

### Value Added Courses (VAC)

Course Code	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2501CS04	Internet of Things	FC			1	1	100		100	-
2501AI06	Data Analysis Essentials	IC			2	2	50	50	100	PP
2501UC11	Employability Skills-I	FC			3	0	100	-	100	-
2501UC13	Employability Skills-II	FC			3	0	100	-	100	ES-I
2501UC14	Employability Skills-III	IC			3	0	100	-	100	ES-II
2501UC15	Employability Skills-IV	IC			3	0	100	-	100	ES-III
2501UC16	Employability Skills-V	AC			3	1	100	-	100	ES-IV
<b>Total</b>					<b>18</b>	<b>4</b>				

## Internet of Things

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

Course Code: 2501CS04

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>

### Course Outcomes:

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

- CO1:** Identify and select appropriate sensors, actuators, and boards (Arduino/Pi) for specific tasks.
- CO2:** Execute digital and analog interfacing of peripherals with embedded platforms.
- CO3:** Develop control algorithms and decision-making logic for real-time automation.
- CO4:** Configure cloud platforms and APIs for data transmission and visualization.
- CO5:** Design and build functional end-to-end IoT prototypes for real-world applications.

### 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	1			1						
CO2	2	2	1		2						
CO3	1	2	2	1							
CO4	1	1		1	2						1
CO5	1	2	2	2	2	1	1	1	2	2	2

### Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1		
CO2		
CO3		
CO4		
CO5		

### Practice:

1. Study of Arduino UNO and Raspberry Pi boards including architecture, pin configuration, power supply, communication interfaces and development environments.
2. Study of commonly used sensors and actuators such as temperature sensor, moisture sensor, LDR, ultrasonic sensor, IR sensor, PIR sensor, LED and motor. Identify their working principles and applications.
3. Design and implement basic digital input-output operations using Arduino by controlling LED/buzzer.
4. Interface an analog sensor (LDR) with Arduino and display sensor values on Serial Monitor.
5. Interface a digital sensor (Ultrasonic sensor) with Arduino and display measured values on Serial Monitor.
6. Develop conditional logic using Arduino to control LED or buzzer based on sensor threshold values.

7. Interface a servo motor with Arduino and control its angular position based on sensor input to demonstrate automatic gate or smart irrigation model.
8. Design and implement a multi-sensor monitoring system using Arduino to read analog and digital sensors simultaneously and display results on Serial Monitor.
9. Create a cloud platform account, explore available IoT services and register a device (Thing) on the platform.
10. Demonstration of IoT based system to upload sensor data to cloud platform and visualize the received data in graphical form.

#### **Additional Practice (Any 2 from the following)**

1. **Smart Lighting System:** Design a lighting system that automatically turns ON/OFF or dims lights based on human movement or surrounding light conditions to demonstrate energy saving.
2. **Intelligent Traffic Control System:** Develop an automated traffic signal system for busy roads with priority control for emergency vehicles (such as ambulances).
3. **Smart Parking System:** Create a sensor-based parking system to detect available slots and provide parking guidance or remote monitoring.
4. **Air Pollution Monitoring System:** Build an IoT-based setup using gas or environmental sensors to measure air quality and indicate whether pollution levels are safe or dangerous.
5. **Bluetooth-Based Actuator Control:** Control motors or other actuators connected to a development board using Bluetooth communication.

#### **Reference Books:**

- 1 An Introduction to Internet of Things, Connecting devices, Edge Gateway and Cloud with Applications, Rahul Dubey, Cengage, 2019. ISBN: 9789353501020
- 2 Adrian McEwen, Designing the Internet of Things, Wiley Publishers. ISBN:978-1118430620
- 3 IoT Fundamentals, Networking Technologies, Protocols and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetette, rob Barton, Jerome Henry, CISCO, Pearson, 2018. ISBN:9789386873743
- 4 Internet of Things, by Vengalapudi Appala Konda and Prof. Sangareddy B. Krutakoti, Scientific International Publishing House, First Edition, 2024. ISBN: 978-93-6132-958-6.

#### **Web Links:**

- 1 <https://iotvirtuallab.github.io/vlab/Experiments/index.html>
- 2 [https://onlinecourses.nptel.ac.in/noc21\\_cs17/preview](https://onlinecourses.nptel.ac.in/noc21_cs17/preview)
- 3 <https://www.electronicsforu.com/electronics-projects/internet-of-things-iot>
- 4 <https://www.coursera.org/specializations/iot>
- 5 <https://projecthub.arduino.cc/>
- 6 <https://www.edureka.co/iot-certification-training>

**Data Analysis Essentials**  
(Common to CSE, IT, AIML & CSE (DS))

**Course Code: 2501AI06** **L** **T** **P** **C**  
**0** **0** **2** **2**

**Course Outcomes:**

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

- CO1:** Perform various operations on NumPy arrays.
- CO2:** Importing data from different file formats using pandas
- CO3:** Draw different types of charts using matplotlib.
- CO4:** Demonstrate web scraping using python.
- CO5:** Design preprocessing techniques on loan prediction dataset.

**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
<b>CO1</b>	2	2	-	-	2	-	-	1	2	-	-
<b>CO2</b>	3	2	-	-	3	-	-	1	2	-	-
<b>CO3</b>	2	2	-	-	3	-	-	2	1	-	-
<b>CO4</b>	2	2	-	-	1	-	-	1	1	-	-
<b>CO5</b>	2	2	-	-	2	-	-	1	1	-	-

**Mapping of Course Outcomes with Program Specific Outcomes:**

CO/PSO	PSO1	PSO2
<b>CO1</b>	1	2
<b>CO2</b>	2	-
<b>CO3</b>	2	-
<b>CO4</b>	1	2
<b>CO5</b>	2	-

**Practice:**

**Week 1: Creating a NumPy Array**

- a. Basic ndarray
- b. Array of zeros
- c. Array of ones
- d. Random numbers in ndarray
- e. An array of your choice
- f. Imatrix in NumPy
- g. Evenly spaced ndarray

**Week 2: The Shape and Reshaping of NumPy Array**

- a. Dimensions of NumPy array
- b. Shape of NumPy array
- c. Size of NumPy array
- d. Reshaping a NumPy array

- e. Flattening a NumPy array
- f. Transpose of a NumPy array

### **Week 3: Expanding and Squeezing a NumPy Array**

- a. Expanding a NumPy array
- b. Squeezing a NumPy array
- c. Sorting in NumPy Arrays

### **Week 4: Indexing and Slicing of NumPy Array**

- a. Slicing 1-D NumPy arrays
- b. Slicing 2-D NumPy arrays
- c. Slicing 3-D NumPy arrays
- d. Negative slicing of NumPy arrays

### **Week 5: Stacking and Concatenating Numpy Arrays**

- a. Stacking ndarrays
- b. Concatenating ndarrays
- c. Broadcasting in Numpy Arrays

### **Week 6: Perform following operations using pandas**

- a. Creating dataframe
- b. concat()
- c. Setting conditions
- d. Adding a new column

### **Week 7: Perform following operations using pandas**

- a. Filling NaN with string
- b. Sorting based on column values
- c. groupby()

### **Week 8: Read the following file formats using pandas**

- a. Text files
- b. CSV files
- c. Excel files
- d. JSON files

### **Week 9: Read the following file formats**

- a. Pickle files
- b. Image files using PIL
- c. Multiple files using Glob
- d. Importing data from database

## **Week 10: Demonstrate web scraping using python**

## **Week 11: Perform following preprocessing techniques on loan prediction dataset**

- a. Feature Scaling
- b. Feature Standardization
- c. Label Encoding
- d. One Hot Encoding

## **Week 12: Perform following visualizations using matplotlib**

- a. Bar Graph
- b. Pie Chart
- c. Box Plot
- d. Histogram
- e. Line Chart and Subplots
- f. Scatter Plot.

### **Additional Practice:**

1. Write a program that reads a list of temperatures from a file called temps.txt, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt
2. Write a program to find the greatest number that can be formed by using given set of numbers.
3. Write a program to find sum of digits of a number till you get single digit sum.  
Example:  
Input: 142 (Hint:  $1+4+2=7$ )  
Output: 7  
Input: 4683 (Hint:  $4+6+8+3=21 \Rightarrow 2+1=3$ )  
Output: 3
4. Write a program to count how many times each word present in a file.

### **Text Books:**

1. Python Data Science Handbook, Jake VanderPlas, 2nd Edition, 2022, ISBN: 978-1098121228
2. Data Analysis from Scratch with Python: Step By Step Guide, Peters Morgan, 2018, ISBN: 978-1725678095

### **Reference Books:**

1. Python for Data Analysis, Wes McKinney, 3rd Edition 2022, ISBN: 978-1098104030
2. An Introduction to Statistical Learning: With Applications in Python, Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Jonathan Taylor, 1st Edition, 2023, ISBN: 978-3031387463

### **Web Links:**

1. <https://www.analyticsvidhya.com/blog/2020/04/the-ultimate-numpy-tutorial-for-data-science-beginners/>

2. <https://www.analyticsvidhya.com/blog/2021/07/data-science-with-pandas-2-minutes-guide-to-key-concepts/>
3. <https://www.analyticsvidhya.com/blog/2020/04/how-to-read-common-file-formats-python/>
4. <https://www.analyticsvidhya.com/blog/2016/07/practical-guide-data-preprocessing-python-scikit-learn/>
5. <https://www.analyticsvidhya.com/blog/2020/02/beginner-guide-matplotlib-data-visualization-explorationpython/>

## **Employability Skills- I**

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

<b>Course Code: 2501UC11</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>

### **Aptitude:**

Number System, LCM & HCF, Ratio and Proportion, Averages

### **Reasoning:**

Number Series, Letter Series, Number Analogy, Letter Analogy, Odd Man Out, Logical Sequence of Words.

### **Verbal:**

Introduction to soft skills, how to improve communication? Parts of Speech, Mind your language towards better English, Vocabulary Expansion

### **Text Books**

- 1 Quantitative Aptitude –Dr. R. S. Aggarwal, S CHAND, ISBN: 9789355012326.
- 2 A Modern Approach to Verbal and Non-Verbal Reasoning – Dr. R. S. Aggarwal, ISBN-13. 978-9352832163.
- 3 Quick Learning Objective General English – Dr. R. S. Aggarwal, S CHAND, , ISBN-13. 978-8121922111.

### **Reference Books:**

- 1 Quantitative Aptitude – Abhijit Guha Mc Graw Hill Publications, ISBN-13 9789389957426.
- 2 How To Crack Test of Reasoning Verbal, Non-Verbal & Analytical – Jaikishan and Premkishan, Arihant Publications, New Edition 2024, ASIN : B0CRQ9BVBC.
- 3 A New Approach to Objective English – R. S. Dhillon DGP Publications, ISBN-13: 978-8186651032

### **Web Links:**

- 1 [www.indiabix.com](http://www.indiabix.com)
- 2 [www.bankersadda.com](http://www.bankersadda.com)

## Employability Skills- II

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

<b>Course Code: 2501UC13</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>

### **Aptitude:**

Problems on Ages, Partnership, Percentages, Profit and Loss

### **Reasoning:**

Coding and Decoding, Ranking Test, Alphabet Test, Direction Test

### **Verbal:**

Written communication skill practice, Grammatical use, Concept of 4 step method for presentation, Present Tense

### **Text Books**

- 1 Quantitative Aptitude –Dr. R. S. Aggarwal, S CHAND, ISBN: 9789355012326.
- 2 A Modern Approach to Verbal and Non-Verbal Reasoning – Dr. R. S. Aggarwal, ISBN-13. 978-9352832163.
- 3 Quick Learning Objective General English – Dr. R. S. Aggarwal, S CHAND, , ISBN-13. 978-8121922111.

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- 2 How To Crack Test of Reasoning Verbal, Non-Verbal & Analytical – Jaikishan and Premkishan, Arihant Publications, New Edition 2024, ASIN : B0CRQ9BVBC.
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- 2 [www.bankersadda.com](http://www.bankersadda.com)

### **Employability Skills- III**

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

<b>Course Code: 2501UC14</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>

#### **Aptitude:**

Simple Interest, Compound Interest, Time and Work, Pipes and Cisterns

#### **Reasoning:**

Blood Relations, Calendar, Clocks, Cubes and Dice, Coded Inequalities

#### **Verbal:**

Grammar in use, Group discussion, Reading Comprehension, Past Tense, Future Tense

#### **Text Books**

- 1 Quantitative Aptitude –Dr. R. S. Aggarwal, S CHAND, ISBN: 9789355012326.
- 2 A Modern Approach to Verbal and Non-Verbal Reasoning – Dr. R. S. Aggarwal, ISBN-13. 978-9352832163.
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- 2 How To Crack Test of Reasoning Verbal, Non-Verbal & Analytical – Jaikishan and Premkishan, Arihant Publications, New Edition 2024, ASIN : B0CRQ9BVBC.
- 3 A New Approach to Objective English – R. S. Dhillon DGP Publications, ISBN-13: 978-8186651032

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- 2 [www.bankersadda.com](http://www.bankersadda.com)

## Employability Skills- IV

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

<b>Course Code: 2501UC15</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>

### **Aptitude:**

Time, Speed and Distance, Problems on Trains, Boats and Streams, Mensuration - I, Mensuration – II

### **Reasoning:**

Venn Diagrams, Syllogisms, Non - Verbal Reasoning, Seating Arrangement

### **Verbal:**

Grammatical use, Self-introduction, Letters, E-Mail & Report writing, Error correction, Effective Communication

### **Text Books**

- 1 Quantitative Aptitude –Dr. R. S. Aggarwal, S CHAND, ISBN: 9789355012326.
- 2 A Modern Approach to Verbal and Non-Verbal Reasoning – Dr. R. S. Aggarwal, ISBN-13. 978-9352832163.
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- 3 A New Approach to Objective English – R. S. Dhillon DGP Publications, ISBN-13: 978-8186651032

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- 2 [www.bankersadda.com](http://www.bankersadda.com)

## **Employability Skills- V**

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

<b>Course Code: 2501UC16</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

### **Aptitude:**

Permutations and Combinations, Probability, Data Interpretation, Logarithms, Statistics

### **Reasoning:**

Puzzle Tests, Eligibility Test, Data Sufficiency, Statements – Arguments, Statements – Assumptions, Statements - Course of Action, Statements – Conclusions

### **Verbal:**

Interview skills, Grammar in use, Interpersonal Skills, Negotiation Skills, Social Skills, Problem-Solving Skills, Time Management Skills

### **Text Books**

- 1 Quantitative Aptitude –Dr. R. S. Aggarwal, S CHAND, ISBN: 9789355012326.
- 2 A Modern Approach to Verbal and Non-Verbal Reasoning – Dr. R. S. Aggarwal, ISBN-13. 978-9352832163.
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- 2 How To Crack Test of Reasoning Verbal, Non-Verbal & Analytical – Jaikishan and Premkishan, Arihant Publications, New Edition 2024, ASIN : B0CRQ9BVBC.
- 3 A New Approach to Objective English – R. S. Dhillon DGP Publications, ISBN-13: 978-8186651032

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