- Exploring the role of fabricated nanomaterials in electronic devices, optical devices, computing devices, drug delivery, environmental remediation and energy etc.

Essential/recommended readings

- Nanotechnology For Dummies; By Richard D. Brooker, Earl Boysen (2011), Wiley Publisher
- Nanotechnology: An Introduction; By Jeremy Ramsden (2011), Elsevier Science Publisher
- Research papers and reviews from journals of international repute like Nanotechnology Reviews (NTREV) journal, NANO Reviews, Nature Nanotechnology

DISCIPLINE SPECIFIC ELECTIVE COURSE -3 (DSE-3)
V. 5.8. IoT, Security and Machine Learning

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit-distribution of the course			Eligibility criteria	Prerequisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
IoT, Security and Machine Learning, DSE 3, V.5.8	**4**	**1**	**0**	**3**	**12th pass with Physics and Mathematic**	**Programming Fundamentals, Probability and statistics, Computer System Architecture**

Learning Objectives

This course introduces students to the field of machine learning, deep learning, security with python and its interaction with the Internet of Things (IoT) devices/ sensors. The course will cover topics such as security models, attacks, concept of privacy preservation, threats to machine learning models, and IoT devices. Students will be implementing various privacy preserving machine learning techniques with Python/ C or in MATLAB. The students will also learn to use various IoT devices in real applications.

Learning Outcomes

- Understand the fundamental concepts of machine learning, security and IoT.
- Identify deep learning and privacy preserving machine learning models, IoT platforms.
- Implement various security techniques for IoT and machine learning applications
- Understand current research trends and developments in the field of machine learning, security and IoT
- Explore on Interacting with digital outputs with C/ Python.

Syllabus

Theory **(15 Hours)**

Basic introduction to IoT, IoT- devices and related security, IoT communication protocols, principles of security, Vulnerability in IoT, CIA triad, Viruses and their types, Machine learning principles, Deep learning, CNN and other models. Concepts of privacy preservation, privacy preserving machine learning models.

Practicals: **(105 Hours)**

- Implementing IoT devices for various sensing applications
- Training deep learning models on sensed data
- Implementing IoT communication protocols
- Designing and testing IoT based systems
- Implementing IoT in wearables/ healthcare systems
- Using Python based application for IoT device control**.**
- Implementing basic deep learning models
- Implementing Privacy Preserving Machine Learning (PPML) models on available data

Essential/ recommended Readings:

- "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things" by David Hanes, Gonzalo Salgueiro, Patrick Grossetete
- "Building IoT Projects with Raspberry Pi and Python" by Matthew Poole
- "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron
- "Machine Learning Yearning" by Andrew Ng
- Adrian McEwen, Hakim Cassimally, ―Designing the Internet of Things‖, John Wiley and Sons, 1st Edition, 2014
- Matt Richardson, Shawn Wallace, ―Getting Started with Raspberry Pi‖, O'Reilly (SPD), 3rd Edition, 2014.

DISCIPLINE SPECIFIC ELECTIVE COURSE -3 (DSE-3)
V.5.9. Integral Transform: Applications to Digital Signal Processing

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE