, data augmentation
Outcome formulation and analysis
Convolutional Neural Network(CNN), Introduction to GAN concept
Sequential Data Analysis, Recurrent Neural Network(RNN), LSTM
Introduction to Large Language Models, Transformers

**Lab and Assignments:**

The hands-on practice of deep learning will be conducted in sync with lectures. The student will be given different problems or assignments for implementation and solving.

*The programming language will be python, and Keras library for deep learning modeling*

## References:

- Ian Goodfellow, Yoshua Bengio, and Aaron Courville. 2016. *Deep Learning*. The MIT Press.
- Christopher M. Bishop and Hugh Bishop, 2024 “*Deep Learning: Foundations and Concepts*”, Springer.
- Seth Weidman. 2019. *Deep Learning from Scratch*. O'Reilly Media, Inc.
- Selected online blogs, texts, book chapters, tutorials, and presentations. It will be provided in due time as the course progress

**Assessment (tentative):** In-Semester (Two) Examinations(45%), Final Exam (30%), LAB assignments and VIVA (25%)

## Expected Course Outcome:

- *Knowledge:* The student will obtain in-depth conceptual, physical, and mathematical knowledge to understand and solve data mining problems using deep learning techniques. The student will work effectively and efficiently as an individual or with a team in various multi-disciplinary data analysis projects
- *Skill:* Students will implement modern deep-learning tools and techniques for different kinds of data.
- *Critical thinking and problem-solving:* Students will understand the complex data mining problem and then identify or develop optimal deep learning techniques to solve the problem. They will be able to review the technical or research literature, identify new data mining problems that can be better solved using deep learning techniques, and possibly advance or develop better deep learning techniques.
- *Future career:* This course will help the student get placement in the industries looking for data mining, artificial intelligence, and machine learning expertise or go for higher education and research in the related domain.

P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
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