NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT COMPUTER SCIENCE AND ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	**B.Tech., (CSE)**		
Course Title	**Deep Learning Techniques**		
Course Code	**CSPE72**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	**-**	**Semester**	**VII sem.**
Session	**July 2022**	**Section**	**A & B**
Name of Faculty	**Dr. M. Sridevi & Ms. Madhusmita Priyadarshini Sahoo**	**Department**	**CSE**
Official Email	**msridevi@nitt.edu**	**Telephone No.**	**0431 - 2503216**
Name of Course Coordinator(s)	**Nil**		
Official E-mail	**Nil**	**Telephone No.**	**Nil**
Course Type	☐ **Programme Elective**		

SYLLABUS

UNIT I: **(Deep Networks)** Deep Feedforward Networks - Learning XOR - Gradient Based learning - Hidden Units - Back-propagation and other Differential Algorithms - Regularization for Deep Learning - Optimization for training Deep Models.

UNIT II: **(Convolutional Networks)** Convolution operation - Motivation - Pooling - Convolution and Pooling as strong prior - Efficient convolution algorithms - Unsupervised features - Sequence Modeling: Recurrent and Recursive Nets - LSTM Networks - Applications - Computer Vision - Speech Recognition - Natural Language Processing.

UNIT III: (Linear factor Models) Probabilistic PCA and Factor Analysis - Independent Component Analysis (ICA) - Auto encoders - Regularized Auto encoders - Representational Power - Layer size and Depth - Stochastic Auto encoders - Applications.

UNIT IV: **(Representation Learning)** Greedy Layer-wise Unsupervised Pre-Training - Transfer learning and Domain Adaptation - Deep Generative Models.

UNIT V: (Deep Learning with Python) Introduction to Keras and Tensorflow - Deep Learning for computer vision - convnets - Deep Learning for Text and Sequences - Generative Deep Learning - Text Generation with LSTM - DeepDream - Neural Style Transfer - Generating images with variational autoencoders - Generative Adversarial Networks (GAN).

COURSE OBJECTIVES

- To introduce building blocks of deep neural network architecture
- To learn deep learning algorithms and its problem settings
- To understand representation and transfer of knowledge using deep learning
- To learn to use deep learning tools and framework for solving real-life problems
- To use Python for Deep Learning

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MAPPING OF COs with POs	
Course Outcomes	**Programme Outcomes (PO)**
1. Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains	2,3,6,11
2. Incorporate transfer of knowledge in machine learning algorithms	1,2,3,9,11
3. Implement deep learning algorithms and solve real-world problems	1,3,6,12
4. Develop Deep Learning techniques using Python	1,4,6,10,11
5. Represent learning Models	1,2,6,11

COURSE PLAN – PART II

COURSE OVERVIEW

This course describes about the basics of Deep learning techniques, different deep learning models and applications of deep learning techniques.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
		UNIT – I (Deep Networks**)**	
1	1 Contact Hour	Introduction of Deep Networks	PPT , Chalk & Talk
2	1 Contact Hour	Deep Feedforward Networks	PPT , Chalk & Talk
3	1 Contact Hour	Learning XOR	PPT , Chalk & Talk
4	1 Contact Hour	Gradient Based learning	PPT , Chalk & Talk
5	1 Contact Hour	Hidden Units	PPT , Chalk & Talk
6	1 Contact Hours	Back-propagation	PPT , Chalk & Talk
7	1 Contact Hour	Differential Algorithms	PPT , Chalk & Talk

8	1 Contact Hour	Regularization for Deep Learning	PPT , Chalk & Talk
9	1 Contact Hour	Optimization for training Deep Models	PPT , Chalk & Talk
UNIT – II (Convolutional Networks)			
10	1 Contact Hour	Convolution operation	PPT , Chalk & Talk
11	1 Contact Hour	Motivation for Pooling; Convolution and Pooling as strong prior	PPT , Chalk & Talk
12	1 Contact Hour	Efficient convolution algorithms	PPT , Chalk & Talk
13	1 Contact Hour	Unsupervised features	PPT , Chalk & Talk
14	2 Contact Hours	Sequence Modeling: Recurrent and Recursive Nets - LSTM Networks	PPT , Chalk & Talk
15	1 Contact Hour	Application - Computer Vision	PPT , Chalk & Talk
16	1 Contact Hour	Application - Speech Recognition	PPT , Chalk & Talk
17	1 Contact Hour	Application - Natural Language Processing	PPT , Chalk & Talk
UNIT – III (Linear factor Models)			
18	1 Contact Hour	Probabilistic PCA and Factor Analysis	PPT , Chalk & Talk
19	1 Contact Hour	Independent Component Analysis (ICA)	PPT , Chalk & Talk
20	2 Contact Hour	Auto encoders	PPT , Chalk & Talk
21	1 Contact Hour	Regularized Auto encoders	PPT , Chalk & Talk

22	1 Contact Hour	Representational Power	PPT , Chalk & Talk
23	1 Contact Hour	Layer size and Depth	PPT , Chalk & Talk
24	1 Contact Hour	Stochastic Auto encoders	PPT , Chalk & Talk
25	1 Contact Hour	Applications.	PPT , Chalk & Talk
UNIT – IV (Representation Learning)			
26	1 Contact Hour	Greedy Layer-wise Unsupervised Pre-Training	
27	2 Contact Hour	Transfer learning	PPT , Chalk & Talk
28	2 Contact Hour	Domain Adaptation	PPT , Chalk & Talk
29	2 Contact Hours	Deep Generative Models	PPT , Chalk & Talk
UNIT – V (Deep Learning with Python)			
30	1 Contact Hour	Introduction to Keras and Tensorflow	PPT , Chalk & Talk
31	1 Contact Hour	Deep Learning for computer vision - convnets	PPT , Chalk & Talk
32	1 Contact Hour	Deep Learning for Text and Sequences	PPT , Chalk & Talk
33	1 Contact Hour	Generative Deep Learning	PPT , Chalk & Talk
34	1 Contact Hour	Text Generation with LSTM	PPT , Chalk & Talk
35	1 Contact Hours	DeepDream , Neural Style Transfer	PPT , Chalk & Talk

36	1 Contact Hour	Generating images with variational autoencoders	PPT , Chalk & Talk
37	1 Contact Hour	Generative Adversarial Networks (GANs)	PPT , Chalk & Talk

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test 1	As per Academic schedule	1 hour	20
2	Cycle Test 2	As per Academic schedule	1 hour	20
3	Assignment (Programming)		-	20
CPA	Compensation Assessment	After completion of Assessment 2	1 hour	20
4	Final Assessment	As per Academic schedule	3 hours	40

COURSE EXIT SURVEY

- Feedbacks are collected before final examination through MIS or any other standard format followed by the institute
- Students may give their feedback at any time to the course faculty which will be duly addressed.
- The students may also give their feedback during Class Committee Meeting.

COURSE POLICY

MODE OF CORRESPONDENCE:

- Email / WhatsApp

COMPENSATION ASSESSMENT:

- One compensation assessment will be given after completion of Assessment 2 for the students those who are absent for the assessment due to genuine reason.
- The prior permission and required document must be submitted for absence.

ATTENDANCE POLICY

- As per the regulations.

ACADEMIC DISHONESTY & PLAGIARISM

- As per the regulations.

ADDITIONAL INFORMATION

- The students can get their doubts clarified at any time with prior appointment.
- Mode of correspondence through Email / WhatsApp.

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", The MIT Press, 2016.

Reference Books:

1. Francois Chollet, "Deep Learning with Python", Manning Publications, 2017.
2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", First Edition, O'Reilly Media, 2017.
3. Josh Patterson, "Deep Learning: A Practitioner's Approach", First Edition, O'Reilly Media.

FOR APPROVAL

16.8.2022 18/8/22		22/8/2022
Dr. M. SRIDEVI **Ms. MADHUSMITA** **Course Faculty**	**Dr. R. MOHAN** **CC- Chairperson**	**Dr. S. MARY SAIRA BHANU** **HOD**