| Course Code | 18CSE388T | Course Name | ARTIFICIAL NEURAL NETWORKS | Course Category | E | Professional Elective | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 3 | 0 | 0 | 3 |

| Pre-requisite Courses | Nil | Co-requisite Courses | Nil | Progressive Courses | Nil |
|---|---|---|---|---|---|
| Course Offering Department | Computer Science and Engineering | Data Book / Codes/Standards | Nil | | |

| Course Learning Rationale (CLR): | *The purpose of learning this course is to:* | Learning | | |
|---|---|---|---|---|
| | | 1 | 2 | 3 |
| | | Level of Thinking (Bloom) | Expected Proficiency (%) | Expected Attainment (%) |
| CLR-1 : | *Connect Biology with Computers* | | | |
| CLR-2 : | *Understand components of artificial neural networks* | | | |
| CLR-3 : | *Understand supervised learning networkparadigms* | | | |
| CLR-4 : | *Understand unsupervised learning networkparadigms* | | | |

| Course Learning Outcomes (CLO): | *At the end of this course, learners will be able to:* | | | |
|---|---|---|---|---|
| CLO-1 : | *Know the purpose of Artificial Neural Networks* | *1* | *80* | *85* |
| CLO-2 : | *Apply the concepts of activation, propogation functions* | *2* | *75* | *80* |
| CLO-3 : | *Work with supervised learning network paradigm* | *3* | *85* | *80* |
| CLO-4 : | *Work with unsupervised learning network paradigm* | *3* | *80* | *75* |

| Program Learning Outcomes (PLO) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Engineering Knowledge | Problem Analysis | Design & Development | Analysis, Design, Research | Modern Tool Usage | Society & Culture | Environment & Sustainability | Ethics | Individual & Team Work | Communication | Project Mgt. & Finance | Life Long Learning | PSO - 1 | PSO - 2 | PSO – 3 |
| *H* | *L* | - | - | *H-* | - | - | - | - | - | - | *H* | *L* | *L* | - |
| *H* | *H* | - | - | *H* | - | - | - | - | - | - | *H* | *H* | *H* | *H* |
| *H* | *H* | *H* | - | *H* | - | - | - | - | - | - | *H* | *H* | *H* | *H* |
| *H* | *H* | - | - | *H* | - | - | - | - | - | - | *H* | *H* | *H* | *H* |

| Duration (hour) | | 9 | 9 | 9 | 9 | 9 |
|---|---|---|---|---|---|---|
| S-1 | SLO-1 | *Why neural network?* | *Components of artificial neural networks* | *Learning and training samples* | *Radial basis functions* | *Unsupervised learning networkparadigms* |
| | SLO-2 | *Basics of Artificial Neural Networks* | *The concept of time in neural networks* | *Paradigms of Learning* | *Information processing of an RBF network* | *Structure of a self-organizing map(SOM)* |
| S-2 | SLO-1 | *A brief history of neural networks* | *Connections* | *Using training samples* | *Training of RBF networks* | *Functionality* |
| | SLO-2 | *Biological neural networks* | *Propagation function* | *Gradient Optimization Procedure* | *Growing of RBF networks* | *Training* |
| S-3 | SLO-1 | *Biological neural networks* | *Activation* | *Hebbian learning rule* | | *Topology function* |
| | SLO-2 | *The vertebrate nervous system* | *Threshold value, Activation function* | *Supervised learning networkparadigms* | *Compare multilayer perceptrons and RBF* | *Decreasing Learning Rate* |
| S-4 | SLO-1 | *peripheral nervous system* | *Common activation functions* | *The perceptron, back propagation and its variants* | *Recurrent perceptron-like networks* | *Variations of SOMs* |
| | SLO-2 | *Cerebrum, cerebellum, diencephalon,brainstem* | *Output function, Learning strategies* | *Singlelayer perceptron* | *Jordan networks* | *Neural gas* |
| S-5 | SLO-1 | | *Network topologies* | *Linear Separability* | *Elman networks* | *Multi-SOM* |
| | SLO-2 | *The Neuron* | *Feedforward networks* | *Multilayer perceptron* | *Training recurrent networks* | *Multi-neural gas* |
| S-6 | SLO-1 | *Components* | *Recurrentnetworks* | *Backpropagation of error* | | *Growing neural gas* |
| | SLO-2 | *Electrochemical processes* | *Completely linked networks* | *Selecting learning rate* | *Unfolding in time* | *Adaptive resonance theory(ART)* |
| S-7 | SLO-1 | *Receptor cells- Various types* | *Bias neuron* | *Resilient Backpropagation* | *Teacher forcing* | *Task and structure of an ART network* |
| | SLO-2 | *Information processing within nervous system* | *Representing Neurons* | *Adaption of Weights* | | |
| S-8 | SLO-1 | *Light Sensing organs* | *Orders of Activation* | *Variations in Backpropagation* | *Recurrent backpropagation* | *Resonance* |
| | SLO-2 | *Neurons in living organisms* | *Synchronous activation* | | | |
| S-9 | SLO-1 | *Transition to technical neurons* | *Asynchronous activation* | *Multilayer perceptron* | *Evolutionary algorithms* | *Learning process of an ART network* |
| | SLO-2 | | input and outputof data | | | |

| Learning Resources | |
|---|---|
| | 1. *David Kriesel, A BriefIntroduction to Neural Networks, dkriesel.com, 2005* |
| | 2. *GunjanGoswami, Introduction to Artificial Neural Networks, S.K. Kataria& Sons, 2012* |
| | 3. *Raul Rojas, Neural Networks: A Systematic Introduction, 1996.* |
| | 4. *S. Sivanandam, Introduction to Artificial Neural Networks, 2003* |

| Learning Assessment | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bloom's Level of Thinking | Continuous Learning Assessment (50% weightage) | | | | | | | | Final Examination (50% weightage) | |
| | | CLA – 1 (10%) | | CLA – 2 (15%) | | CLA – 3 (15%) | | CLA – 4 (10%)# | | | |
| | | Theory | Practice | Theory | Practice | Theory | Practice | Theory | Practice | Theory | Practice |
| Level 1 | Remember | *40 %* | - | *30 %* | - | *30 %* | - | *30 %* | - | *30%* | - |
| | Understand | | | | | | | | | | |
| Level 2 | Apply | *40 %* | - | *40 %* | - | *40 %* | - | *40 %* | - | *40%* | - |
| | Analyze | | | | | | | | | | |
| Level 3 | Evaluate | *20 %* | - | *30 %* | - | *30 %* | - | *30 %* | - | *30%* | - |
| | Create | | | | | | | | | | |
| | Total | 100 % | | 100 % | | 100 % | | 100 % | | 100 % | |

# CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

| Course Designers | | |
|---|---|---|
| Experts from Industry | Experts from Higher Technical Institutions | Internal Experts |
| *1. Dr.Harisekharan,CTO,Sri SeshaaTechnologies Pvt. Ltd., Chennai* | *1. Dr.J.Suresh, SSN College of Engineering* | *Dr.G.Vadivu* |
| | *2. Dr. Sharmila Shankar, Crescent Institute of Science and Technology* | *Dr. D.Rajeswari* |
| | | *Dr.M.S.Abirami* |