Skill Enhancement Courses (SEC)

Course Code	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2501IT01	Business Intelligence Lab	FC			2	2	50	50	100	-
2501EE17	Smart Technology & Applications Lab	IC			2	2	50	50	100	-
2501CS05	Machine Learning with Python	IC			2	2	50	50	100	-
2501EE18	Intelligent Algorithms for Power Systems	AC			2	2	50	50	100	-
	Total				**08**	**08**				

Business Intelligence Lab

(Common to CE, EEE, ME, ECE, CSE, IT, AIML, CSE(DS), PT & Min.E)

	L	T	P	C
Course Code: 2501IT01	**0**	**0**	**2**	**2**

Course Outcomes:

At the end of the course, student will be able to:

- **CO1:** Utilize Excel and Power BI for data analysis, visualization, and reporting.
- **CO2:** Apply various data analysis techniques in Excel and Power BI to extract meaningful insights from datasets
- **CO3:** Create clear and compelling visualizations using Excel and Power BI to communicate data-driven insights.
- **CO4:** Develop data models in Power BI to organize and analyze data efficiently.
- **CO5:** Design interactive dashboards in Power BI to facilitate data exploration and decision-making.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	2	-	-	2	-	-	-	1	1	1
CO2	2	3	-	-	2	-	-	-	1	1	2
CO3	2	2	-	-	2	-	-	-	1	1	2
CO4	1	2	1	-	2	-	-	-	1	1	2
CO5	1	2	1	-	2	-	-	-	1	1	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	2
CO2	2	1
CO3	2	2
CO4	1	2
CO5	2	2

Practice

1.Introduction to Excel

a. Overview of Excel and its capabilities for data analysis
b. Basics of Excel: Navigating the interface, entering data, formatting cells
c. Introduction to functions and formulas: SUM, AVERAGE, IF, VLOOKUP, etc.
d. Importing data into Excel from different sources: CSV, text files.

2. Data Analysis with Excel

a. Data manipulation techniques: Sorting, filtering, and grouping data
b. Advanced functions and formulas: INDEX/MATCH, SUMIFS, COUNTIFS, etc.

c. Data visualization with Excel: Creating charts and graphs
d. Using PivotTables for data summarization and analysis

3.Advanced Excel Features
a. Introduction to Excel tables and structured references
b. Working with named ranges and dynamic ranges
c. Excel data validation techniques

4. Introduction to Power BI
a. Overview of Power BI and its advantages over Excel for large datasets
b. Installing Power BI Desktop
c. Understanding the Power BI interface: Navigation, ribbons, and panes
d. Importing data into Power BI Desktop from various sources

5. Data Preparation in Power BI
a. Introduction to Power Query for data transformation
b. Cleaning, shaping, and filtering data in Power Query Editor

6.Data Preparation in Power BI
a. Combining data from different sources
b. Loading data into Power BI model.

7. Data Modeling in Power BI
a. Understanding relationships between tables
b. Creating calculated columns and measures using DAX

8.Data Modeling in Power BI
a. Introduction to DAX functions: CALCULATE, FILTER, RELATED, etc.
b. Working with date and time functions in DAX

9. Visualization Basics in Power BI
a. Creating basic visualizations: Bar charts, line charts, pie charts, etc.
b. Customizing visualizations: Formatting, titles, legends, etc.

10. Visualization Basics in Power BI
a. Using slicers and filters to interact with visualizations
b. Adding drill-down capabilities to visualizations

11. Advanced Visualizations and Dashboards in Power BI
a. Exploring advanced visualizations: TreeMap, Waterfall chart, KPIs, etc.
b. Creating custom visuals from the marketplace

12.Advanced Visualizations and Dashboards in Power BI
a. Designing effective dashboards: Layout, arrangement, and organization
b. Adding interactivity with bookmarks and drill-through

Additional Practice:

1. **Basic Data Analysis:** Import a dataset into Excel and perform basic data analysis tasks such as sorting, filtering, and creating simple charts to visualize the data.

2. **Expense Tracker:** Create a spreadsheet to track your expenses. You can have columns for date, item description, category, and amount. Use formulas to calculate totals and analyze your spending habits.

3. **Data modeling and extracting statistics from dataset:** Connecting Power BI to local data files and cloud servers (COVID19 dataset will be imported into the Power BI for visualization).

Text Books:

1 Learn Power BI - Second Edition: A comprehensive, step-by-step guide for beginners to learn real-world business intelligence 2nd Edition,ISBN: 9781801811958.

2 Power BI Beginner: Zero to Hero in Power BI Desktop by Philip Seamark, ISBN 1691641227.

Reference Books:

1 Power BI Quick Start Guide: Build dashboards and visualizations to make your data come to life by Devin Knight and Siddharth Mehta.

2 Learn Power BI: A Beginner's Guide to Analyzing Data and Creating Reports with Power BI by Murilo Miranda.

Web Links:

1 https://learn.microsoft.com/en-us/power-bi/
2 https://support.microsoft.com/en-us/excel
3 https://cce.sydney.edu.au/course/MSE1
4 https://cce.sydney.edu.au/course/PBBA

IOT Applications of Electrical Engineering

	L	T	P	C
Course Code:2501EE17	**0**	**0**	**2**	**2**

Course Outcomes:

At the end of the Course, student s will be able to:

- **CO1** Explain the sensors & actuators for IoT applications.
- **CO2** Apply various sensors to IoT applications.
- **CO3** Utilize the cloud platform & APIs for IoT application
- **CO4** Experiment with embedded boards for creating IoT prototypes.
- **CO5** Develop a solution for a given IoT application.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	1	3	2	1	2				1	1	
CO2	1	2	3	1	2				1	1	
CO3	1	3	2	1	2				1	1	
CO4	1	2	3	1	2				1	1	
CO5	1	3	2	1	2				1	1	

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1		2
CO2		2
CO3		2
CO4		2
CO5		2

Practice:

1. Interfacing of IR sensor with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
2. To interface Organic Light Emitting Diode (OLED) with Arduino/Raspberry Pi
3. To interface Bluetooth with Arduino/Raspberry Pi & write a program to send sensor data to smartphone using Bluetooth.
4. To interface Bluetooth with Arduino/Raspberry Pi & write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.
5. Interfacing of 7 Segment Display with Arduino/Raspberry Pi
6. Interfacing of Joystick with Arduino/Raspberry Pi
7. Interfacing of Analog Input & Digital Output with Arduino/Raspberry Pi

8. Night Light Controlled & Monitoring System
9. A Heart Rate Monitoring System
10. LDR based appliance control

Additional Practice:

11. Fire Alarm Using Arduino
12. Alexa based Home Automation System

Text Books:

1 IoT Fundamentals, Networking Technologies, Protocols & Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetette, rob Barton, Jerome Henry, CISCO, Pearson, 2018 (ISBN: 9781587144561).

2 Designing the Internet of Things, Adrian McEwen & Hakim Cassimally, Wiley (ISBN: 9781118430620).

Reference Books:

1 An Introduction to Internet of Things, Connecting devices, Edge Gateway & Cloud with Applications, Rahul Dubey, Cengage, 2019 (ISBN: 978935350931).

2 Designing the Internet of Things, by Adrian McEwen, Wiley Publishers (ISBN: 9781118430620).

Web Links:

1 https://iotify.io/iot-virtual-lab/

2 https://onlinecourses.nptel.ac.in/noc18_cs46/preview

3 https://www.electronicsforu.com/electronics-projects/internet-of-things-iot

Machine Learning With Python

	L	T	P	C
Course Code:2501CS05	**0**	**0**	**2**	**2**

Course Outcomes:

At the end of the course, student will be able to:

- **CO1** Underst& the basic concepts of Python language.
- **CO2** Generate, analyze, & interpret data using Python
- **CO3** Analyze several problems & apply ML techniques to solve it
- **CO4** Design prediction & classification models
- **CO5** Underst& the basic concepts of deep neural network model & design the same.

Mapping of Course Outcomes with Program Outcomes:

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	1						1	1		
CO2	2	3	1						1	1		
CO3	2	3	1						1	1		
CO4	2	3	1						1	1		
CO5	2	3	1						1	1		

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	
CO2	1	
CO3	1	
CO4	1	
CO5	1	

PRACTICE:

1. Basic Programs: Introduction to Python- Importing datasets- Reading data from different file formats Data Pre-processing & visualization
2. P&as: Missing Data P&as Overview, Categorical Data, Several other data operations through P&as & Time Series data analysis.
3. Numpy:
   3.1) Creating N-dims arrays Some Mathematical functions, Indexing & slicing.
   3.2) Numeric operations using NumPy
4. Matplotlib & Seaborn: Histogram, Line plot, Scatter plot, bar plot, BoxPlot, Heat Map Xlabel, Ylabel, Xticks, Yticks, title Overview.

5. Regression: Implementation of various types of regression using any dataset.
6. Decision Tree: Implementation of the decision tree based ID3 algorithm using an appropriate data set & verification of inductive bias of decision tree learning algorithm
7. Support Vector Machine: Implementation of SVM for h&written character recognition using MNIST dataset.
8. KNN: Implementation of k-Nearest Neighbor Classification
9. Naive Bayes classification :Implementation of Naive Bayes classification
10. Backpropagation algorithm: Implementation of Backpropagation algorithm for deep neural networks. Study of impact on performance when activation functions are changed. Consider three common activations functions. - Sigmoid, Relu, Tanh

Additional Practice:

11. Implement logistic regression.
12. Implementation of Recommendation systems
13. Implement Applications: Natural Language Processing Projects: Automatic Review Analyzer

Reference Books:

1 Pattern Recognition & Machine Learning by C. M. Bishop. First Edition. Springer (ISBN: 978-149393843)

2 Machine Learning: The Art & Science of Algorithms that Make Sense of Data, P. Flach. First Edition, Cambridge University Press.(ISBN: 978-1107422223)

Web Links:

1 https://ml-course.github.io/master/labs/Lab%201%20-%20Tutorial

2 https://www.nielit.gov.in/calicut/calicut/content/machine-learning-using-python-smart-lab-free-course

3 Machine Learning with MATLAB - MATLAB & Simulink (mathworks.com)

Intelligent Algorithms for Power System Lab

	L	T	P	C
Course Code:2501EE18	**0**	**0**	**2**	**2**

Course Outcomes:

At the end of the course, student will be able to:

- **CO1** Acquire knowledge about basic of MATLAB & SIMULINK software
- **CO2** Aapply evolutionary techniques in real time problems
- **CO3** Acquire knowledge & apply neural networks in real time problems
- **CO4** Apply fuzzy systems in real time problems
- **CO5** Apply genetic algorithm in real time problems

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	3	2	2					1	1	
CO2	2	3	2	2					1	1	
CO3	2	3	1	1					1	1	
CO4	2	3	2	2					1	1	
CO5	2	3							1	1	

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2
CO5	2	2

Practice:

1. Introduction to Fundamental of Fuzzy Logic & Basic Operations
2. Fuzzy Inference System (FIS)
3. Fuzzy Weighted Average & Application
4. Fuzzy Control & Application
5. Introduction to Neural Networks & Perceptron Example
6. Multilayer Perceptron & Application
7. Probabilistic Neural Networks & Application
8. Application of genetic algorithm to optimize controller parameters
9. Application of evolutionary algorithms to optimize controller parameters
10. Application of neural networks with optimization techniques to optimize controller parameters

Additional Practice:

11. Application of fuzzy sets with optimization techniques to optimize controller parameters
12. LFC of a single area system using genetic algorithm
13. LFC of a two-area system using genetic algorithm
14. Application of evolutionary algorithms for single-area LFC system using Integral squared error

Reference Books:

1	"Principles of Soft Computing", S.N.Sivanandam&S.N.DeepaWiley (ISBN: 9788126527410).
2	"Genetic Algorithm in Search Optimization & Machine Learning", David E. Goldberg, Pearson Education (ISBN: 978021157673).
3	"Fuzzy Set Theory: Foundations & Applications", George J. Klir, Ute St. Clair, Bo Yuan,Prentice Hall (ISBN: 9780133410587).

Web Links:

1	http://vlabs.iitkgp.ac.in/scte/
2	http://vlabs.iitkgp.ac.in/scte/exp5/index.html