

### Value Added Courses (VAC)

| Course Code | Course Name                          | Level | L | T | P         | C        | CIE | SEE | Total | Pre-requisite |
|-------------|--------------------------------------|-------|---|---|-----------|----------|-----|-----|-------|---------------|
| 241PE001    | Sports & Yoga                        | FC    |   |   | 1         | 1        | 100 | -   | 100   | -             |
| 241UC010    | Indian Cultural Heritage & Fine Arts | FC    |   |   | 1         | 1        | 100 | -   | 100   | -             |
| 241IT001    | IT & AI Skills                       | FC    |   |   | 2         | 2        | 50  | 50  | 100   | -             |
| 241CS004    | Internet of Things                   | FC    |   |   | 1         | 1        | 100 | -   | 100   | -             |
| 241CS002    | Data Analysis using Python           | IC    |   |   | 2         | 2        | 50  | 50  | 100   | -             |
| 241UC011    | Employability Skills - I             | FC    |   |   | 3         | 0        | 100 | -   | 100   | -             |
| 241UC013    | Employability Skills - II            | FC    |   |   | 3         | 0        | 100 | -   | 100   | ES-I          |
| 241UC014    | Employability Skills - III           | IC    |   |   | 3         | 0        | 100 | -   | 100   | ES-II         |
| 241UC015    | Employability Skills – IV            | IC    |   |   | 3         | 0        | 100 | -   | 100   | ES-III        |
| 241UC016    | Employability Skills - V             | AC    |   |   | 3         | 1        | 100 | -   | 100   | ES-IV         |
|             | <b>Total</b>                         |       |   |   | <b>22</b> | <b>8</b> |     |     |       |               |

**Sports & Yoga**  
(CE, EEE, ME, ECE, CSE, IT, AIML, CSE (DS), PT, Min. E)

|                              |          |          |          |          |
|------------------------------|----------|----------|----------|----------|
| <b>Course Code: 241PE001</b> | <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 Objectives:**

The main objective of introducing this course is to make the students understand the importance of sound health and fitness principles as they relate to better health.

**Course Outcomes:**

**After completion of the course the student will be able to:**

**CO1:** Identify their physical and mental health, including their concentration, motivation, and productivity

**CO2:** Demonstrate the need for health-related fitness requirements.

**CO3:** Develop an appreciation of physical activity as a lifetime pursuit and a means to better health.

**CO4:** Apply current personal fitness levels in their day-to-day lifestyle.

**CO5:** Recall specific facts about safety measurements, and efficiently use the techniques to minimize the risk of injury

**Mapping of Course Outcomes with Program Outcomes**

| CO/PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| <b>CO1</b> | -   | -   | -   | -   | -   | -   | -   | -   | -   | -    | 1    |
| <b>CO2</b> | -   | -   | -   | -   | -   | -   | -   | -   | -   | -    | 1    |
| <b>CO3</b> | -   | -   | -   | -   | -   | -   | -   | -   | -   | -    | 1    |
| <b>CO4</b> | -   | -   | -   | -   | -   | -   | -   | -   | -   | -    | 1    |
| <b>CO5</b> | -   | -   | -   | -   | -   | -   | -   | -   | -   | -    | 1    |

**Practice:**

**1. a) B.M.I (Measurement and BMI Chart Preparation)**

- Height
- Weight
- Age

**Activities:**

- Students are informed to find out BMI for any 5 members of different age groups.

**b) AAHPER Fitness Test (American Alliance for Health, Physical Education and Recreation)**

| <b>Category 1</b>   | <b>Category 2</b> |
|---------------------|-------------------|
| 50mts               | Pull Ups          |
| Standing Broad Jump | Sit-ups           |
| Shuttle Run         | 600 Mts           |

**Activities:**

- Students are informed to find out BMI for any 5 members of different age groups.
- Students are instructed to perform all activities under Category-I (or) II

**2. Surya Namaskar**

- **Pranamasana (Prayer Pose)**
- **Hasta Uttanasana (Raised Arms Pose)**
- **Hasta Padasana (Hand to Foot Pose)**
- **Ashwa Sanchalanasana (Equestrian Pose)**
- **Dandasana (Stick Pose)**
- **Ashtanga Namaskara (Salute with Eight Parts or Points)**
- **Bhujangasana (Cobra Pose)**
- **Parvatasana (Mountain Pose)**
- **Ashwa Sanchalanasana (Equestrian Pose)**
- **Hasta Padasana (Hand to Foot Pose)**
- **Hasta Uttanasana (Raised Arms Pose)**
- **Pranamasana (Prayer Pose)**

**Activities:**

- Students are given practice on all Surya Namaskar Asanas.
- Students must participate and perform any 2 or 3 Surya Namaskar Asanas

**3. Asanas**

- Standing Asanas
- Sitting Asanas
- Supine Postures
- Prone Asanas

**Activities:**

- Students are given practice on all above Asanas.
- Students must participate and perform any 2 Asanas.

**4. CPR (Cardiopulmonary resuscitation)****Activities:**

- Practical demo session on CPR by a healthcare professional.
- Quiz is conducted on the above topic.

**5. Games Activities**

- Kabaddi
- Volleyball
- Basketball
- Tennikoit
- Badminton
- Hand ball
- Kho Kho

**Activities:**

- Practice is given in all the above major games.
- Students must participate and perform in any one major game.

#### **6. JCR Test (Jumping, Chinning, Running)**

- 100mts-(Shuttle Run)
- Vertical Jump
- Chin up

##### **Activities:**

- Practice is given in all the above.
- Students must participate and perform in anyone activity.

#### **7. Kriyas**

- Dhouti,
- Bastirika
- Neti,
- Navali
- Kapalabati
- Trataka
- Nauli

##### **Activities:**

- Practice is given in all the above Kriyas.
- Students must participate and perform in any two Kriya's.

#### **8. Sports Activities: (Athletics Throws & Jumps)**

- Shotput
- Discuss
- Long jump

##### **Activities:**

- Practice is given in all the above Sports activities.
- Students must participate and perform in any one activity.

#### **9. Pranayama**

- **Nadi Shodhana (Alternate Nostril Breathing)**
- **Ujjayi Pranayama (Victorious Breath)**
- **Kapalabhati (Skull Shining Breath)**
- **Bhastrika Pranayama (Bellows Breath)**
- **Sheetali Pranayama (Cooling Breath)**
- **Sheetkari Pranayama (Hissing Breath)**
- **Bhramari Pranayama (Bee Breath)**
- **Sitali Pranayama (Cooling Breath)**

**Activities:**

- Practice is given in all the above Pranayama's.
- Students must practice and perform any 2 Pranayama's.

**10. Sports Activities :( Athletics-Runs)**

- 100Mts
- 400Mts
- 5000Mts

**Activities:**

- Practice is given in all the above activities.
- Students must practice and perform any 1 activity.

**Reference Books:**

1. Health & Wellness, Yoga Education, Sports and Fitness-S.Chand Publication-2024. ISBN: 9789358704372
2. Health and Wellness, Gordon Edlin, Eric Golanty. 14th Edn. Jones & Bartlett Learning 2022 ISBN: 978-1284235197
3. First Aid- Dr.Rajeev Sharma. ISBN: 9788171826933
4. Health and Fitness-Bharani Publications. ISBN: 978-0880115995
5. The Sports Rules Gordon Edlin, Eric Golanty. / Human Kinetics with Thomas Hanlon. -- 3rd ed. HumanKinetics, Inc.
6. A Text book Yoga-Dr.Guneet Monga Bhargava Richa Talreja

**General Guidelines:**

- Participation in all activities is mandatory.
- Students should carry proper sports dress to carry out Yoga Practice and regular Sports activities.

**Evaluation Guidelines:**

- The Continuous Internal Evaluation for this course is 100 marks.
- Each activity shall be evaluated by the concerned teacher for 10 marks as day-to-day performance. For 10 activities the students will be evaluated for 100 marks.

**INDIAN CULTURAL HERITAGE AND FINE ARTS**  
**(Common to all branches Except Ag. E)**

|                              |          |          |          |          |
|------------------------------|----------|----------|----------|----------|
| <b>I Semester</b>            | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Course Code: 241UC010</b> | <b>0</b> | <b>0</b> | <b>1</b> | <b>1</b> |

Course Outcomes: At the end of the course, students will be able to:

CO1: Apply Communication Skills by participating in various language learning activities on Indian Cultural Heritage.

CO2: Develop cultural understanding and prepare for intercultural citizenship by different activities like role play, drawing, painting etc.

CO3: Describe the different horizons in the field of art and design, skilful use of elements and principles of graphic design.

CO4: Demonstrate their talent using instruments, dance, singing, seminar etc., related to Indian culture

CO5: Recall facts and basic concepts of Indian culture through article writing.

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

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| CO1   | -   | -   | -   | -   | -   | -   | 1   | 1   | 2   | -    | -    |
| CO2   | -   | -   | -   | -   | -   | -   | 1   | 1   | 2   | -    | -    |
| CO3   | -   | -   | -   | -   | -   | -   | 1   | 1   | 1   | -    | -    |
| CO4   | -   | -   | -   | -   | -   | -   | 1   | 1   | 1   | -    | 1    |
| CO5   | -   | -   | -   | -   | -   | -   | 1   | 1   | 1   | -    | 1    |

**Practice:**

**1. JAM(Just a Minute) Sessions on Indian Cultural Heritage (Speaking):**

Explain the importance of JAM sessions and their format.

**Activities:**

**Just a Minute:** Each student gets 1 minute to speak on a randomly assigned topic related to Indian cultural heritage.

**Topics: Ancient Indian civilization, Indus Valley, Mauryan empires, Gupta empires**

**2. Role-plays on Indian Itihasas and Puranas:**

Overview of Indian Itihasas (Ramayana, Mahabharata) and Puranas

**Activities:**

**Preparation:** Assign roles and prepare short scripts.

**Role-plays:** Students perform their role-plays

**Topics: Ramayana, Mahabharata, Vishnu Purana, Shiva Purana, Skanda Purana**

**3. Painting: Competition on ancient Indian Architectures and civilizations:**

Brief on ancient Indian architectures and civilizations

**Activities:**

**Painting Activity:** Students create paintings based on the theme.

**Topics: Temple Architecture (Nagara, Dravidian, Vesara), Mughal Architecture (TajMahal, Fathepur Sikhri, Humayun's Tomb)**

**Exhibition:** Display paintings related to ancient Indian architectures and civilizations.

**4. Talent shows in singing patriotic songs**

Explain the format and purpose of the talent show on patriotic songs.

**Activities:**

**Talent Performances:** Students present their talent (Singing).

**Topics: Patriotic songs**

**5. Story Narration about Ancient Historical Issues.**

Importance of storytelling in preserving history

**Activities:**

**Story Narration:** Students narrate stories on assigned ancient historical issues.

**Topics: Hinduism (Festivals and Temples), Buddhism Spread and Impact in Asia, Jainism (Philosophy of Non-violence, Sikhism (Teaching of the Gurus)**

**6. Poster Presentations on Epics, Puranas and Architecture of the Indian Temple.**

Guidelines for creating effective posters on Epics, Puranas and Architecture of the Indian Temple

**Activities:**

**Preparation:** Students create posters on assigned topics.

**Presentations:** Students present their posters.

**Topics: Temple Architecture and Sculpture (Iconography, Dravidian, Nagara, Vesara)**

**7. Seminars on the importance and significance of our Indian Culture. (Speaking)**

Importance of seminars and public speaking tips on our Indian Culture

**Activities:**

**Seminars:** Students deliver seminars on assigned topics.

**Topics: Indian Classical Dance, Indian Music traditions, Indian festivals and Fine arts, Indian Handicrafts**

**8. A. Craft works-** Displaying different models of architectures, Overview of different Indian architectural styles

**B. Musical instruments:** Performance of the talent in playing different musical instruments, Introduction to various Indian musical instruments

**C. Dancing:** Performance on various dance forms of Indian culture, Brief on various Indian dance forms of Indian culture

**Activities:**

**Craft Activity:** Students create and display models of architectures.

**Exhibition:** Display and discuss the craft works.

**Performances:** Students performs using different instruments.

**Appreciation & Discussion:** Acknowledge performances and discuss instruments.

**Performances:** Students perform different dance forms.

**Topics: Indian Handicrafts, Musical Instruments** (Veena, Sitar, Tabla, Mridangam),  
**Indian Classical Dance** (Bharathanatyam, Kuchipudi, Kathakhali, Khathak, Odissi)

(Note: Students can choose either Craft works, Musical instruments or dancing activities)

**9. Drawing:** Theme based art on Indian Religious Traditions.

Overview of drawing techniques and themes on Indian Religious Traditions

**Activities:**

**Drawing Activity:** Students create drawings based on historical themes.

**Topics: Rituals, Festivals and Temples (Hinduism, Buddhism, Jainism, Sikhism etc.)**

**Exhibition:** Display drawings and provide feedback.

**10. Article Writing:** On Indian Ancient Period/Heritage and Culture. (Writing)

Guidelines for writing informative articles on Indian Ancient Period / Heritage and Culture

**Activities:**

**Topics: Indian Culture, Indian art architecture and monuments, Indian Civilization, Indian Philosophy, Indian religious Traditions**

**Writing Activity:** Students write articles on assigned topics.

**Reference Books:**

1. History of India and Culture (Upto 1964)-Telugu Academy, ISBN-13: 978-8181804341/ISBN-10: 8181804341
2. R.S. Sharma., Ancient India, New Delhi, 1996, ISBN-13: 978-0-19-568785-9/ISBN-10: 0-19-568785-X
3. D.D. Kosambi, the Culture and Civilization of Ancient India in Historical Outline, Vikas Publishing, 1965, ISBN-1000653471, ISBN-9781000653472
4. V. Rama Krishna, Social Reform Moment Andhra, Vikas Publications, ISBN-0706923499, ISBN-9780706923490
5. Romila Thaper., History of India, Penguin, 1965, ISBN: 978-0-14-194976-5

**Evaluation Guidelines:**

- Each activity carries 10 marks for day-to-day assessment.
- The Continuous evaluation will be awarded based on day-to-day performances.

**IT & AI Skills**  
(Common to CE,EEE,ME,ECE,CSE,IT,AI ML,CSE(DS),PT&Min.E)

Course Code: 241IT001

|          |          |          |          |
|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

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

**Internet of Things**  
(Common to EEE,ME,ECE,CSE,IT,AIIML,CSE(DS),PT&Min.)

**Course Code: 241CS004**

**L     T     P     C**  
**0     0     1     1**

**Course Outcomes:**

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

- CO1:** Choose the sensors and actuators for an IoT application.
- CO2:** Select protocols for a specific IoT application.
- CO3:** Utilize the cloud platform and APIs for IoT application.
- CO4:** Experiment with embedded boards for creating IoT prototypes.
- CO5:** Design 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 |
|------------|------|------|------|------|------|------|------|------|------|-------|-------|
| <b>CO1</b> | 2    | 1    |      |      | 1    |      |      |      |      |       |       |
| <b>CO2</b> | 1    | 2    | 1    |      |      |      |      |      |      |       |       |
| <b>CO3</b> | 1    | 1    | 2    | 1    |      |      |      |      |      |       |       |
| <b>CO4</b> | 1    | 2    |      |      | 1    |      |      |      |      |       | 1     |
| <b>CO5</b> | 1    | 2    | 2    | 1    | 2    |      |      | 1    | 1    |       | 1     |

**Practice:**

1. Study of active and passive sensors: Light, Temperature and Humidity, Force, Pressure, Speed, Sound etc
2. Study of Arduino, Raspberry Pi, Beagle Bone
3. Select any one development board (Ex. Arduino or Raspberry Pi) to control LED and Motor
4. Demonstrate the working of temperature and humidity sensor, level sensor, moisture sensor, distance sensor
5. Using the same board as in (3), read data from a sensor. Experiment with both analog and digital sensors.
6. Write a program to Control any two actuators connected to the development board using Bluetooth.
7. Implement Socket communication to Read data from sensor and send it to a requesting client.
8. Create any cloud platform account, explore IoT services and register a thing on the platform.
9. Write a program to push sensor data to cloud
10. Write a program to Control an actuator through cloud
11. Access the data pushed from sensor to cloud and applies any data analytics or visualization services
12. Identify a problem in your local area or college which can be solved by integrating the things you learned so far and create a prototype to solve it (Mini Project).

### Additional Practice:

1. **Lighting as a service:** Smart Lightening for smart homes and smart cities helps in saving energy by adapting the lighting to ambient conditions and switching on/off or dimming the lights when needed.  
Simulate the energy savings environment with LED lights or IP enabled lights or anyother variants by monitoring human movements and their environments and controlling the lights accordingly
2. **Intelligent Traffic systems:** Smart cities have vital aspects in relation with sub domains like smart parking, surveillance, emergency response and many more. Among all, smart traffic systems or intelligent traffic systems are one such criticalinfrastructure needed.  
Design an automated environment that controls vehicle traffic on busy roads. Alsoinclude the emergency control and response mechanisms (like ambulance) at signalposts
3. **Smart Parking:** Finding a parking space during rush hours in crowded cities can be time consuming and frustrating.  
Design a prototype smart parking system based on sensor technology with anyone ofthe following features: Space allocation or remote parking monitoring or automatedguidance
4. **Air Pollution Monitoring:** IoT based air pollution monitoring systems can monitor emission of harmful gases like CO<sub>2</sub>, CO, NO etc by factories and automobiles.  
Simulate an environment with help of any gaseous or meteorological sensors thatchecks level of gases in the air and specify whether it is dangerous or not

### 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, 2013, 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 Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley, ISBN 978-1118430620
- 5 Internet of Things, Vengalapudi Appalakonda, prof.Sangareddy B.Krutakoti from Scientific International Publishing House ,First Edition 2024, ISBN 978-8173719547

### Web Links:

- 1 <https://iotify.io/iot-virtual-lab/>
- 2 [https://onlinecourses.nptel.ac.in/noc18\\_cs46/preview](https://onlinecourses.nptel.ac.in/noc18_cs46/preview)
- 3 <https://www.electronicsforu.com/electronics-projects/internet-of-things-iot>
- 4 <https://www.coursera.org/specializations/iot>
- 5 <http://ledworldmag.com/issue/iot-lighting-ecosystem-making/>
- 6 <https://www.edureka.co/iot-certification-training>

**Data Analysis using Python**  
(Common to CE,EEE,ME,ECE,CSE,IT,AIML,CSE(DS),PT&Min.E)

**Course Code: 241CS002**

**L    T    P    C**  
**0    0    2    2**

**Course Outcomes: At the end of the Course, Student will be able to:**

- CO1:** Make use of control statements and data structures to solve problems
- CO2:** Apply OOPs concepts and files to develop applications.
- CO3:** Explain the data collection, management and storage for processing using Numpy
- CO4:** Make use of Pandas to create and manipulate data structures like Series and DataFrames.
- CO5:** Create plots using Matplotlib library for better visualization.

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

**Unit-1**

**Introduction:** History of Python, Applications of Python, Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation, Operators and Expressions, Control Flow- if, if-elif-else, for, while, break, continue, Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions, Defining Functions, Calling Functions, Passing Arguments.

- 1.1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
- 1.2) Write a program that uses a for loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
- 1.3) Split a string into array of characters in Python.
- 1.4) Write a Python program to get the largest number from a list.
- 1.5) Write a Python program to calculate the nth Fibonacci number using a function.

**Unit-2**

**Object Oriented Programming:** Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using OOPS support Design with Classes: Objects and Classes, Data modeling Examples, Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, Userdefined Exceptions.

- 2.1) Write a Python program that defines a Car class with attributes like make, model, and year, and methods like start() to start the car and stop() to stop it.
- 2.2) Write a Python program that demonstrates inheritance by creating a base class Animal and derived classes like Dog, Cat, etc., each with their specific behaviors.

- 2.3) Define a base class called Animal with a method make\_sound(). Implement derived classes like Dog, Cat, and Bird that override the make\_sound() method to produce different sounds. Demonstrate polymorphism by calling the method on objects of different classes.
- 2.4) Write a Python program that demonstrates error handling using the try-except block to handle division by zero

### Unit-3

**Numpy:** Introduction to numpy, creating arrays, using arrays and scalars, Indexing Arrays, Array transposition, Universal array function, Array Processing, Array Input and Output, Examples.

- 3.1) Write a NumPy program using methods – info, add, array, all, greater, greater\_equal, less and less\_equal, allclose, zeros, ones, linspace, tolist.
- To get help on the add function
  - To test whether none of the elements of a given array is zero.
  - To create an element-wise comparison (greater, greater\_equal, less and less\_equal, equal, equal within a tolerance) of two given arrays.
- 3.2) Write a NumPy program using NumPy methods - max, min, argmax, argmin, argmax, repr, count, bincount, unique.
- To extract all numbers from a given array which are less and greater than a specified number.
  - To find the indices of the maximum and minimum numbers along the given axis of an array.

### Unit-4

**Pandas:** Exploring Data using Series, Exploring Data using DataFrames, Index objects, Re index, Drop Entry, Selecting Entries, Data Alignment, Rank and Sort, Summary Statistics, Data Munging in Python using Pandas, Index Hierarchy, Example Problem.

- 4.1) Pandas DataSeries:
- Write a Pandas program to create and display a one-dimensional array-like object containing an array of data using Pandas module.
  - Write a Pandas program to convert a Panda module Series to Python list and its type.
- 4.2) Pandas DataFrames:
- Consider Sample Python dictionary data and list labels:
- ```
exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],
'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],
'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],
'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']
```
- Write a Pandas program to create and display a DataFrame from a specified dictionary data which has the index labels.
  - Write a Pandas program to change the name 'James' to 'Suresh' in name column of the DataFrame.
  - Write a Pandas program to insert a new column in existing DataFrame.
  - Write a Pandas program to get list from DataFrame column headers.
  - Write a Pandas program to get list from DataFrame column headers.

## Unit-5

**Introduction to Matplotlib:** Introduction to Matplotlib Library, Plotting Data: Line Plots, Scatter Plots, Customizing Plots, Common Types of Plots Bar Charts: Simple Bar Plot, Horizontal Bar Plot, Advanced Plot Customizations.

- 5.1) Create a series of plots to analyze a given dataset.
- 5.2) Generate a subplot layout with various plot types (scatter, line, bar).
- 5.3) Visualize time-series data and customize axis labels and date formats.
- 5.4) Create a 3D plot.

### Additional Practice:

1. Write a program to find the greatest number that can be formed by using given set of numbers.
2. Write a Python program to create a simple calculator GUI application using functions for arithmetic operations.
3. Write a Python program to build a todo list GUI application with functions for adding, deleting, and updating tasks.

### Reference Books:

1. Python for Everybody Exploring Data in Python 3, Charles Russell Severance, SueBlumenberg. ISBN:978-1530051120
2. Code with Python: Suresh Sundaradasu,S.Rama Sree ISBN: 978-9355017574
3. Python Programming, Dr.Maganti Venkatesh,Monelli Ayyavaraiah,Niveditha Ravindra Pandey, NeethumolSabu,Charulatha Publications ISBN:978-93-5577-695-6
4. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, Wes McKinney, O'Reilly Media, ISBN: 978-1491957660.

### Web Links:

1. <https://www.hackerrank.com/>
2. <https://www.codechef.com/>
3. <https://www.topcoder.com/>
4. <https://code-cracker.github.io/>

**Employability Skills- I**  
**(Common to CE,EEE,ME,ECE,CSE,IT,AI ML,CSE(DS),PT&Min.E)**

**Course Code: 241UC011**

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| <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,AIIML,CSE(DS),PT&Min.E)

**Course Code: 241UC013**

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**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.
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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- III**  
(Common to CE,EEE,ME,ECE,CSE,IT,AIIML,CSE(DS),PT&Min.E)

**Course Code: 241UC014**

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**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.

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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:**

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

**Employability Skills- IV**  
(Common to CE,EEE,ME,ECE,CSE,IT,AI ML,CSE(DS),PT&Min.E)

**Course Code: 241UC015**

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

**Course Code: 241UC016**

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| <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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