



FORMAT FOR COURSE CURRICULUM

Course Title: Artificial Intelligence and Machine Learning in Life Science.

L	T	P/S	SW/FW	No. of PSDA	TOTAL CREDIT UNITS
2	1	2	-	3	4

Course Code: to be decided later

Credit Units: 4

Course Objectives:

The course will introduce the concept of Artificial Intelligence and Machine Learning with life science, integrated AI with Machine Learning, Data cleaning, Clustering, Deep Learning and AI as a programming language.

Pre-requisites:

Basic knowledge about Data Structure, Python Language.

Student Learning Outcomes: On completion of the course student will

- Apply the principles of Machine Learning with reference of Life Science.
- Identify and demonstrate skills of Deep learning.
- Interpret the concept of Bayes rule
- Conceptualize the principles of AI.
- Apply the statistics analysis with the help of AI as a programming language.

Course Contents/Syllabus:

	Weightage (%)
Module I	15
Descriptors/Topics: Introduction of Machine Learning Introduction and Basic Concept, Basic Prediction Model, Definition of learning systems, Goals and applications of machine learning, Aspects of developing a learning system: training data, concept representation, function approximation, Data Cleaning, imputation, cross-validation, and interpreting results, Probability and Statistics	

<p>Module II</p> <p>Descriptors/Topics : Supervised & Unsupervised learning Unsupervised Methods, Clustering: Distance Metrics, K-Means, hierarchical clustering, Supervised Methods, Classification: K-NN, naïve Bayes, decision trees, boosting and bagging, Bayesian Learning: Probability theory and Bayes rule. Naive Bayes learning algorithm. Neural networks. Introduction to Deep learning, Active learning, Reinforcement learning, Genetic algorithms and genetic programming, Convolutional networks, RNNs, LSTM, Adam, Dropout, BatchNorm, Xavier/He initialization; Case studies in Health Care and Life Sciences. Probabilistic Neural Network, Conditional Random Fields. Deep Learning Tools: Caffe, Theano, Torch. Implementing Deep Learning Algorithms for solving real time health care and life sciences problem.</p>	25
<p>Module III</p> <p>Descriptors/Topics: Decision Tree Decision Tree Learning: Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute: entropy and information gain. Searching for simple trees and computational complexity. Occam's razor. Overfitting, noisy data, and pruning.</p>	20
<p>Module IV</p> <p>Descriptors/Topics: Artificial Intelligence Artificial Intelligence: Issues, Techniques, Problems, Importance and areas of AI; Problem solving state space search; DFS; BFS Production: System, Problem characteristics; Heuristic Search Techniques; Generate and Test; Hill Climbing; Best First Search; Problem reduction. Knowledge representation: Mapping; Approaches; Issues; Representing simple facts in logic; Representing instance and relationships; Resolution and natural deduction.</p>	20
<p>Module V</p> <p>Descriptors/Topics: AI programming language AI programming language: Prolog: Objects, Relationships, Facts, Rules, Variables, Syntax and Data Structures; Representing objects & Relationships by using “trees” and “lists”; Use of cut; I/O of characters and structures; Symbolic reasoning under uncertainty; Monotonic Reasoning: Logics for Non-Monotonic reasoning; Implementation issues; Implementation: DFS & BFS.</p>	20

Pedagogy for Course Delivery:

Lectures: 27

Tutorial: -13

Presentation/ Seminar: - 4

Class Test: 1

Total: 45

Lab/ Practical details, if applicable:

Tutorial: -

Practical: 26

Class Test: 4

Total: 30

List of Professional Skill Development Activities (PSDA):

- i. Interaction with AI & ML expert from Industry/Research
- ii. Group Discussion
- iii. Case studies

Lab/ Practicals details, if applicable:

- Install SciPy Libraries
- Load The Data
- Import libraries
- Peek at the Data
- Statistical Summary
- Class Distribution
- Application of AI (R or Python based codes) on open source Diabetes/Clinical Data Sets.
- Deep learning applications in Vaccine Discovery Systems.
- AI and Deep Learning in Breast Cancer diagnosis.
- Standard AI and Deep Learning Systems- PyTORCH, IBM Watson; Arterys Cardio DL application; etc
- NLP applications in Health Care
- IOT and AI in health care

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)
75	25

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment (30 %)					End Term Examination (70 %)		
Components (Drop down)	Class Test	Home Assignment	Attendance				
Linkage of PSDA with Internal Assessment Component, if any		Group Discussion					
Weightage (%)	15	10	5				

Lab/ Practical/ Studio Assessment:

	Continuous Assessment/Internal Assessment (40 %)				End Term Examination (60%)		
Components (Drop down)	Lab. Performance	Viva Voce	Attendance	Quiz on Case Studies	Lab. Performance	Viva-voce	Lab Records
Weightage (%)	20	10	5	5	40	10	10

Text & References:

1. “Malignant Tumor Detection Using Machine Learning through Scikit-learn” Arushi Agarwal, Ankur Saxena, International Journal of Pure and Applied Mathematics, Volume 119 No. 15 2018, 2863-2874, ISSN: 1314-3395 (on-line version) url: <http://www.acadpubl.eu/hub/>
2. “HerbNet: Intelligent Knowledge Discovery in MySQL Database for Acute Ailments” S Mohagaonkar, A Rawlani, P Srivastava, A Saxena Elsevier 2018.
3. Deep Learning by Ian Goodfellow et al 2016
4. Krizhevsky, A., Sutskever, I. & Hinton, G. ImageNet classification with deep convolutional neural networks. In *Proc. Advances in Neural Information Processing Systems 25* 1090–1098 (2012).
5. Hinton, G. *et al.* Deep neural networks for acoustic modeling in speech recognition. *IEEE Signal Processing Magazine* **29**, 82–97 (2012).