NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	**M.TECH / CSE**		
Course Title	**Principles of Machine learning and Deep Learning**		
Course Code	**CS632**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)			
Session	**~~July~~ / January 2020**	**Section (if, applicable)**	**~~A / B~~**
Name of Faculty	**Dr. Rajeswari Sridhar**	**Department**	**CSE**
Official Email	srajeswari@nitt.edu	**Telephone No.**	
Name of Course Coordinator(s) (if, applicable)	**Batch – 2019 – 2021**		
Official E-mail		**Telephone No.**	
Course Type (please tick appropriately)		☐ **Elective course**	

Syllabus (approved in Senate)

UNIT-I Introduction Basic Concepts, Introduction to Machine Learning, Applications of ML, Design Perspective and Issues in ML, Supervised, Unsupervised, Semi-supervised learning with applications and issues.

UNIT-II Supervised and Unsupervised Learning Decision Tree - Representation, hypothesis, issues in Decision Tree Learning, Pruning, Rule extraction from Tree, Learning rules from Data, Probabilistic classifier: Bayes rule, Nearest Neighbor, Clustering: Unsupervised learning technique, Similarity and Distance Measures, k-means and k-medoids algorithm.

UNIT-III Deep Networks Deep Networks – Introduction to Neural Networks, Feed-forward Networks, Deep Feed-forward Networks - Learning XOR, Gradient Based learning, Hidden Units, Back-propagation and other Differential Algorithms, Regularization for Deep Learning, Optimization for training Deep Models.

UNIT-IV 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-V Deep Learning Frameworks Introduction to Keras and Tensorflow, Deep Learning for computer vision - convnets, Deep Learning for Text and Sequences, Generative Deep Learning - Text Generation with LSTM, Deep Dream, Neural Style Transfer, Generating

images with variational autoencoders, Generative Adversarial Networks (GAN)

Text books

1. Ethem Alpaydin, Introduction to Machine Learning, PHI, 2005
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", The MIT Press, 2016.
3. Tom Mitchell, Machine Learning, McGraw-Hill, 1997
4. Francois Chollet, "Deep Learning with Python", Manning Publications, 2017
5. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", O'Reilly Media; 1 edition (April 9, 2017)
6. Josh Patterson, "Deep Learning: A Practitioner's Approach", O'Reilly Media; 1 edition (August 19, 2017)

COURSE OBJECTIVES

- To understand the basic building blocks and general principles that allow one to design machine learning algorithms
- To become familiar with specific, widely used machine learning algorithms
- To introduce building blocks of deep neural network architecture
- To understand representation and transfer of knowledge using deep learning
- To learn to use deep learning tools and framework for solving real-life problems

MAPPING OF COs with POs

Course Outcomes	**Programme Outcomes (PO)** (Enter Numbers only)
1. Ability to implement and apply machine learning algorithms to real-world applications.	1, 2,
2. Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains	1, 3, 4
3. Incorporate transfer of knowledge in machine learning algorithms	1, 2, 3, 5, 6
4. Implement deep learning algorithms and solve real-world problems	3, 4, 5

COURSE PLAN – PART II

COURSE OVERVIEW

Machine learning and Deep learning algorithms are getting popular in today's activities. Machine learning algorithms can be classified into supervised, unsupervised algorithms. Deep learning algorithms are a subclass of machine learning algorithms that requires huge training and computation time. This course discusses the basics of machine learning algorithms and then dwells into deep learning fundamentals followed by advanced concepts of deep learning

COURSE TEACHING AND LEARNING ACTIVITIES (Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	06/01/2020 to 10/01/2020 2 hours	Unit 1 - Introduction to machine learning, - applications, principles	Powerpoint presentation
2	06/01/2020 to 10/01/2020 1 hour	Issues in machine learning, curse of dimensionality, tackling the issues in machine learning	Powerpoint presentation
3	13/01/2020 to 17/01/2020 2 hours	Designing a machine learning system, principles and approaches, Types of machine learning	Powerpoint presentation
4	13/01/2020 to 17/01/2020 1 hour	Classification of machine learning, Supervised learning, unsupervised learning, examples	Powerpoint presentation
5	20/01/2020 to 24/01/2020 2 hours	Unit 2 – Supervised learning, mathematical foundations, bayes classifier	Powerpoint presentation
6	20/01/2020 to 24/01/2020 1 hour	Decision trees, approaches	Powerpoint presentation
7	27/01/2020 to 31/01/2020 2 hours	Decision trees construction, variations, problems	Powerpoint presentation
8	27/01/2020 to 31/01/2020 1 hour	Nearest neighbor classifier, ANN introduction and classifier	Powerpoint presentation
9	03/02/2020 to 07/02/2020 2 hours	Unsupervised learning – k-means algorithms	Powerpoint presentation
10	03/02/2020 to 07/02/2020 1 hour	K-medoid algorithm, Hierarchical clustering	Powerpoint presentation
11	10/02/2020 to 14/02/2020 2 hours	Ensemble classifiers, Boosting and Bagging	Powerpoint presentation
12	10/02/2020 to 14/02/2020 1 hour	Unit 3 – Feed forward networks, Deep feed forward networks,	Powerpoint presentation

13	17/02/2020 to 21/02/2020 2 hours	Deep feed forward networks, Learning XOR	Powerpoint presentation
14	17/02/2020 to 21/02/2020 1 hour	Cycle Test 1	
15	24/02/2020 to 28/02/2020 2 hours	Gradient based learning, hidden units, backpropagation algorithm	Powerpoint presentation
16	24/02/2020 to 28/02/2020 1 hour	Regularization for deep learning, Optimization for training deep learning models	Powerpoint presentation
17	02/03/2020 to 06/03/2020 1 hour	Optimization for deep learning models	Powerpoint presentation
18	02/03/2020 to 06/03/2020 2 hours	Unit 4 – Convolution operation, CNN, Pooling, Pooling and convolution	Powerpoint presentation
19	09/03/2020 to 13/03/2020 1 hour	Convolution algorithms, Unsupervised features	Powerpoint presentation
20	16/03/2020 to 20/03/2020 2 hours	Sequence modeling: Recurrent neural networks, recursive networks, LSTM	Powerpoint presentation
21	16/03/2020 to 20/03/2020 1 hour	Application of CNN	Powerpoint presentation
22	23/03/2020 to 27/03/2020 2 hours	Application of CNN, speech, image processing	Powerpoint presentation
23	23/03/2020 to 27/03/2020 1 hour	Keras and Tensor flow frameworks	Powerpoint presentation
24	30/03/2020 to 03/04/2020 1 hour	Keras and Tensor flow frameworks	Powerpoint presentation
25	06/04/2020 to 10/04/2020 1 hour	Cycle Test 2	

26	06/04/2020 to 10/04/2020 2 hours	Deep learning for Convnets, Text and Sequences, Text generation with LSTM, Deep dream, neural style transfer	Powerpoint presentation
27	13/04/2020 to 17/04/2020 2 hours	Autoencoders, GANS	Powerpoint presentation
28	13/04/2020 to 17/04/2020 1 hour	GANS	Powerpoint presentation

COURSE ASSESSMENT METHODS (shall range from 4 to 6**)**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cyle Test 1	17/02/2020 to 21/02/2020 1 hour	1 hour	15
2	Cycle Test 2	06/04/2020 to 10/04/2020 1 hour	1 hour	15
3	Assignment 1	17/02/2020 to 21/02/2020 1 hour	2 hours	10
4	Project	13/04/2020 to 17/04/2020 1 hour	10 hours	20
CPA	Compensation Assessment*			
5	Final Assessment *	As per academic schedule	3 hours	40

***mandatory; refer to guidelines on page 4**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

1. **Students' feedback through PAC meetings**
2. **Feedbacks are collected before final examination through MIS or any other standard format followed by the institute**
3. **Students, through their Class Representatives, may give their feedback at any time to the course faculty which will be duly addressed.**

COURSE POLICY (including compensation assessment to be specified**)**

MODE OF CORRESPONDENCE (email/ phone etc)

Email, in-person – after 4.00 pm.

COMPENSATION ASSESSMENT POLICY

1. One compensation assessment will be given after completion of Cycle Test 1 and 2 for the students those who are absent for any assessment due to genuine reason.
2. Compensatory assessments would cover the syllabus of Cycle tests 1 & 2
3. The prior permission and required documents must be submitted for absence signed by HoD/CSE.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

1. **The Course Coordinator is available for consultation during the time intimated to the students then and there.**
2. **Relative grading adhering to the instructions from the office of the Dean (Academic) will be adopted for the course.**

FOR APPROVAL

Course Faculty _____ 14/1/2020 **CC- Chairperson** _____ 17/1/2020 **HOD** _____