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	50	50	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
Total					**18**	**4**				

Internet of Things

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

	L	T	P	C
Course Code: 2501CS04	**0**	**0**	**1**	**1**

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 analogue 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
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))

	L	T	P	C
Course Code: 2501AI06	**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
CO1	2	2	-	-	2	-	-	1	2	-	-
CO2	3	2	-	-	3	-	-	1	2	-	-
CO3	2	2	-	-	3	-	-	2	1	-	-
CO4	2	2	-	-	1	-	-	1	1	-	-
CO5	2	2	-	-	2	-	-	1	1	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	2
CO2	2	-
CO3	2	-
CO4	1	2
CO5	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 =>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)

	L	T	P	C
Course Code: 2501UC11	**0**	**0**	**3**	**0**

Course Outcomes:

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

CO1:	Apply fundamental arithmetic concepts such as number systems, LCM & HCF, ratio & proportion, and averages to solve quantitative problems efficiently.
CO2:	Analyze number and letter series to identify logical patterns and predict subsequent elements.
CO3:	Select the option by evaluating relationships in analogy-based problems and detecting inconsistencies in logical sequences
CO4:	Demonstrate effective verbal communication skills by using appropriate parts of speech and tone in various interpersonal and professional contexts.

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	-	-	1	-	-	-	-	-	-
CO2	1	3	-	2	2	-	-	-	-	-	-
CO3	-	3	-	2	1	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	2	3	-	1

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
2 www.bankersadda.com

Employability Skills- II

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

	L	T	P	C
Course Code: 2501UC13	**0**	**0**	**3**	**0**

Course Outcomes:

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

CO1: Apply percentage, profit & loss, and partnership concepts to solve real-world quantitative problems.

CO2: Analyze age-related problems to develop logical problem-solving strategies.

CO3: Evaluate logical reasoning questions including ranking, directions, and alphabet tests for accurate decision-making.

CO4: Solve pattern-based problems in coding and decoding to enhance analytical skills.

CO5: Demonstrate effective written communication using correct grammar and structured presentation techniques

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	3	3	-	-	2	-	-	-	-	-	-
CO2	2	3	2	-	1	-	-	-	-	-	-
CO3	-	3	-	2	2	-	-	-	-	-	-
CO4	-	3	-	2	2	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	2	2	-	2

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.

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
2 www.bankersadda.com

Employability Skills- III

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

	L	T	P	C
Course Code: 2501UC14	**0**	**0**	**3**	**0**

Course Outcomes:

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

CO1: Solve financial and quantitative aptitude problems using concepts of simple and compound interest.

CO2: Apply logical time-work frameworks to solve real-time problems related to work efficiency and pipe systems .

CO3: Analyze and interpret problems related to blood relations, clocks, calendars, and coded inequalities.

CO4: Evaluate spatial and logical reasoning through cubes, dice, and symbolic interpretation problems.

CO5: Demonstrate effective communication using correct grammar, and participate actively in discussions and comprehension activities.

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	-	-	1	-	-	-	-	-	-
CO2	3	3	-	-	1	-	-	-	-	-	-
CO3	-	3	-	2	1	-	-	-	-	-	-
CO4	-	3	-	2	2	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	2	3	-	2

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
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
2 www.bankersadda.com

Employability Skills- IV

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

	L	T	P	C
Course Code: 2501UC15	**0**	**0**	**3**	**0**

Course Outcomes:

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

CO1: Apply concepts of time, speed, distance, trains, boats and streams to solve motion-related aptitude problems.

CO2: Solve mensuration problems involving surface area and volume in real-world contexts.

CO3: Analyze logical reasoning questions involving Venn diagrams and syllogisms to make valid conclusions.

CO4: Interpret seating arrangements and solve non-verbal reasoning questions involving patterns and spatial reasoning.

CO5: Demonstrate effective communication through structured self-introduction, emails, letters, reports, and grammar usage.

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	3	3	-	-	2	-	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-	-	-
CO3	-	3	-	2	2	-	-	-	-	-	-
CO4	-	3	-	2	2	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	2	2	-	2

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
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
2 www.bankersadda.com

Employability Skills- V

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

	L	T	P	C
Course Code: 2501UC16	**0**	**0**	**3**	**1**

Course Outcomes:

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

CO1:	Apply principles of permutations, combinations, probability, and logarithms to solve quantitative aptitude problems.
CO2:	Interpret and analyze data from charts, graphs, and statistical tables for decision-making and accuracy.
CO3:	Evaluate logical reasoning statements involving arguments, assumptions, conclusions, and data sufficiency.
CO4:	Solve puzzle and eligibility test problems using analytical and critical thinking skills.
CO5:	Demonstrate effective interpersonal, communication, and time management skills for successful personal and professional interactions.

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	3	3	-	-	2	-	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-	-	-
CO3	-	3	-	2	2	-	-	-	-	-	-
CO4	-	3	-	2	2	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	2	3	-	2

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
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
2 www.bankersadda.com