CVM UNIVERSITY
Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2020-21

Programme: **Bachelor of Engineering (Information Technology)**

Semester: **VII**

Course Code: **102047804**

Course Title: **Deep Learning and Applications**

Course Group: **Professional Elective Course - IV**

Course Objectives: This course aims to provide the fundamental knowledge of the theoretical foundations, algorithms, and methodologies of Neural Network. It covers design and development of applications using various deep learning methods such as convolutional neural networks, recurrent neural networks, and other advancements.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	40/14	60/21	20/07	30/10	150/52

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Introduction to Deep Learning:** Introduction, Machine learning vs. deep learning, applications of deep learning, Feature engineering, Deep learning frameworks, Bias, Variance, Regularizations	5
2	**Review of Neural Networks:** Review of Neural network basics – architectures, activation functions, parameters, Single layer and Multilayer Perceptron, Backpropagation learning	5
3	**Convolutional Neural Networks (CNNs):** Introduction to CNNs – convolution, pooling, Deep CNNs, Different deep CNN architectures – LeNet, AlexNet, VGG, InceptionV3, etc., Training a CNNs: weights initialization, batch normalization, hyperparameter optimization, Understanding and visualizing CNNs, Transfer learning, CNN applications	10
4	**Recurrent Neural Networks (RNNs):** Introduction to RNN, Sequence modeling using RNNs,Long Short-Term Memory (LSTM), Bidirectional LSTMs, Bidirectional RNNs, Gated Recurrent Units, Autoencoders	8

5	**Generative Models:** Restrictive Boltzmann Machines (RBMs), Belief nets, Deep belief nets, Generative Adversarial Networks (GAN), Applications of Generative models	**7**
6	**Applications:** Applications in computer vision, speech processing, and natural language processing Image Classifications, Object detections, etc.	**5**
	Total	**40**

List of Practicals / Tutorials:

1	Study of TensorFlow Framework.
2	Write the code to read a dataset using the appropriate python library and display it.
3	Implementation of multi-layer network and study network parameters for any application.
4	Implement Digit Recognition for MNIST dataset using pretrained models.
5	Implement CNN architecture for any given classification task.
6	Perform object recognition using CNN Model.
7	Implement LSTM model and test it for a given application/dataset.
8	Implement GRU model and test it for a given application/dataset
9	Implement autoencoder for any application.
10	Study of Generative models and applications.
11	Mini Project (Implementation of any application using deep learning model)

Reference Books:

1	Ian Goodfellow, Yoshua Bengio and Aaron Courville, “Deep Learning”, MIT Press, 2017.
2	Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017
3	Umberto Michelucci “Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks” Apress, 2018.
4	Aurelion Geron, “Hands-on machine learning with Scikit-learn Keras and TensorFlow” O’Reilley publications
5	Francois Chollet, “Deep Learning with Python” Manning.
6	Nikhil Buduma, “Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms”, O’Reilly publications.

Supplementary learning Material:	
1	NPTEL - Swayam Courses https://nptel.ac.in/courses/106/106/106106184/
2	Coursera courses https://in.coursera.org/specializations/deep-learning https://in.coursera.org/learn/introduction-to-deep-learning-boulder https://in.coursera.org/specializations/tensorflow2-deeplearning#courses

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
15%	25%	25%	15%	20%	---	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%2eightage
CO-1	Realize characteristics of deep learning models that are useful to solve real-world problems.	**10**
CO-2	Understand different models to create application using deep nets.	**25**
CO-3	Identify and apply appropriate deep learning algorithms for analyzing the data for variety of problems.	**25**
CO-4	Experiment the various challenges involved in designing deep learning models.	**20**
CO-5	Apply deep learning algorithms for various applications such as Computer vision, Speech processing, NLP and other.	**20**

Curriculum Revision:	
Version:	1.0
Drafted on (Month-Year):	June -2020
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	June-2025