Deep Learning Course Curriculum

Module 1: Introduction to Deep Learning

- What is Deep Learning?
- History and Evolution of Neural Networks
- Applications of Deep Learning
- Overview of Machine Learning vs Deep Learning

Module 2: Python and Math Foundations

- Linear Algebra Essentials
- Calculus Basics for Deep Learning
- Probability and Statistics
- Python Libraries: NumPy, Pandas, Matplotlib

Module 3: Neural Networks Fundamentals

- Perceptrons and Activation Functions
- Feedforward Neural Networks
- Backpropagation and Gradient Descent
- Loss Functions and Optimizers

Module 4: Convolutional Neural Networks (CNNs)

- Introduction to CNNs
- Convolution and Pooling Layers
- Architectures: LeNet, AlexNet, VGG, ResNet
- Applications in Image Classification

Module 5: Recurrent Neural Networks (RNNs) and LSTMs

- Sequence Modeling
- Understanding RNNs

- LSTM and GRU Networks
- Applications in NLP and Time Series

Module 6: Advanced Deep Learning Topics

- Transfer Learning and Fine-Tuning
- Autoencoders and Variational Autoencoders
- GANs - Generative Adversarial Networks
- Attention Mechanisms and Transformers

Module 7: Deep Learning Tools and Frameworks

- TensorFlow and Keras
- PyTorch Essentials
- Model Deployment Basics
- Using Pre-trained Models

Module 8: Capstone Project and Case Studies

- Selecting a Project Topic
- Model Design and Evaluation
- Deployment Considerations
- Presentation and Reporting