

# **B.E. (Computer Science and Engineering)**

## **2026 Regulations, Curriculum & Syllabi**



### **BANNARI AMMAN INSTITUTE OF TECHNOLOGY**

An Autonomous Institution Affiliated to Anna University – Chennai • Approved by AICTE • Accredited by NAAC with "A+" Grade

**SATHYAMANGALAM - 638401    ERODE DISTRICT    TAMILNADU    INDIA**

Ph : 04295-226000/221289 Fax : 04295-226666 E-mail : [stayahead@bitsathy.ac.in](mailto:stayahead@bitsathy.ac.in) Web : [www.bitsathy.ac.in](http://www.bitsathy.ac.in)

## **CONTENTS**

|                         | <b>Page No.</b> |
|-------------------------|-----------------|
| Vision and Mission      | 3               |
| PEOs                    | 3               |
| POs                     | 4               |
| Mapping of PEOs and POs | 6               |
| Connectivity Chart      | 7               |
| Curriculum 2026         | 8               |
| Syllabi                 | 14              |
| Electives               |                 |

## **VISION OF THE DEPARTMENT**

To excel in the field of Computer Science and Engineering, to meet the emerging needs of the industry, society, and beyond.

## **MISSION OF THE DEPARTMENT**

- To impart need based education to meet the requirements of the industry and society.
- To equip students with emerging technologies, global professional standards, and ethical values to promote sustainable societal development.
- To build technologically competent graduates for industry and entrepreneurial ventures by providing state-of-the art infrastructure and skilled human resources

## **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

- I. Graduates will apply core computer science and engineering principles to design and implement effective solutions for real-world industry and societal problems through strong technical competence and problem-solving skills.
- II. Graduates will acquire domain knowledge and research orientation to pursue higher education, adapt to emerging technologies, and develop innovative solutions that address socially relevant and sustainable challenges.
- III. Graduates will demonstrate effective communication, ethical conduct, leadership, teamwork, and social responsibility, and engage in lifelong learning to succeed in professional, entrepreneurial, and multidisciplinary environments.

## **PROGRAMME OUTCOMES (POs)**

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective

reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs)**

1. Apply algorithmic thinking and effective data management techniques to design, develop and evaluate computing solutions for real-world and research-oriented problems.
2. Design and develop cost-effective computing solutions using advanced hardware and software tools and technologies to address global technological requirements.

**MAPPING OF PEOs AND POs**

| PEO(s) | Programme Outcome(s) |   |   |   |   |   |   |   |   |    |    |
|--------|----------------------|---|---|---|---|---|---|---|---|----|----|
|        | 1                    | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| I      | X                    | X | X | X | X | X |   |   |   |    |    |
| II     | X                    | X | X | X | X | X |   |   |   |    | X  |
| III    |                      |   |   |   |   | X | X | X | X | X  | X  |

| <p style="text-align: center;"><b>DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING</b><br/> <b>Minimum Credits to be Earned : 162</b></p> |                                                              |          |          |          |           |                        |                      |           |              |                 |
|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------|----------|----------|-----------|------------------------|----------------------|-----------|--------------|-----------------|
| <b>I SEMESTER</b>                                                                                                                       |                                                              |          |          |          |           |                        |                      |           |              |                 |
| <b>Code No.</b>                                                                                                                         | <b>Course</b>                                                | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b>  | <b>Hours/<br/>Week</b> | <b>Maximum Marks</b> |           |              | <b>Category</b> |
|                                                                                                                                         |                                                              |          |          |          |           |                        | <b>CA</b>            | <b>ES</b> | <b>Total</b> |                 |
| 26MA101                                                                                                                                 | Linear Algebra and Calculus                                  | 3        | 1        | 0        | 4         | 4                      | 40                   | 60        | 100          | BS              |
| 26PH102                                                                                                                                 | Engineering Physics                                          | 3        | 0        | 0        | 3         | 3                      | 40                   | 60        | 100          | BS              |
| 26CH103                                                                                                                                 | Engineering Chemistry                                        | 2        | 0        | 0        | 2         | 2                      | 40                   | 60        | 100          | BS              |
| 26GE004                                                                                                                                 | Digital Computer Electronics                                 | 3        | 1        | 0        | 4         | 4                      | 40                   | 60        | 100          | ES              |
| 26GE005                                                                                                                                 | Problem Solving using C                                      | 3        | 0        | 0        | 3         | 3                      | 40                   | 60        | 100          | ES              |
| 26HS001                                                                                                                                 | Communicative English                                        | 1        | 0        | 2        | 2         | 3                      | 50                   | 50        | 100          | HSS             |
| 26HS002                                                                                                                                 | தமிழர் மரபு / Heritage of Tamils                             | 1        | 0        | 0        | 1         | 1                      | 40                   | 60        | 100          | HSS             |
| 26PS108                                                                                                                                 | Physical Science Laboratory                                  | 0        | 0        | 4        | 2         | 4                      | 60                   | 40        | 100          | BS              |
| 26GE006                                                                                                                                 | C Programming Laboratory                                     | 0        | 0        | 2        | 1         | 2                      | 60                   | 40        | 100          | ES              |
| 26HS003                                                                                                                                 | Induction Programme                                          | -        | -        | -        | NC        | -                      | -                    | -         | -            | EEC             |
| <b>Total</b>                                                                                                                            |                                                              |          |          |          | <b>22</b> | <b>26</b>              | -                    | -         | -            | -               |
| <b>II SEMESTER</b>                                                                                                                      |                                                              |          |          |          |           |                        |                      |           |              |                 |
| <b>Code No.</b>                                                                                                                         | <b>Course</b>                                                | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b>  | <b>Hours/<br/>Week</b> | <b>Maximum Marks</b> |           |              | <b>Category</b> |
|                                                                                                                                         |                                                              |          |          |          |           |                        | <b>CA</b>            | <b>ES</b> | <b>Total</b> |                 |
| 26MA201                                                                                                                                 | Differential Equations, Vector Calculus and Complex Analysis | 3        | 1        | 0        | 4         | 4                      | 40                   | 60        | 100          | BS              |
| 26PH202                                                                                                                                 | Materials Science                                            | 3        | 0        | 0        | 3         | 3                      | 40                   | 60        | 100          | ES              |
| 26CS203                                                                                                                                 | Web Principles                                               | 3        | 0        | 0        | 3         | 3                      | 40                   | 60        | 100          | ES              |
| 26CS204                                                                                                                                 | Computer Organization and Architecture                       | 3        | 1        | 0        | 4         | 4                      | 40                   | 60        | 100          | PC              |
| 26GE007                                                                                                                                 | Python Programming                                           | 3        | 0        | 0        | 3         | 3                      | 40                   | 60        | 100          | ES              |
| 26HS004                                                                                                                                 | Professional Communication                                   | 1        | 0        | 2        | 2         | 3                      | 50                   | 50        | 100          | HSS             |
| 26HS005                                                                                                                                 | தமிழரும் தொழில்நுட்பமும் / Tamils and Technology             | 1        | 0        | 0        | 1         | 1                      | 40                   | 60        | 100          | HSS             |
| 26GE008                                                                                                                                 | Python Programming Laboratory                                | 0        | 0        | 2        | 1         | 2                      | 60                   | 40        | 100          | ES              |
| 26GE009                                                                                                                                 | Web Principles Laboratory                                    | 0        | 0        | 2        | 1         | 2                      | 60                   | 40        | 100          | ES              |
| 26HS006                                                                                                                                 | Co-curricular / Extracurricular Activities                   | -        | -        | -        | NC        | -                      | -                    | -         | -            | ECC             |
| <b>Total</b>                                                                                                                            |                                                              |          |          |          | <b>22</b> | <b>25</b>              | -                    | -         | -            | -               |

| III SEMESTER |                                                            |   |   |   |    |                |               |    |       |          |
|--------------|------------------------------------------------------------|---|---|---|----|----------------|---------------|----|-------|----------|
| Code No.     | Course                                                     | L | T | P | C  | Hours/<br>Week | Maximum Marks |    |       | Category |
|              |                                                            |   |   |   |    |                | CA            | ES | Total |          |
| 26CS301      | Discrete Mathematics                                       | 3 | 1 | 0 | 4  | 4              | 40            | 60 | 100   | BS       |
| 26CS302      | Data Structures                                            | 3 | 0 | 0 | 3  | 3              | 40            | 60 | 100   | PC       |
| 26CS303      | Operating Systems                                          | 3 | 0 | 0 | 3  | 3              | 40            | 60 | 100   | PC       |
| 26CS304      | Object Oriented Programming with Java                      | 3 | 0 | 0 | 3  | 3              | 40            | 60 | 100   | PC       |
| 26CS305      | Software Design and Development                            | 3 | 0 | 0 | 3  | 3              | 40            | 60 | 100   | PC       |
| 26CS306      | Database Management Systems                                | 3 | 0 | 0 | 3  | 3              | 40            | 60 | 100   | PC       |
| 26CS307      | Standards in Computer Science                              | 1 | 0 | 0 | 1  | 1              | 40            | 60 | 100   | HSS      |
| 26CS308      | Data Structures and Object Oriented Programming Laboratory | 0 | 0 | 4 | 2  | 4              | 60            | 40 | 100   | PC       |
| 26CS309      | Database Management Systems Laboratory                     | 0 | 0 | 2 | 1  | 2              | 60            | 40 | 100   | PC       |
| 26CS310      | Design Thinking and Innovation Laboratory                  | 0 | 0 | 2 | 1  | 2              | 60            | 40 | 100   | EEC      |
| <b>Total</b> |                                                            |   |   |   | 24 | 28             | -             | -  | -     | -        |
| IV SEMESTER  |                                                            |   |   |   |    |                |               |    |       |          |
| Code No.     | Course                                                     | L | T | P | C  | Hours/<br>Week | Maximum Marks |    |       | Category |
|              |                                                            |   |   |   |    |                | CA            | ES | Total |          |
| 26CS401      | Probability and Statistics                                 | 3 | 1 | 0 | 4  | 4              | 40            | 60 | 100   | BS       |
| 26CS402      | Design and Analysis of Algorithm                           | 3 | 0 | 0 | 3  | 3              | 40            | 60 | 100   | PC       |
| 26CS403      | Theory of Computation                                      | 3 | 1 | 0 | 4  | 4              | 40            | 60 | 100   | PC       |
| 26CS404      | Artificial Intelligence and Machine Learning               | 3 | 0 | 0 | 3  | 3              | 40            | 60 | 100   | PC       |
| 26CS405      | Full Stack Development                                     | 3 | 0 | 0 | 3  | 3              | 40            | 60 | 100   | PC       |
| 26CS406      | Microprocessor and Interfacing                             | 3 | 0 | 0 | 3  | 3              | 40            | 60 | 100   | ES       |
| 26HS007      | Environmental Sciences and Sustainability                  | 2 | 0 | 0 | 2  | 2              | 40            | 60 | 100   | HSS      |
| 26CS408      | Artificial Intelligence and Machine Learning Laboratory    | 0 | 0 | 2 | 1  | 2              | 60            | 40 | 100   | PC       |
| 26CS409      | Full Stack Development Laboratory                          | 0 | 0 | 2 | 1  | 2              | 60            | 40 | 100   | PC       |
| 26CS410      | Community Engagement Project                               | 0 | 0 | 2 | 1  | 2              | 60            | 40 | 100   | EEC      |
| <b>Total</b> |                                                            |   |   |   | 25 | 28             | -             | -  | -     | -        |

| V SEMESTER         |                                 |   |   |   |           |                |               |    |       |          |
|--------------------|---------------------------------|---|---|---|-----------|----------------|---------------|----|-------|----------|
| Code No.           | Course                          | L | T | P | C         | Hours/<br>Week | Maximum Marks |    |       | Category |
|                    |                                 |   |   |   |           |                | CA            | ES | Total |          |
| 26CS501            | Network Engineering             | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | PC       |
| 26CS502            | Embedded Programming            | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | ES       |
| 26CS503            | Distributed Systems             | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | PC       |
| 26CS504            | Compiler Design                 | 3 | 1 | 0 | 4         | 4              | 40            | 60 | 100   | PC       |
|                    | Professional Elective I         | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | PE       |
|                    | Open Elective I                 | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | OE       |
| 26CS507            | Network Engineering Laboratory  | 0 | 0 | 2 | 1         | 2              | 60            | 40 | 100   | PC       |
| 26CS508            | Embedded Programming Laboratory | 0 | 0 | 2 | 1         | 2              | 60            | 40 | 100   | ES       |
| <b>Total</b>       |                                 |   |   |   | <b>21</b> | <b>23</b>      | -             | -  | -     | -        |
| FOR HONOURS DEGREE |                                 |   |   |   |           |                |               |    |       |          |
|                    | Honours Elective I              | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | -        |
|                    | Honours Elective II             | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | -        |
| FOR MINOR DEGREE   |                                 |   |   |   |           |                |               |    |       |          |
|                    | Minor Elective I                | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | -        |
|                    | Minor Elective II               | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | -        |

| VI SEMESTER               |                                                                                                 |   |   |   |           |                |               |    |       |          |
|---------------------------|-------------------------------------------------------------------------------------------------|---|---|---|-----------|----------------|---------------|----|-------|----------|
| Code No.                  | Course                                                                                          | L | T | P | C         | Hours/<br>Week | Maximum Marks |    |       | Category |
|                           |                                                                                                 |   |   |   |           |                | CA            | ES | Total |          |
| 26CS601                   | Cloud Computing                                                                                 | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | PC       |
| 26CS602                   | Cryptography and Cyber Security                                                                 | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | PC       |
| 22CS603                   | Deep Learning Techniques                                                                        | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | PC       |
|                           | Professional Elective II                                                                        | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | PE       |
|                           | Professional Elective III                                                                       | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | PE       |
|                           | Open Elective II                                                                                | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | OE       |
| 26CS607                   | Cloud Computing Laboratory                                                                      | 0 | 0 | 2 | 1         | 2              | 60            | 40 | 100   | PC       |
| 26CS608                   | Deep Learning Laboratory                                                                        | 0 | 0 | 2 | 1         | 2              | 60            | 40 | 100   | PC       |
| 26CS609                   | Innovation and Product Development<br>Project / Industry Oriented Course /<br>Summer Internship | 0 | 0 | 2 | 1         | 2              | 60            | 40 | 100   | EEC      |
| 26HS008                   | Finance for Engineers                                                                           |   |   |   | NC        |                | 100           |    |       | HSS      |
| <b>Total</b>              |                                                                                                 |   |   |   | <b>21</b> | <b>24</b>      | -             | -  | -     | -        |
| <b>FOR HONOURS DEGREE</b> |                                                                                                 |   |   |   |           |                |               |    |       |          |
|                           | Honours Elective III                                                                            | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | -        |
|                           | Honours Elective IV                                                                             | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | -        |
| <b>FOR MINOR DEGREE</b>   |                                                                                                 |   |   |   |           |                |               |    |       |          |
|                           | Minor Elective III                                                                              | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | -        |
|                           | Minor Elective IV                                                                               | 3 | 0 | 0 | 3         | 3              | 40            | 60 | 100   | -        |

| VII SEMESTER       |                                                        |   |   |    |           |                |               |    |       |          |
|--------------------|--------------------------------------------------------|---|---|----|-----------|----------------|---------------|----|-------|----------|
| Code No.           | Course                                                 | L | T | P  | C         | Hours/<br>Week | Maximum Marks |    |       | Category |
|                    |                                                        |   |   |    |           |                | CA            | ES | Total |          |
| 22CS701            | Generative AI and Large Language Models                | 3 | 0 | 0  | 3         | 3              | 40            | 60 | 100   | PC       |
| 22CS702            | IoT and Edge Computing                                 | 3 | 0 | 0  | 3         | 3              | 40            | 60 | 100   | PC       |
|                    | Professional Elective IV                               | 3 | 0 | 0  | 3         | 3              | 40            | 60 | 100   | PE       |
|                    | Professional Elective V                                | 3 | 0 | 0  | 3         | 3              | 40            | 60 | 100   | PE       |
|                    | Professional Elective VI                               | 3 | 0 | 0  | 3         | 3              | 40            | 60 | 100   | PE       |
| 26CS706            | Generative AI and Large Language Models Laboratory     | 0 | 0 | 2  | 1         | 2              | 60            | 40 | 100   | PC       |
| 26CS707            | Project work I / Internship Project                    | 0 | 0 | 6  | 3         | 6              | 60            | 40 | 100   | EEC      |
| <b>Total</b>       |                                                        |   |   |    | <b>19</b> | <b>23</b>      | -             | -  | -     | -        |
| FOR HONOURS DEGREE |                                                        |   |   |    |           |                |               |    |       |          |
|                    | Honours Elective VI                                    | 3 | 0 | 0  | 3         | 3              | 40            | 60 | 100   | -        |
|                    | Honours Elective VII                                   | 3 | 0 | 0  | 3         | 3              | 40            | 60 | 100   | -        |
| FOR MINOR DEGREE   |                                                        |   |   |    |           |                |               |    |       |          |
|                    | Minor Elective VI                                      | 3 | 0 | 0  | 3         | 3              | 40            | 60 | 100   | -        |
|                    | Minor Elective VII                                     | 3 | 0 | 0  | 3         | 3              | 40            | 60 | 100   | -        |
|                    |                                                        |   |   |    |           |                |               |    |       |          |
| VIII SEMESTER      |                                                        |   |   |    |           |                |               |    |       |          |
| Code No.           | Course                                                 | L | T | P  | C         | Hours/<br>Week | Maximum Marks |    |       | Category |
|                    |                                                        |   |   |    |           |                | CA            | ES | Total |          |
| 26CS801            | Project Work II / Internship Project / Startup Product | 0 | 0 | 16 | 8         | 16             | 60            | 40 | 100   | EEC      |
| <b>Total</b>       |                                                        |   |   |    | <b>8</b>  | <b>16</b>      | -             | -  | -     | -        |

## SUMMARY OF CREDIT DISTRIBUTION

| S.No  | CATEGORY | CREDITS PER SEMESTER |    |     |    |    |    |     |      | TOTAL CREDIT | CREDITS in % | Range of Total Credits |     |
|-------|----------|----------------------|----|-----|----|----|----|-----|------|--------------|--------------|------------------------|-----|
|       |          | I                    | II | III | IV | V  | VI | VII | VIII |              |              | Min                    | Max |
| 1     | BS       | 1<br>1               | 4  | 4   | 4  | 0  | 0  | 0   | 0    | 23           | 14           | 15%                    | 20% |
| 2     | ES       | 8                    | 11 | 0   | 3  | 4  | 0  | 0   | 0    | 26           | 16           | 15%                    | 20% |
| 3     | HSS      | 3                    | 3  | 1   | 2  | 0  | 0  | 0   | 0    | 9            | 6            | 5%                     | 10% |
| 4     | PC       | 0                    | 4  | 18  | 15 | 8  | 11 | 7   | 0    | 63           | 39           | 30%                    | 40% |
| 5     | PE       | 0                    | 0  | 0   | 0  | 6  | 9  | 9   | 0    | 24           | 15           | 10%                    | 15% |
| 6     | EEC      | 0                    | 0  | 1   | 1  | 0  | 1  | 3   | 8    | 14           | 9            | 10%                    | 15% |
| 7     | IKS      | 0                    | 0  | 0   | 0  | 0  | 0  | 0   | 0    | 0            | -            | -                      | -   |
| Total |          | 2<br>2               | 22 | 24  | 25 | 21 | 21 | 19  | 8    | 162          |              | -                      | -   |

BS - Basic Sciences  
 ES - Engineering Sciences  
 HSS - Humanities and Social Sciences  
 PC - Professional Core  
 PE - Professional Elective  
 EEC - Employability Enhancement Course

CA - Continuous Assessment  
 ES - End Semester Examination



| <b>Module 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Integral calculus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>11 Hours</b> |
| Improper integrals of the first and second kind and their convergence – Differentiation under integrals - Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions -Properties – Evaluation of integrals by using Beta and Gamma functions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |
| <b>Multiple integral Calculus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>12 Hours</b> |
| Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of variables in double and triple integrals.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |
| <b>Term Work Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                 |
| GATE Questions, Quiz, Assignments.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |
| <b>Self-Learning Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 |
| <b>SWAYAM / NPTEL:</b><br><b>Linear Algebra</b><br><a href="https://onlinecourses.nptel.ac.in/noc25_ma114/preview">https://onlinecourses.nptel.ac.in/noc25_ma114/preview</a><br><b>Differential Calculus</b><br><a href="https://onlinecourses.nptel.ac.in/noc19_ma18/preview">https://onlinecourses.nptel.ac.in/noc19_ma18/preview</a><br><b>Multiple integral Calculus</b><br><a href="https://onlinecourses.nptel.ac.in/noc23_ma27/preview">https://onlinecourses.nptel.ac.in/noc23_ma27/preview</a>                                                                                                                                                                                                                                                      |                 |
| <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>45 Hours</b> |
| <b>Tutorial</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>15 Hours</b> |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>60 Hours</b> |
| <b>Text Books:</b><br>1. B.S Grewal, Higher Engineering Mathematics, Khanna Publisher, 45 <sup>th</sup> Edition, 2024.<br>2. J. Stewart, Essential Calculus, Cengage, 2nd edition, 2017.<br><b>References:</b><br>1. Howard Anton, Chris Rorres, Elementary Linear Algebra with Supplementary Applications, Wiley, 11th edition, 2023.<br>2. Joel Hass, Christopher Heil, Przemyslaw Bogachi, Maurice D. Weir, Thomas' Calculus, 15th edition, Pearson, 2024.<br>3. Richard E., Williamson, Introduction to Differential Equations and Dynamical Systems, McGraw Hill Companies Inc, 1997.<br>4. Michael Greenberg, Advanced Engineering Mathematics, 2/e., Pearson, 2018<br>5. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley, 10th edition, 2015. |                 |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Heat, Temperature, and Phases of Matter</b> <span style="float: right;"><b>7 Hours</b></span><br>Kinetic theory of gases: Ideal gas law and equation of state - Heat and temperature: thermal equilibrium – specific and latent heat capacity - temperature scales. Expansion of solids, liquids, and gases: Phase transitions. Modes of heat transfer: Conduction, convection and radiation.                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |
| <b>Module 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |
| <b>Forces, Energy and Gravity</b> <span style="float: right;"><b>7 Hours</b></span><br>Concept of force-mass-weight-inertia. Newton’s laws of motion: Linear and circular motion. Work-energy-power. Potential and kinetic energy- conservation of energy. Universal law of gravitation: gravitational field and potential energy. Density-mass-buoyancy-Archimedes’ principle- stability in fluids.                                                                                                                                                                                                                                                                                                                                                                                                                   |                 |
| <b>Oscillations and Wave Mechanics</b> <span style="float: right;"><b>8 Hours</b></span><br>Simple harmonic motion (SHM) – mathematical formulation-energy exchange. Damped and forced oscillations-resonance conditions. Mechanical waves: longitudinal and transverse wave-characteristics. Energy transport in waves: reflection-interference-diffraction. Sound waves: classification and application.                                                                                                                                                                                                                                                                                                                                                                                                             |                 |
| <b>Introduction to Electromagnetic Waves and Matter Interaction</b> <span style="float: right;"><b>7 Hours</b></span><br>Generation and propagation of electromagnetic waves-spectrum-dual nature of light-interaction of light with matter – absorption-transmission-reflection. Optical properties of materials: transparent-translucent-opaque. Luminescence: phosphorescence and fluorescence.                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |
| <b>Term Work Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |
| GATE Questions, Quiz, Assignments, Presentations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |
| <b>Self-Learning</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                 |
| <b>SWAYAM / NPTEL:</b><br><a href="https://nptel.ac.in/courses">https://nptel.ac.in/courses</a><br><a href="https://nptel.ac.in/courses/122103011">https://nptel.ac.in/courses/122103011</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |
| <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>45 Hours</b> |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>45 Hours</b> |
| <b>Text Books:</b> <ol style="list-style-type: none"> <li>Halliday, D. &amp; Resnick, R. Fundamentals of Physics, 12th Edition, John Wiley &amp; Sons, Inc., New Delhi (2021).</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |
| <b>References:</b> <ol style="list-style-type: none"> <li>Verma, H. C. Concepts of Physics Vol. I, Bharati Bhawan Publishers, New Delhi (2022 reprint).</li> <li>Young, H. D. &amp; Freedman, R. A. University Physics with Modern Physics, Global Edition, 15th Edition, Pearson, New Delhi (2024).</li> <li>Tipler, P. A. &amp; Mosca, G. Physics for Scientists and Engineers, 6th Edition, W. H. Freeman &amp; Company / Macmillan, New Delhi (2020).</li> <li>Serway, R. A. &amp; Jewett, J. W. Principles of Physics: A Calculus-Based Text, 5th Edition, Brooks/Cole / Cengage Learning India Pvt. Ltd., New Delhi (2012).</li> <li>Feynman, R. P., Leighton, R. B. &amp; Sands, M. The Feynman Lectures on Physics (Vol. I), New Millennium Edition, Basic Books / Perseus Group, New Delhi (2011).</li> </ol> |                 |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| conducting and biodegradable polymers – polymer composites. Nanomaterials: CNTs – graphene and quantum dots. Future directions in sustainable material design                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |
| <b>Surface Chemistry</b> <span style="float: right;"><b>5 Hours</b></span><br>Adsorption: Physisorption and chemisorption, isotherms (Freundlich, Langmuir). Catalysis: homogeneous, heterogeneous and enzyme catalysis – Industrial examples                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |
| <b>Computational Chemistry and Molecular Modelling</b> <span style="float: right;"><b>4 hours</b></span><br>Need and scope in engineering. Basic quantum methods – molecular modelling software and visualization. Applications in chemical reactions, battery materials, corrosion and reaction pathways                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                 |
| <b>Term Work Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                 |
| Quiz, Assignments, Student seminar, case studies and models (Experimental /Computational)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                 |
| <b>Self-Learning Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |
| <b>SWAYAM / NPTEL:</b><br>Electrochemical Energy Systems (Prof. S. Mitra, IIT Madras)<br>NPTEL link - <a href="https://nptel.ac.in/courses/113106028">https://nptel.ac.in/courses/113106028</a><br><br>Corrosion (Prof. Kallol Mondal, IIT Kanpur)<br>NPTEL link - <a href="https://nptel.ac.in/courses/112104088">https://nptel.ac.in/courses/112104088</a><br><br>Composite Materials( Dr. P.C. Pandey, IISc Bangalore)<br>NPTEL link - <a href="https://nptel.ac.in/courses/105108124">https://nptel.ac.in/courses/105108124</a><br><br>Foundations of Computational Materials Modelling (Narasimhan Swaminathan, Indian Institute of Technology Madras)<br>NPTEL Link – <a href="https://nptel.ac.in/courses/112106296">https://nptel.ac.in/courses/112106296</a><br><br>Heterogeneous Catalysis and Catalytic Processes<br>Indian Institute of Technology Delhi (NPTEL)<br>NPTEL Link – <a href="https://nptel.ac.in/courses/103102012">https://nptel.ac.in/courses/103102012</a>                                                                                                                                                                               |                 |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>30 Hours</b> |
| <b>Textbooks:</b> <ol style="list-style-type: none"> <li>1. Thomas Engel, Maheswaramma and Chugh, Engineering Chemistry, First Edition, Pearson, 2026.</li> <li>2. Jain, P. C. and Jain M, Engineering Chemistry, 17 th Edition, Dhanpat Rai Publishing Company (P) Ltd, 2015.</li> <li>3. Puri, Sharma, and Pathania, Principles of Physical Chemistry, Vishal Publishing Co, 48 th Edition, 2024.</li> </ol> <b>References:</b> <ol style="list-style-type: none"> <li>1. Frank Jensen, Introduction to Computational Chemistry, Wiley &amp; sons, 3rd Edition, 2017.</li> <li>2. S. Glasstone, An Introduction to Electrochemistry, 8 th Edition, East-West Press, Reprint, 2006.</li> <li>3. Young and Lovell, Introduction to Polymers, 3rd Edition, CRC Press (Taylor &amp; Francis imprint), 2011.</li> <li>4. Michael F. Ashby, Hugh Shercliff and David Cebon, Materials: Engineering, Science, Processing and Design, 4th Edition, Butterworth-Heinemann -an imprint of Elsevier, 2018.</li> <li>5. <a href="https://avogadro.cc">https://avogadro.cc</a></li> <li>6. <a href="https://orcaforum.kofo.mpg.de">https://orcaforum.kofo.mpg.de</a></li> </ol> |                 |



|                                                                                                                                                                                                                                                                          |  |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------|
| <b>Interfacing Digital and Analog Systems</b>                                                                                                                                                                                                                            |  | <b>11 Hours</b> |
| Digital to analog converters: weighted resistor/converter, binary ladder, converter, accuracy and resolution, Analog to digital converter: quantization and encoding, different types of conversion, accuracy and resolution.                                            |  |                 |
| <b>Term Work Activity</b>                                                                                                                                                                                                                                                |  |                 |
| GATE Questions, Quiz, Assignments, Presentations, Seminars                                                                                                                                                                                                               |  |                 |
| Self-Learning Activity                                                                                                                                                                                                                                                   |  |                 |
| NPTEL Course<br><a href="https://onlinecourses.nptel.ac.in/noc25_ee20/preview">https://onlinecourses.nptel.ac.in/noc25_ee20/preview</a><br><br><a href="https://onlinecourses.nptel.ac.in/noc25_ee125/preview">https://onlinecourses.nptel.ac.in/noc25_ee125/preview</a> |  |                 |
| <b>Theory</b>                                                                                                                                                                                                                                                            |  | <b>45 Hours</b> |
| <b>Tutorial</b>                                                                                                                                                                                                                                                          |  | <b>15 Hours</b> |
| <b>Total</b>                                                                                                                                                                                                                                                             |  | <b>60 Hours</b> |
| <b>Text Books:</b>                                                                                                                                                                                                                                                       |  |                 |
| 1. M. Morris Mano, Digital Design, Pearson, Paperback, 6th Edition, 2018.                                                                                                                                                                                                |  |                 |
| <b>References:</b>                                                                                                                                                                                                                                                       |  |                 |
| 1. Thomas L. Floyd, Digital Fundamentals, Pearson, Hardcover, 11th Edition, 2017.                                                                                                                                                                                        |  |                 |
| 2. R. P. Jain, Modern Digital Electronics, Tata McGraw-Hill Education, Paperback, 4th Edition, 2010                                                                                                                                                                      |  |                 |
| 3. Charles H. Roth Jr. & Larry L. Kinney, Fundamentals of Logic Design, Cengage Learning, Hardcover, 7th Edition, 2020                                                                                                                                                   |  |                 |
| 4. John F. Wakerly, Digital Design: Principles and Practices, Pearson, Hardcover, 5th Edition, 2017                                                                                                                                                                      |  |                 |
| 5. Malvino & Leach, Digital Principles and Applications, McGraw-Hill, Latest Edition, 2025.                                                                                                                                                                              |  |                 |



|                                                                                                                                                                                                                                                                                                                                                                                       |                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Control Structures, Arrays and Strings</b> <span style="float: right;"><b>8 Hours</b></span>                                                                                                                                                                                                                                                                                       |                 |
| Decision making: if, if-else, nested if, switch – Looping: while, for, do-while – Loop control statements: break, continue – Nested loops and example programs – One-dimensional and two-dimensional arrays: declaration, initialization, traversal – Concept of multi-dimensional arrays – Character arrays – Strings and string library functions – String processing applications. |                 |
| <b>Module 2</b>                                                                                                                                                                                                                                                                                                                                                                       |                 |
| <b>Functions and Modular Programming</b> <span style="float: right;"><b>8 Hours</b></span>                                                                                                                                                                                                                                                                                            |                 |
| Concept of functions and modular programming, Function definition, declaration, prototypes, Parameter passing: call by value and call by reference, Recursion, Storage classes (auto, static, extern, register)                                                                                                                                                                       |                 |
| <b>Pointers and Dynamic Memory</b> <span style="float: right;"><b>7 Hours</b></span>                                                                                                                                                                                                                                                                                                  |                 |
| Pointers and pointer arithmetic, Relationship between arrays and pointers, Pointers to functions, Pointers - function arguments, Dynamic memory allocation: malloc, calloc, free, realloc.                                                                                                                                                                                            |                 |
| <b>Structures, Unions and File Handling</b> <span style="float: right;"><b>7 Hours</b></span>                                                                                                                                                                                                                                                                                         |                 |
| Structures: definition, initialization, arrays of structures, nested structures, Pointers to structures, Unions: definition, initialization, and difference from structures, Enumerated data types (enum), File handling: concept of files and streams, file operations, reading/writing text and binary files, error handling.                                                       |                 |
| <b>Term Work Activity</b>                                                                                                                                                                                                                                                                                                                                                             |                 |
| Micro projects, PS Assessment and Programming Assignments                                                                                                                                                                                                                                                                                                                             |                 |
| <b>Self-Learning Activity</b>                                                                                                                                                                                                                                                                                                                                                         |                 |
| <b>SWAYAM / NPTEL:</b>                                                                                                                                                                                                                                                                                                                                                                |                 |
| Prof. AnupamBasu, Problem solving through Programming in C, IIT Kharagpur, 2025, <a href="https://nptel.ac.in/courses/106105171">https://nptel.ac.in/courses/106105171</a> .                                                                                                                                                                                                          |                 |
| Prof. SatyadevNandakumar, Introduction to Programming in C, NPTEL Online Course, Indian Institute of Technology Khanpur, 2025, <a href="https://onlinecourses.nptel.ac.in/noc25_cs119/preview">https://onlinecourses.nptel.ac.in/noc25_cs119/preview</a> .                                                                                                                            |                 |
| <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                         | <b>45 Hours</b> |
| <b>Tutorial</b>                                                                                                                                                                                                                                                                                                                                                                       | <b>- Hours</b>  |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                          | <b>45 Hours</b> |
| <b>Text Book:</b>                                                                                                                                                                                                                                                                                                                                                                     |                 |
| 1. Kernighan, B. W. and Ritchie, D. M., The C Programming Language, Prentice Hall, 2nd Edition, USA, 2023.                                                                                                                                                                                                                                                                            |                 |
| 2. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.                                                                                                                                                                                                                                                                                                   |                 |
| <b>References:</b>                                                                                                                                                                                                                                                                                                                                                                    |                 |
| 1. Schildt, H., C: The Complete Reference, McGraw Hill, Latest Edition, USA, 2018.                                                                                                                                                                                                                                                                                                    |                 |
| 2. Kanetkar, Y. P., Let Us C, BPB Publications, Latest Edition, India, 2025.                                                                                                                                                                                                                                                                                                          |                 |
| 3. Byron S. Gottfried, “Schaum’s Outline of Theory and Problems of Programming with C”, McGraw-Hill Education, 1996.                                                                                                                                                                                                                                                                  |                 |
| 4. PradipDey, Manas Ghosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press, 2013.                                                                                                                                                                                                                                                               |                 |
| 5. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, 1st Edition, Pearson Education, 2013.                                                                                                                                                                                                                                                                    |                 |

|                                                                                                                                                                                                                                                                                                                                                                                                                        |                       |     |     |     |     |                    |     |       |     |         |      |      |      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----|-----|-----|-----|--------------------|-----|-------|-----|---------|------|------|------|
| 26HS001                                                                                                                                                                                                                                                                                                                                                                                                                | COMMUNICATIVE ENGLISH |     |     |     |     | L                  | T   | P     | C   |         |      |      |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                        |                       |     |     |     |     | 1                  | 0   | 2     | 2   |         |      |      |      |
| Prerequisite                                                                                                                                                                                                                                                                                                                                                                                                           |                       |     |     |     |     | Assessment Pattern |     |       |     |         |      |      |      |
| Basic Communication & Writing skill                                                                                                                                                                                                                                                                                                                                                                                    |                       |     |     |     |     | CIA                | SEE | Total |     |         |      |      |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                        |                       |     |     |     |     | 50                 | 50  | 100   |     |         |      |      |      |
| Course Objectives:                                                                                                                                                                                                                                                                                                                                                                                                     |                       |     |     |     |     |                    |     |       |     |         |      |      |      |
| <ul style="list-style-type: none"><li>Develop students' ability to communicate effectively and professionally using accurate and appropriate English.</li><li>Enhance students' skills in descriptive and narrative forms of communication.</li><li>Develop active reading and comprehension skills through exposure to authentic English texts.</li></ul>                                                             |                       |     |     |     |     |                    |     |       |     |         |      |      |      |
| Course Outcomes (COs)                                                                                                                                                                                                                                                                                                                                                                                                  |                       |     |     |     |     |                    |     |       |     |         |      |      |      |
| At the end of the course, students will be able to                                                                                                                                                                                                                                                                                                                                                                     |                       |     |     |     |     |                    |     |       |     |         |      |      |      |
| <ol style="list-style-type: none"><li>Express themselves in a professional manner using error-free language</li><li>Express in both descriptive and narrative formats</li><li>Understand and make effective use of the English Language in Business contexts</li><li>Actively read and comprehend authentic text</li></ol>                                                                                             |                       |     |     |     |     |                    |     |       |     |         |      |      |      |
| Articulation Matrix                                                                                                                                                                                                                                                                                                                                                                                                    |                       |     |     |     |     |                    |     |       |     |         |      |      |      |
| COs                                                                                                                                                                                                                                                                                                                                                                                                                    | PO1                   | PO2 | PO3 | PO4 | PO5 | PO6                | PO7 | PO8   | PO9 | PO10    | PO11 | PSO1 | PSO2 |
| CO 1                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |     |     |     |     |                    |     |       | 2   | 3       | 2    |      |      |
| CO 2                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |     |     |     |     |                    |     |       | 2   | 3       | 2    |      |      |
| CO 3                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |     |     |     |     |                    |     |       | 2   | 3       | 2    |      |      |
| CO 4                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |     |     |     |     |                    |     |       | 2   | 3       | 2    |      |      |
| Module 1                                                                                                                                                                                                                                                                                                                                                                                                               |                       |     |     |     |     |                    |     |       |     |         |      |      |      |
| Communication Process                                                                                                                                                                                                                                                                                                                                                                                                  |                       |     |     |     |     |                    |     |       |     | 5 Hours |      |      |      |
| Listening –formal & informal conversations - Speaking –Self introduction– speaking on given topics & situations – recording speeches and strategies to improve - Reading - Reading comprehension – skimming/ scanning/ predicting – question & answers – objective and descriptive answers - Writing – paragraph writing, personal notes - Language Development- single word substitutes, compound words- conditionals |                       |     |     |     |     |                    |     |       |     |         |      |      |      |
| Language Mechanics                                                                                                                                                                                                                                                                                                                                                                                                     |                       |     |     |     |     |                    |     |       |     | 5 Hours |      |      |      |
| Listening –Interviews – Extensive speech on current affairs - Speaking – Role plays- describing a simple process – asking and answering questions - Reading – critical reading – finding key information in a given text – ideation, mind mapping - Writing - dialogue, instructions, process description - Language Development – writing single sentence definitions, sequence words, synonyms & antonyms.           |                       |     |     |     |     |                    |     |       |     |         |      |      |      |
| Module 2                                                                                                                                                                                                                                                                                                                                                                                                               |                       |     |     |     |     |                    |     |       |     |         |      |      |      |
| Narration and Summation:                                                                                                                                                                                                                                                                                                                                                                                               |                       |     |     |     |     |                    |     |       |     | 5 Hours |      |      |      |
| Listening - TED talks - popular speeches and presentations, Motivational speeches - Speaking - impromptu speeches, Debates and discussion -Reading - articles – magazines - Writing – review writing, channel conversion – bar diagram/ table, poster/ picture interpretation- Language Development – modal verbs, collocations, 21st century vocabulary                                                               |                       |     |     |     |     |                    |     |       |     |         |      |      |      |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                  |                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|
| <b>Practical</b><br><b>Listening</b><br>Practice listening, speaking, pronunciation, and non-verbal communication in lab activities.<br>Summarize interviews, news, or expert speeches.<br>Summarize TED Talks, speeches, or presentations, noting purpose, tone, and techniques.<br><br><b>Speaking</b><br>Deliver short talks, presentations, or speeches on current issues and professional communication.<br>Role-plays, process descriptions, and Q&A practice.<br>Impromptu speeches, debates, and group discussions on current or social issues.<br><br><b>Reading</b><br>Create podcasts, mind maps, infographics, or record speeches for micro-projects.<br>Identify main ideas and create mind maps.<br>Identify main ideas, supporting evidence, and author's viewpoint from articles or excerpts.<br><br><b>Writing</b><br>Complete written tasks like paragraphs, comprehension, process descriptions, and poster/picture interpretation.<br>Write dialogues, instructions, or process paragraphs.<br>Reviews, chart-to-paragraph conversions, and poster/image interpretations.<br><br><b>Language Development</b><br>Prepare group reports and reflections from industrial or field visits.<br>Practice definitions, connectors, synonyms, and antonyms.<br>Practice modal verbs, collocations, and 21st-century vocabulary. |                  | <b>30 Hours</b> |
| <b>Term Work Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |                 |
| Technical Article Analysis, Mind Mapping, Interview Script, TED Talk review                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                 |
| <b>Self-Learning</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                 |
| 1. <b>MOOC:</b> NPTEL “Developing Soft Skills and Personality” or equivalent.<br><b>NPTEL link:</b> <a href="https://nptel.ac.in/courses/109104107">https://nptel.ac.in/courses/109104107</a><br>2. <b>Online Module:</b> Complete an NPTEL or Spoken Tutorial and submit the certificate or a 150–200 word summary.<br><b>NPTEL link:</b> <a href="https://onlinecourses.nptel.ac.in/noc26_hs74/preview">https://onlinecourses.nptel.ac.in/noc26_hs74/preview</a><br>3. <b>MOOCs:</b> Complete an Nptel online module; submit certificate or summary.<br><b>NPTEL link:</b> <a href="https://onlinecourses.swayam2.ac.in/e-learning/preview/cec26_hs08">https://onlinecourses.swayam2.ac.in/e-learning/preview/cec26_hs08</a><br>4. <b>Online Module:</b> Coursera / Swayam / FutureLearn on Communication Skills.<br><b>NPTEL link:</b> <a href="https://onlinecourses.swayam2.ac.in/e-learning/preview/aic21_ge24">https://onlinecourses.swayam2.ac.in/e-learning/preview/aic21_ge24</a><br>5. <b>Spoken Tutorial:</b> IIT Bombay English Communication.<br>6. <b>TED Talk:</b> 200-word reflection on strategies learned.                                                                                                                                                                                                               |                  |                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Theory</b>    | <b>15 Hours</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Practical</b> | <b>30 Hours</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Total</b>     | <b>45 Hours</b> |

**Textbooks:**

1. A Course in Technical English, D. Praveen Sam and K.N. Shoba, Cambridge University Press, 2020
2. *Anderson, Paul V.* Technical Communication: A Reader – Centered Approach. Cengage, New Delhi, 2008.

**References:**

1. Smith-Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason, USA, 2007.
2. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford, 2007.
3. Chauhan, Gajendra Singh and et.al. Technical Communication (Latest Revised Edition). Cengage Learning India Pvt. Limited, 2018.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                    |     |       |     |         |     |     |     |      |      |      |      |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|-----|-------|-----|---------|-----|-----|-----|------|------|------|------|------|
| 26HS002                                                                                                                                                                                                                                                                                                                                                                                                                                                               | HERITAGE OF TAMILS | L                  | T   | P     | C   |         |     |     |     |      |      |      |      |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    | 1                  | 0   | 0     | 1   |         |     |     |     |      |      |      |      |      |
| Prerequisite                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    | Assessment Pattern |     |       |     |         |     |     |     |      |      |      |      |      |
| Understanding of Indian and Regional History/Culture                                                                                                                                                                                                                                                                                                                                                                                                                  |                    | CIA                | SEE | Total |     |         |     |     |     |      |      |      |      |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    | 40                 | 60  | 100   |     |         |     |     |     |      |      |      |      |      |
| Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |                    |     |       |     |         |     |     |     |      |      |      |      |      |
| <ul style="list-style-type: none"><li>To understand the history, culture, and traditions of Tamils.</li><li>To learn about the achievements and contributions of Tamils.</li><li>To develop pride in and preserve Tamil heritage.</li></ul>                                                                                                                                                                                                                           |                    |                    |     |       |     |         |     |     |     |      |      |      |      |      |
| Course Outcomes (COs)                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    |                    |     |       |     |         |     |     |     |      |      |      |      |      |
| At the end of the course, students will be able to                                                                                                                                                                                                                                                                                                                                                                                                                    |                    |                    |     |       |     |         |     |     |     |      |      |      |      |      |
| <ol style="list-style-type: none"><li>Describe the linguistic diversity in India, highlighting Dravidian languages and their features.</li><li>Summarize the evolution of art, highlighting key transitions from rock art to modern sculptures.</li><li>Examine the role of sports and games in promoting cultural values and community bonding.</li><li>Discuss the education and literacy systems during the Sangam Age and their impact.</li></ol>                 |                    |                    |     |       |     |         |     |     |     |      |      |      |      |      |
| Articulation Matrix                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |                    |     |       |     |         |     |     |     |      |      |      |      |      |
| COs                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | PO1                | PO2                | PO3 | PO4   | PO5 | PO6     | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
| CO 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                    |     |       |     | 3       | 3   | 2   |     | 2    |      |      |      |      |
| CO 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                    |     |       |     | 3       | 3   | 2   |     | 2    |      |      |      |      |
| CO 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                    |     |       |     | 3       | 3   | 2   |     | 2    |      |      |      |      |
| CO 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                    |     |       |     | 3       | 3   | 2   |     | 2    |      |      |      |      |
| CO 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                    |     |       |     | 3       | 3   | 2   |     | 2    |      |      |      |      |
| Module 1                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |                    |     |       |     |         |     |     |     |      |      |      |      |      |
| Language And Literature                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |                    |     |       |     | 3 Hours |     |     |     |      |      |      |      |      |
| Language Families in India – Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature – Management Principles in Thirukural – Tamil Epics and Impact of Buddhism & Jainism in Tamil Land – Bakthi Literature Azhwars and Nayanmars – Forms of minor Poetry – Development of Modern literature in Tamil – Contribution of Bharathiyar and Bharathidhasan. |                    |                    |     |       |     |         |     |     |     |      |      |      |      |      |
| Rock Art Paintings To Modern Art Sculpture                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |                    |     |       |     | 3 Hours |     |     |     |      |      |      |      |      |
| Heritage – Rock Art Paintings To Modern Art – Sculpture Hero stone to modern sculpture – Bronze icons – Tribes and their handicrafts – Art of temple car making – Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments – Mridhangam, Parai, Veenai, Yazh and Nadhaswaram – Role of Temples in Social and Economic Life of Tamils.                                                                       |                    |                    |     |       |     |         |     |     |     |      |      |      |      |      |
| Folk And Martial Arts                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    |                    |     |       |     | 3 Hours |     |     |     |      |      |      |      |      |
| Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance – Sports and Games of Tamils.                                                                                                                                                                                                                                                                                                                     |                    |                    |     |       |     |         |     |     |     |      |      |      |      |      |
| Module 2                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |                    |     |       |     |         |     |     |     |      |      |      |      |      |
| Thinai Concept of Tamils                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |                    |     |       |     | 3 Hours |     |     |     |      |      |      |      |      |

Thinai Concept in Tamil Culture – Flora and Fauna associated with the five landscapes of Tamils Aham and Puram concepts from Tholkappiyam and Sangam Literature – Aram concept of Tamils and its ethical values – Education and literacy during the Sangam Age – Ancient cities and ports of the Sangam period – Export and import trade during Sangam Age – Overseas conquest and maritime expansion of the Cholas.

**Contribution of Tamils to Indian National Movement and Indian Culture**

**3 Hours**

Contribution of Tamils to the Indian Freedom Struggle – Participation of Tamil leaders and revolutionaries – Cultural influence of Tamils over other regions of India – Self-Respect Movement and its social impact – Role of Siddha medicine in indigenous medical systems – Importance of inscriptions and manuscripts in preserving Tamil history – Development of Tamil print culture and history of Tamil books.

**Term Work Activity**

Assignments, Case Study

**Theory**

**15 Hours**

**Total**

**15 Hours**

**Textbooks:**

1. TAMILAR MARABU-Dr.A.Boobalan VRB PUBLISHERS PVT LTD,6/50,Venkatesa Nagar 1 st street,Virukambakkam, Chennai-600 092.

**References:**

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by:International Institute of Tamil Studies.)
5. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’(Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporate Tamil Nadu) Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
6. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
7. .Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |     |     |     |                    |     |       |     |         |      |      |      |      |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----|-----|-----|--------------------|-----|-------|-----|---------|------|------|------|------|------|
| 26HS002                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | தமிழர் மரபு |     |     |     | L                  | T   | P     | C   |         |      |      |      |      |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |     |     |     | 1                  | 0   | 0     | 1   |         |      |      |      |      |      |
| Prerequisite                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |     |     |     | Assessment Pattern |     |       |     |         |      |      |      |      |      |
| Understanding of Indian and Regional History/Culture                                                                                                                                                                                                                                                                                                                                                                                                                        |             |     |     |     | CIA                | SEE | Total |     |         |      |      |      |      |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |     |     |     | 40                 | 60  | 100   |     |         |      |      |      |      |      |
| Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |     |     |     |                    |     |       |     |         |      |      |      |      |      |
| <ul style="list-style-type: none"><li>தமிழர்களின் வரலாறு, பண்பாடு மற்றும் மரபுகளை அறிதல்.</li><li>தமிழர்களின் சாதனைகள் மற்றும் பங்களிப்புகளை அறிதல்.</li><li>தமிழர் மரபின் மீது பெருமை கொண்டு அதைப் பாதுகாத்தல்.</li></ul>                                                                                                                                                                                                                                                  |             |     |     |     |                    |     |       |     |         |      |      |      |      |      |
| Course Outcomes (COs)                                                                                                                                                                                                                                                                                                                                                                                                                                                       |             |     |     |     |                    |     |       |     |         |      |      |      |      |      |
| At the end of the course, students will be able to                                                                                                                                                                                                                                                                                                                                                                                                                          |             |     |     |     |                    |     |       |     |         |      |      |      |      |      |
| <ol style="list-style-type: none"><li>இந்தியாவில் உள்ள மொழி பல்வகைத்தன்மையை விளக்கி, திராவிட மொழிகளையும் அவற்றின் சிறப்பம்சங்களையும் குறிப்பிடுவர்.</li><li>கலை வளர்ச்சியின் பரிணாமத்தை சுருக்கமாக -விளக்கி, பாறை ஓவியங்களிலிருந்து நவீன சிற்பங்கள்வரை ஏற்பட்ட முக்கிய மாற்றங்களை எடுத்துக்காட்டுவர்.</li><li>விளையாட்டுகள் மற்றும் பாரம்பரிய விளையாட்டுகள் பண்பாட்டு மதிப்புகளை வளர்த்தல் மற்றும் சமூக ஒற்றுமையை உருவாக்குவதில் கொண்டுள்ள பங்கினை ஆய்வு செய்வர்.</li></ol> |             |     |     |     |                    |     |       |     |         |      |      |      |      |      |
| <ol style="list-style-type: none"><li>சங்க காலத்தில் இருந்த கல்வி மற்றும் எழுத்தறிவு முறைகள் மற்றும் அவற்றின் தாக்கத்தை விவாதிப்பர்.</li></ol>                                                                                                                                                                                                                                                                                                                              |             |     |     |     |                    |     |       |     |         |      |      |      |      |      |
| Articulation Matrix                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |     |     |     |                    |     |       |     |         |      |      |      |      |      |
| COs                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | PO1         | PO2 | PO3 | PO4 | PO5                | PO6 | PO7   | PO8 | PO9     | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
| CO 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |             |     |     |     |                    | 3   | 3     | 2   |         | 2    |      |      |      |      |
| CO 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |             |     |     |     |                    | 3   | 3     | 2   |         | 2    |      |      |      |      |
| CO 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |             |     |     |     |                    | 3   | 3     | 2   |         | 2    |      |      |      |      |
| CO 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |             |     |     |     |                    | 3   | 3     | 2   |         | 2    |      |      |      |      |
| CO 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |             |     |     |     |                    | 3   | 3     | 2   |         | 2    |      |      |      |      |
| அலகு - I                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |     |     |     |                    |     |       |     |         |      |      |      |      |      |
| மொழி மற்றும் இலக்கியம்                                                                                                                                                                                                                                                                                                                                                                                                                                                      |             |     |     |     |                    |     |       |     | 3 Hours |      |      |      |      |      |
| இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் –தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச்சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மை கருத்துக்கள் –தமிழ் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களில் தாக்கம்- பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் –தமிழில் நவீன                                                                                                              |             |     |     |     |                    |     |       |     |         |      |      |      |      |      |

இலக்கியத்தின் வளர்ச்சி -தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

**மரபு -பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை- சிற்பக்கலை 3 Hours**  
 ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள் பொம்மைகள்- தேர் செய்யும் கலை-சுடுமண் சிற்பங்கள்- நாட்டுப்புற தெய்வங்கள்- குமரி முனையில் திருவள்ளுவர் சிலை- இசைக்கருவிகள்- மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம்- தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோயில்களின் பங்கு

**நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் 3 Hours**  
 தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவை கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம்- தமிழர்களின் விளையாட்டுகள்.

### அலகு - II

**தமிழர்களின் திணைக் கோட்பாடுகள் 3 Hours**  
 தமிழகத்தின் தாவரங்களும் விலங்குகளும்- தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புற கோட்பாடுகள்- தமிழர்கள் போற்றிய அறக்கோட்பாடு சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும் கல்வியும்-சங்ககால நகரங்களும் துறைமுகங்களும்- சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி-கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி

**இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்கு தமிழர்களின் பங்களிப்பு 3 Hours**  
 இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு -இந்தியாவின் பிற்பகுதிகளில் தமிழ் பண்பாட்டின் தாக்கம்- சுயமரியாதை இயக்கம்- இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு- கல்வெட்டுகள்- கையெழுத்து படிகள்- தமிழ் புத்தகங்களின் அச்ச வரலாறு

| Term Work Activity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Assignments, Case Study                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |
| <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>15 Hours</b> |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>15 Hours</b> |
| <p><b>பாடநூல்கள்:</b></p> <p>1. தமிழர் மரபு - முனைவர் அ. பூபாலன்<br/>VRB பதிப்பகம் (VRB PUBLISHERS PVT LTD), 6/50, வெங்கடேசா நகர் 1-வது தெரு, விருகம்பாக்கம், சென்னை - 600 092.</p> <p><b>பார்வை நூல்கள்:</b></p> <p>1. தமிழர்களின் சமூக வாழ்க்கை (Social Life of Tamils) - முனைவர் க.க. பிள்ளை (TNTB, ESC மற்றும் RMRL ஆகியவற்றின் கூட்டு வெளியீடு) - (அச்சில் உள்ளது)</p> <p>2. தமிழர்களின் சமூக வாழ்க்கை - செவ்வியல் காலம் (Social Life of the Tamils - The Classical Period) - முனைவர் ச. சிங்காரவேலு (வெளியீடு: உலகத் தமிழாராய்ச்சி நிறுவனம்)</p> <p>3. தமிழர்களின் வரலாற்றுப் பாரம்பரியம் (Historical Heritage of the Tamils) - முனைவர் ச.வ. சுப்பிரமணியன், முனைவர் க.தி. திருநாவுக்கரசு (வெளியீடு: உலகத் தமிழாராய்ச்சி நிறுவனம்)</p> <p>4. இந்தியப் பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்புகள் (The Contributions of the Tamils to Indian Culture) - முனைவர் ம. வளர்மதி (வெளியீடு: உலகத் தமிழாராய்ச்சி நிறுவனம்)</p> <p>5. கீழடி - 'வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்' (Keeladi - 'Sangam City Civilization on the banks of river Vaigai') (கூட்டு வெளியீடு: தொல்லியல் துறை மற்றும் தமிழ்நாடு பாடநூல் மற்றும் கல்விச் சேவைகள் கழகம், தமிழ்நாடு) இந்திய வரலாற்று ஆய்வுகள் - தமிழ்நாட்டிற்கான சிறப்புக்குறிப்புடன் (Studies in the History of India with Special Reference to Tamil Nadu) - முனைவர் க.க. பிள்ளை (வெளியீடு: நூலாசிரியர்)</p> <p>6. பொருநை நாகரிகம் (Porunai Civilization) - (கூட்டு வெளியீடு: தொல்லியல் துறை மற்றும் தமிழ்நாடு பாடநூல் மற்றும் கல்விச் சேவைகள் கழகம், தமிழ்நாடு)</p> <p>7. நாகரிகப் பயணம்: சிந்து முதல் வைகை வரை (Journey of Civilization: Indus to Vaigai) - இரா. பாலகிருஷ்ணன் (வெளியீடு: RMRL) - பார்வை நூல்..</p> |                 |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Apply the non-uniform bending method to determine the Young's modulus of a uniform bar and analyze its mechanical properties for engineering applications.                                                                                                                                                                                                                                                                                                                 |  |
| <b>Experiment 4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
| Analyze the thickness of a thin sheet or wire by observing the interference pattern in an air-wedge arrangement                                                                                                                                                                                                                                                                                                                                                            |  |
| <b>Module 2 (Any two experiments)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| <b>6 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| <b>Experiment 5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
| Evaluate the wavelength of a laser source and assess the size of the given micro-particles (Lycopodium powder) using appropriate experimental techniques                                                                                                                                                                                                                                                                                                                   |  |
| <b>Experiment 6</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
| Determine the efficiency of a solar cell by experimentally plotting its current-voltage (I–V) characteristics curve.                                                                                                                                                                                                                                                                                                                                                       |  |
| <b>Experiment 7</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
| Measure the characteristics of a PN junction diode to determine the energy band gap of the semiconductor material.                                                                                                                                                                                                                                                                                                                                                         |  |
| <b>Experiment 8</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
| Investigate the refractive indices of a glass slab and water by measuring their apparent thickness using a travelling microscope.                                                                                                                                                                                                                                                                                                                                          |  |
| <b>Self-Learning Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |
| <b>NPTEL Course: NOC:</b> Experimental Physics I, Prof. Amal Kumar Das<br>NPTEL link <a href="https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_ph16">https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_ph16</a><br><b>NPTEL Course: NOC:</b> Experimental Physics II, Prof. Amal Kumar Das<br>NPTEL link: <a href="https://onlinecourses.nptel.ac.in/e-learning/preview/noc24_ph06">https://onlinecourses.nptel.ac.in/e-learning/preview/noc24_ph06</a> |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
| <b>Practical</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
| <b>15 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| <b>15 Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
| <b>Text Book:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |
| 1. Knight, R. D., “Physics for Scientists and Engineers: A Strategic Approach with Modern Physics,” 4th Edition, Pearson, 2017.                                                                                                                                                                                                                                                                                                                                            |  |
| <b>Reference:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |
| 1. Prakash, I., Ramakrishna, “A Textbook of Practical Physics,” 11th Edition, Kitab Mahal, 2011.                                                                                                                                                                                                                                                                                                                                                                           |  |



|                                                                                                                                                                                                                                 |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Redox titration: Potentiometric Analysis of iron ( $\text{Fe}^{2+}$ ) present in the given water sample using $\text{KMnO}_4$                                                                                                   |  |
| <b>Module 2 (Any two experiments)</b>                                                                                                                                                                                           |  |
| <b>6 Hours</b>                                                                                                                                                                                                                  |  |
| <b>Experiment 5</b>                                                                                                                                                                                                             |  |
| Estimation of Hardness in water sample by EDTA method.                                                                                                                                                                          |  |
| <b>Experiment 6</b>                                                                                                                                                                                                             |  |
| Determination of acid content by measuring pH (Use pH Meter)                                                                                                                                                                    |  |
| <b>Experiment 7</b>                                                                                                                                                                                                             |  |
| Evaluate the corrosion percentage in concrete TMT bars.                                                                                                                                                                         |  |
| <b>Experiment 8</b>                                                                                                                                                                                                             |  |
| Investigate the amount of Iron ( $\text{Fe}^{2+}$ ) in a mild steel alloy sample using a spectrophotometer.                                                                                                                     |  |
| <b>Experiment 9</b>                                                                                                                                                                                                             |  |
| Visualize the geometry of the given molecule and identify the stable structure using software tools.                                                                                                                            |  |
| <b>Self-Learning</b>                                                                                                                                                                                                            |  |
| NPTEL Course: NOC: Water Quality Management Practices, Prof. Gourav Dhar<br>Bhowmick IIT Kharagpur<br>NPTEL link: <a href="https://nptel.ac.in/courses/126105335">https://nptel.ac.in/courses/126105335</a>                     |  |
| NPTEL Course: Elementary Electrochemistry, Prof. Angshuman Roy Choudhur,<br>IISER Mohali<br>NPTEL link: <a href="https://onlinecourses.nptel.ac.in/noc23_cy19/preview">https://onlinecourses.nptel.ac.in/noc23_cy19/preview</a> |  |
| <b>Practical</b>                                                                                                                                                                                                                |  |
| <b>15 Hours</b>                                                                                                                                                                                                                 |  |
| <b>Total</b>                                                                                                                                                                                                                    |  |
| <b>15 Hours</b>                                                                                                                                                                                                                 |  |
| <b>Textbook:</b>                                                                                                                                                                                                                |  |
| 1. Vogel, A. I., Vogel's Textbook of Quantitative Chemical Analysis, 6th Edition, Pearson, 2009                                                                                                                                 |  |
| <b>References:</b>                                                                                                                                                                                                              |  |
| 1. Skoog, West and Holler, Fundamentals of Analytical Chemistry, 10th Edition, 2022                                                                                                                                             |  |
| 2. Fontana, M. G., Corrosion Engineering, 4th Edition, 2017.                                                                                                                                                                    |  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------|-----|-------|-----|-----|-----|-----|-----|------|---------|------|------|
| 26GE006                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | C Programming Laboratory | L                  | T   | P     | C   |     |     |     |     |      |         |      |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          | 0                  | 0   | 2     | 1   |     |     |     |     |      |         |      |      |
| Prerequisite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          | Assessment Pattern |     |       |     |     |     |     |     |      |         |      |      |
| Fundamental mathematics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                          | CIA                | SEE | Total |     |     |     |     |     |      |         |      |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          | 60                 | 40  | 100   |     |     |     |     |     |      |         |      |      |
| Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| <ul style="list-style-type: none"><li>To understand problem solving through flowcharts, pseudocode, and the C compilation process.</li><li>To learn to write programs using operators, decision-making, and looping constructs.</li><li>To implement programs using arrays, matrices, and string library functions.</li><li>To use functions, recursion, pointers, and dynamic memory allocation in programs.</li><li>To do file operations in C using structures and unions for real-world applications.</li></ul>                                                                    |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| Course Outcomes (COs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| At the end of the course, students will be able to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| <ol style="list-style-type: none"><li>Apply algorithmic problem-solving techniques and fundamental C programming constructs to develop programs using operators, decision-making and looping constructs.</li><li>Develop C programs using arrays, matrices and string processing techniques to manipulate and process data.</li><li>Implement modular C programs using functions, recursion, pointers and dynamic memory allocation techniques.</li><li>Construct C programs using structures, unions and file handling techniques to manage structured and persistent data.</li></ol> |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| Articulation Matrix                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| COs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | PO1                      | PO2                | PO3 | PO4   | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11    | PSO1 | PSO2 |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2                        | 2                  |     |       | 3   |     |     |     | 1   |      |         | 3    | 2    |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2                        | 2                  |     |       | 3   |     |     |     | 1   |      |         | 3    | 2    |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2                        | 2                  |     |       | 3   |     |     |     | 1   |      |         | 3    | 2    |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2                        | 2                  |     |       | 3   |     |     |     | 1   |      |         | 3    | 2    |
| Module 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| Experiment 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                    |     |       |     |     |     |     |     |      | 3 Hours |      |      |
| Problem-solving using flowcharts and pseudocode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| Experiment 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                    |     |       |     |     |     |     |     |      | 3 Hours |      |      |
| Simple programs using arithmetic, logical, and relational operators.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| Experiment 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                    |     |       |     |     |     |     |     |      | 3 Hours |      |      |
| Programs using decision-making and looping constructs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| Experiment 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                    |     |       |     |     |     |     |     |      | 3 Hours |      |      |
| Programs using arrays and matrices                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| Experiment 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                    |     |       |     |     |     |     |     |      | 3 Hours |      |      |
| String manipulation programs using library functions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| Module 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| Experiment 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                    |     |       |     |     |     |     |     |      | 3 Hours |      |      |
| Programs with user-defined functions and recursion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                          |                    |     |       |     |     |     |     |     |      |         |      |      |
| Experiment 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                    |     |       |     |     |     |     |     |      | 3 Hours |      |      |
| Implementation of pointer-based programs (arrays and functions).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                          |                    |     |       |     |     |     |     |     |      |         |      |      |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Experiment 8</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>3 Hours</b>  |
| Dynamic memory allocation programs                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |
| <b>Experiment 9</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>3 Hours</b>  |
| Programs using structures and unions.                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |
| <b>Experiment 10</b>                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>3 Hours</b>  |
| File handling – reading, writing, and updating text/binary files.                                                                                                                                                                                                                                                                                                                                                                                                  |                 |
| <b>Practical</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>30 Hours</b> |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>30 Hours</b> |
| <b>References:</b> <ol style="list-style-type: none"> <li>1. Kernighan, B. W. and Ritchie, D. M., The C Programming Language, Prentice Hall, 2nd Edition, USA, 2023.</li> <li>2. Schildt, H., C: The Complete Reference, McGraw Hill, Latest Edition, USA, 2018.</li> <li>3. Kanetkar, Y. P., Let Us C, BPB Publications, Latest Edition, India, 2025.</li> <li>4. Thareja, R., Programming in C, Oxford University Press, Latest Edition, India, 2024.</li> </ol> |                 |



| <b>Module 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Analytic Functions</b><br>Complex Variable-Analytic functions and Cauchy – Riemann equations - Laplace equation and Harmonic functions - Construction of Harmonic conjugate and analytic functions - Applications of analytic functions to fluid-flow and Field problems. Conformal mapping - Elementary transformations-translation, magnification, rotation, inversion. Bilinear transformation.                                                                                                                                                                                                                                                                                                                               | <b>12 Hours</b> |
| <b>Complex Integration</b><br>Functions given by Power Series - Taylor and Laurent series -singularities - poles - Residues. Integration of a complex function along a contour - Cauchy's integral formula and theorem -Cauchy's residue theorem - Contour integrals in Real axis.                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>11 Hours</b> |
| <b>Term Work Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |
| GATE Questions, Quiz, Assignments.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |
| <b>Self-Learning Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |
| <b>SWAYAM / NPTEL:</b><br><b>Linear Differential Equations of first and second order</b><br><a href="https://onlinecourses.nptel.ac.in/noc22_ma72/preview">https://onlinecourses.nptel.ac.in/noc22_ma72/preview</a><br><b>Vector Calculus</b><br><a href="https://onlinecourses.nptel.ac.in/noc22_ma03/preview">https://onlinecourses.nptel.ac.in/noc22_ma03/preview</a><br><b>Analytic Functions</b><br><a href="https://nptel.ac.in/courses/115106086">https://nptel.ac.in/courses/115106086</a><br><b>Complex Integration</b><br><a href="https://nptel.ac.in/courses/122107036">https://nptel.ac.in/courses/122107036</a>                                                                                                       |                 |
| <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>45 Hours</b> |
| <b>Tutorial</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>15 Hours</b> |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>60 Hours</b> |
| <b>Text Books:</b> <ol style="list-style-type: none"> <li>1. B.S Grewal, Higher Engineering Mathematics, Khanna Publisher, 45<sup>th</sup> Edition, 2024.</li> <li>2. J. Stewart, Essential Calculus, Cengage, 2nd edition, 2017.</li> </ol> <b>References:</b> <ol style="list-style-type: none"> <li>1. Erwin Kreyszig, Advanced Engineering Mathematics Wiley, 10th edition ,2015.</li> <li>2. Richard E., Williamson Introduction to Differential Equations and Dynamical Systems, McGraw Hill Companies Inc, 1997.</li> <li>3. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018.</li> <li>4. George B.Thomas, Maurice D. Weir and Joel Hass Thomas Calculus, 13/e, Pearson Publishers, 2013.</li> </ol> |                 |



|                                                                                                                                                                                                                                                                            |  |                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------|
| <b>Magnetism and Electromagnetic Induction</b>                                                                                                                                                                                                                             |  | <b>7 Hours</b>  |
| Magnetic field: Biot–Savart law-Ampere’s circuital law. Classification of magnetic materials-magnetic domains: B–H curve and hysteresis. Faraday’s and Lenz’s law: Eddy currents and applications. Inductance – self and mutual-transformers and energy in magnetic fields |  |                 |
| <b>Module 2</b>                                                                                                                                                                                                                                                            |  |                 |
| <b>Optics</b>                                                                                                                                                                                                                                                              |  | <b>7 Hours</b>  |
| Interference: Air wedge-Newton’s ring-Michelson interferometer. Diffraction: Single slit- diffraction grating-resolving power. Polarization: Plane-circular-elliptical-applications. Optical fibers: Principle-numerical aperture-applications in communication.           |  |                 |
| <b>Quantum Mechanics</b>                                                                                                                                                                                                                                                   |  | <b>8 Hours</b>  |
| Blackbody radiation-photoelectric effect-Compton effect. De-Broglie hypothesis-Davisson–Germer experiment. Schrödinger wave equation – physical interpretation-particle in a one dimensional-box. Quantum tunneling-application in electronic devices.                     |  |                 |
| <b>Solid State and Modern Materials</b>                                                                                                                                                                                                                                    |  | <b>7 Hours</b>  |
| Band theory of solids: Conductors-semiconductors-insulators. Semiconductor: Types-Fermi level and conductivity. Superconductor: Types-properties-applications. Nanomaterials – properties and applications.                                                                |  |                 |
| <b>Term Work Activity</b>                                                                                                                                                                                                                                                  |  |                 |
| GATE Questions, Quiz, Assignments, Presentations                                                                                                                                                                                                                           |  |                 |
| <b>Self-Learning</b>                                                                                                                                                                                                                                                       |  |                 |
| <b>SWAYAM / NPTEL:</b><br><a href="https://nptel.ac.in/courses">https://nptel.ac.in/courses</a><br><a href="https://nptel.ac.in/courses/113107078">https://nptel.ac.in/courses/113107078</a>                                                                               |  |                 |
| <b>Theory</b>                                                                                                                                                                                                                                                              |  | <b>45 Hours</b> |
| <b>Total</b>                                                                                                                                                                                                                                                               |  | <b>45 Hours</b> |
| <b>Text Books:</b>                                                                                                                                                                                                                                                         |  |                 |
| 1. William D. Callister Materials Science and Engineering: An Introduction, 6 <sup>th</sup> Edition, John Wiley & Sons, 2003.                                                                                                                                              |  |                 |
| <b>References:</b>                                                                                                                                                                                                                                                         |  |                 |
| 1. Halliday, D. & Resnick, R. Fundamentals of Physics, 12th Edition, John Wiley & Sons, Inc., New Delhi (2021).                                                                                                                                                            |  |                 |
| 2. Verma, H. C. Concepts of Physics Vol. I, Bharati Bhawan Publishers, New Delhi (2022 reprint).                                                                                                                                                                           |  |                 |
| 3. Young, H. D. & Freedman, R. A. University Physics with Modern Physics, Global Edition, 15th Edition, Pearson, New Delhi (2024).                                                                                                                                         |  |                 |
| 4. Tipler, P. A. & Mosca, G. Physics for Scientists and Engineers, 6th Edition, W. H. Freeman & Company / Macmillan, New Delhi (2020).                                                                                                                                     |  |                 |
| 5. Serway, R. A. & Jewett, J. W. Principles of Physics: A Calculus-Based Text, 5th Edition, Brooks/Cole / Cengage Learning India Pvt. Ltd., New Delhi (2012).                                                                                                              |  |                 |
| 6. Feynman, R. P., Leighton, R. B. & Sands, M. The Feynman Lectures on Physics (Vol. I), New Millennium Edition, Basic Books / Perseus Group, New Delhi (2011).                                                                                                            |  |                 |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Need for utility-first CSS frameworks - Tailwind CSS setup and configuration - Core utility classes: typography, spacing, borders, flexbox, grid - Responsive design and breakpoints in Tailwind - Component building: cards, navbars, buttons - Customizing themes and reusability - Comparison of traditional CSS vs Tailwind approach.                                                                                                                                                                                                                                                                                                                       |                 |
| <b>Module 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |
| <b>JavaScript Essentials</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>7 Hours</b>  |
| Role of JavaScript in web development - Variables, data types, and operators - Conditional statements and loops - Functions: declaration, scope, and return values - Arrays and objects - Script integration in HTML documents - Best practices for code organization.                                                                                                                                                                                                                                                                                                                                                                                          |                 |
| <b>DOM Manipulation and Events</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>7 Hours</b>  |
| Document Object Model (DOM) overview - Accessing and modifying HTML elements - Handling events: click, input, submit - Dynamic content updates using innerHTML and class manipulation - JavaScript-based form validation - Developer tools and debugging techniques                                                                                                                                                                                                                                                                                                                                                                                             |                 |
| <b>Integrating HTML, CSS, JS, and Tailwind</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>8 Hours</b>  |
| Structuring a multi-page website using semantic HTML - Reusable layout components (navigation bar, header, footer) - Enhancing UI with Tailwind transitions and effects - Adding interactivity: toggles, modals, and validation - Integrating HTML, CSS, and JS for cohesive front-end behavior - Introduction to component-based design (overview of React/Node.js) - Version control with Git and GitHub publishing workflow.                                                                                                                                                                                                                                 |                 |
| <b>Term Work Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |
| <b>Mini / Micro Projects: Sample Term work Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |
| Design and development of a responsive, accessible, multi-page web application integrating HTML5, CSS, Tailwind CSS and JavaScript. Students shall implement semantic page structures, responsive layouts, interactive DOM-based features, client-side form validation and reusable UI components. The project shall be managed using Git/GitHub and evaluated through periodic reviews, technical implementation, documentation and final demonstration.                                                                                                                                                                                                       |                 |
| <b>Self-Learning Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                 |
| <b>Module 1:</b><br>Spoken Tutorial - IIT Bombay<br>HTML<br><a href="https://spoken-tutorial.org/tutorial-search/?search_foss=HTML&amp;search_language=English">https://spoken-tutorial.org/tutorial-search/?search_foss=HTML&amp;search_language=English</a><br>CSS<br><a href="https://spoken-tutorial.org/watch/CSS/Overview+of+CSS/English/">https://spoken-tutorial.org/watch/CSS/Overview+of+CSS/English/</a><br><b>Module 2:</b><br>Dr. Ashutosh Kumar Bhatt, Web Technology, Uttarakhand Open University, Haldwani, 2025, <a href="https://onlinecourses.swayam2.ac.in/nou24_cs09/preview">https://onlinecourses.swayam2.ac.in/nou24_cs09/preview</a> . |                 |
| <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>45 Hours</b> |
| <b>Tutorial</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>- Hours</b>  |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>45 Hours</b> |

**References:**

1. Duckett, J., HTML & CSS: Design and Build Websites, Wiley, 1st Edition, 2011.
2. Haverbeke, M., Eloquent JavaScript, No Starch Press, 3rd Edition, 2018.
3. Wathan, A., Refactoring UI / Tailwind CSS Documentation, Tailwind Labs, 1st Edition, 2020.
4. Meyer, E.A., CSS: The Definitive Guide, O'Reilly Media, 4th Edition, 2017.
5. Nixon, R., Learning PHP, MySQL & JavaScript, O'Reilly Media, 6th Edition, 2021.
6. MDN Web Docs – HTML, CSS, and JS Developer Guide, Mozilla Foundation, Online Resource, 2024.



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| execution - Instruction-Level Parallelism (ILP) - Speculative execution and branch prediction techniques - Side-channel vulnerabilities – Spectre, Meltdown (overview).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |
| <b>Module 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |
| <b>Memory and I/O Organization</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>9 Hours</b>  |
| Memory hierarchy – concepts & performance - Cache mapping techniques: direct, associative, set-associative - Cache levels – L1, L2, L3 - Cache optimization & memory prefetching - Overview of Tera MTA architecture - I/O organization – interfacing and connectivity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |
| <b>GPU Architecture and Programming</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>5 Hours</b>  |
| Compare GPU vs CPU architecture - GPU core organization – cores, warps, memory model - CUDA toolkit – overview - CUDA programming model & parallel execution - Case studies – real GPU applications.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |
| <b>Modern Computing and Accelerators</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>8 Hours</b>  |
| Domain-specific architectures (DSA) and heterogeneous compute - Wafer-scale processors – high-performance architecture - Hardware accelerators – FPGA, ASIC - RISC-V design – implementation on FPGA - Apple M1 / M2 overview - ARM big. LITTLE design philosophy, mobile efficiency - AI-driven hardware accelerators.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |
| <b>Term Work Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 |
| 1. Micro Projects<br>2. Assignments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |
| <b>Self-Learning Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                 |
| <b>Module 1:</b><br>Processor Architecture & Instruction Sets<br>NPTEL link - <a href="https://nptel.ac.in/courses/106106134/">https://nptel.ac.in/courses/106106134/</a><br>Computer Architecture, IIT Madras<br>Prof. Madhu Mutyam<br><br>Instruction Set Architecture<br>NPTEL link- <a href="https://onlinecourses.nptel.ac.in/noc25_ma114/preview">https://onlinecourses.nptel.ac.in/noc25_ma114/preview</a><br>Computer Organization and Architecture: A Pedagogical Aspect, IIT Guwahati<br>Prof. Santhosh Biswas, Prof. Jatindra Kumar deka, Prof. Arnab Sarkar<br><b>Module 2:</b><br>GPU Architectures and Programming<br>NPTEL link: <a href="https://onlinecourses.nptel.ac.in/noc20_cs41/">https://onlinecourses.nptel.ac.in/noc20_cs41/</a><br>GPU Architectures and Programming<br>By Prof. Soumyajit Dey   IIT Kharagpur |                 |
| <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>45 Hours</b> |
| <b>Tutorial</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>15 Hours</b> |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>60 Hours</b> |
| <b>Text Book:</b><br>1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, Third Reprint, McGraw-Hill, 2015.<br><b>References:</b><br>1. John L. Hennessy, David A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann, 6th edition, 2019.<br>2. David A. Patterson, John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Morgan Kaufmann, 6th edition, 2021.<br>3. William Stallings, Computer Organization and Architecture: Designing for Performance, Pearson, 11th edition, 2023.                                                                                                                                                                                                                                                                       |                 |

4. David Money Harris, Sarah L. Harris, Digital Design and Computer Architecture, Morgan Kaufmann, 3rd edition, 2021.



| <b>Module 2</b>                                                                                                                                                                                                                                                                                                                                  |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>File Handling and Exception Management</b>                                                                                                                                                                                                                                                                                                    | <b>7 Hours</b>  |
| Modules and packages – creation and import of built-in and user-defined modules – File operations (open, read, write, append) – Working with text and CSV files – Context managers (with statement) – Exception handling using try, except, else, finally, raise – User-defined exceptions.                                                      |                 |
| <b>Object-Oriented Programming</b>                                                                                                                                                                                                                                                                                                               | <b>7 Hours</b>  |
| Classes and objects – attributes and methods – Constructors ( __init__ ) and destructors – Instance and class variables – Basics of inheritance and polymorphism – Encapsulation and abstraction – Simple OOP applications.                                                                                                                      |                 |
| <b>Numerical and Data Analysis with Visualization</b>                                                                                                                                                                                                                                                                                            | <b>8 Hours</b>  |
| Introduction to NumPy arrays and operations – Introduction to Pandas (Series and DataFrame) – Data import/export (CSV, Excel) – Data selection, filtering, cleaning, and aggregation – Data visualization using Matplotlib (line, bar, scatter plots) with chart customization – Integration of NumPy and Pandas for analysis and visualization. |                 |
| <b>Term Work Activity</b>                                                                                                                                                                                                                                                                                                                        |                 |
| Micro projects, PS Assessment, Programming Assignments.                                                                                                                                                                                                                                                                                          |                 |
| <b>Self-Learning Activity</b>                                                                                                                                                                                                                                                                                                                    |                 |
| <b>SWAYAM / NPTEL:</b><br>Dr. RizwanRehman, Programming in Python, Dibrugarh University,<br><a href="https://onlinecourses.swayam2.ac.in/cec22_cs20/preview">https://onlinecourses.swayam2.ac.in/cec22_cs20/preview</a>                                                                                                                          |                 |
| <b>Theory</b>                                                                                                                                                                                                                                                                                                                                    | <b>45 Hours</b> |
| <b>Tutorial</b>                                                                                                                                                                                                                                                                                                                                  | <b>- Hours</b>  |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                     | <b>45 Hours</b> |
| <b>Text Book:</b>                                                                                                                                                                                                                                                                                                                                |                 |
| 1. 1. Thareja, R., Python Programming using Problem Solving Approach, Oxford University Press, 2nd Edition, New Delhi, 2019.                                                                                                                                                                                                                     |                 |
| <b>References:</b>                                                                                                                                                                                                                                                                                                                               |                 |
| 1. McKinney, W., Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Jupyter, O'Reilly Media, 3rd Edition, Sebastopol, 2022.                                                                                                                                                                                                        |                 |
| 2. Lutz, M., Learning Python, O'Reilly Media, 5th Edition, Sebastopol, 2013.                                                                                                                                                                                                                                                                     |                 |
| 3. Matthes, E., Python Crash Course: A Hands-On, Project-Based Introduction to Programming, No Starch Press, 2nd Edition, San Francisco, 2019.                                                                                                                                                                                                   |                 |
| 4. Vasiliev, Y., Python for Data Science: A Hands-On Introduction, No Starch Press, 1st Edition, San Francisco, 2022.                                                                                                                                                                                                                            |                 |
| 5. VanderPlas, J., Python Data Science Handbook: Essential Tools for Working with Data, O'Reilly Media, 1st Edition, Sebastopol, 2016. Severance, C., Python for Everybody: Exploring Data Using Python 3, CreateSpace Independent Publishing, 1st Edition, Michigan, 2016.                                                                      |                 |
| 6. Chen, D.Y., Pandas for Everyone: Python Data Analysis, Addison-Wesley Professional, 1st Edition, Boston, 2018.                                                                                                                                                                                                                                |                 |
| 7. Arora, S. and Deore, P., Hands-On Data Analysis with NumPy and Pandas, Packt Publishing, 1st Edition, Birmingham, 2019.                                                                                                                                                                                                                       |                 |

|                                                                                                                                                                                                                                                                                                                                                                                           |                            |     |     |     |     |     |     |     |                    |      |      |         |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----|-----|-----|-----|-----|-----|-----|--------------------|------|------|---------|------|
| 26HS004                                                                                                                                                                                                                                                                                                                                                                                   | PROFESSIONAL COMMUNICATION |     |     |     |     |     |     |     | L                  | T    | P    | C       |      |
|                                                                                                                                                                                                                                                                                                                                                                                           |                            |     |     |     |     |     |     |     | 1                  | 0    | 2    | 2       |      |
| Prerequisite                                                                                                                                                                                                                                                                                                                                                                              |                            |     |     |     |     |     |     |     | Assessment Pattern |      |      |         |      |
| Basic Communication & Writing skill                                                                                                                                                                                                                                                                                                                                                       |                            |     |     |     |     |     |     |     | CIA                | SEE  |      | Total   |      |
|                                                                                                                                                                                                                                                                                                                                                                                           |                            |     |     |     |     |     |     |     | 50                 | 50   |      | 100     |      |
| Course Objectives                                                                                                                                                                                                                                                                                                                                                                         |                            |     |     |     |     |     |     |     |                    |      |      |         |      |
| <ul style="list-style-type: none"><li>Develop students’ professional communication skills using clear, accurate, and error-free English.</li><li>Enhance students’ ability to communicate effectively through descriptive and narrative forms.</li><li>Develop students’ ability to use English appropriately in business and professional contexts.</li></ul>                            |                            |     |     |     |     |     |     |     |                    |      |      |         |      |
| Course Outcomes (COs)                                                                                                                                                                                                                                                                                                                                                                     |                            |     |     |     |     |     |     |     |                    |      |      |         |      |
| At the end of the course, students will be able to                                                                                                                                                                                                                                                                                                                                        |                            |     |     |     |     |     |     |     |                    |      |      |         |      |
| <ul style="list-style-type: none"><li>Express themselves in a professional manner using error-free language</li><li>Express in both descriptive and narrative formats</li><li>Understand and make effective use of the English Language in Business contexts</li><li>Actively read and comprehend authentic text</li></ul>                                                                |                            |     |     |     |     |     |     |     |                    |      |      |         |      |
|                                                                                                                                                                                                                                                                                                                                                                                           |                            |     |     |     |     |     |     |     |                    |      |      |         |      |
| COs                                                                                                                                                                                                                                                                                                                                                                                       | PO1                        | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9                | PO10 | PO11 | PSO1    | PSO2 |
| CO 1                                                                                                                                                                                                                                                                                                                                                                                      |                            |     |     |     |     |     |     |     | 2                  | 3    | 2    |         |      |
| CO 2                                                                                                                                                                                                                                                                                                                                                                                      |                            |     |     |     |     |     |     |     | 2                  | 3    | 2    |         |      |
| CO 3                                                                                                                                                                                                                                                                                                                                                                                      |                            |     |     |     |     |     |     |     | 2                  | 3    | 2    |         |      |
| CO 4                                                                                                                                                                                                                                                                                                                                                                                      |                            |     |     |     |     |     |     |     | 2                  | 3    | 2    |         |      |
| Articulation Matrix                                                                                                                                                                                                                                                                                                                                                                       |                            |     |     |     |     |     |     |     |                    |      |      |         |      |
| Module 1                                                                                                                                                                                                                                                                                                                                                                                  |                            |     |     |     |     |     |     |     |                    |      |      |         |      |
| Effective Communication                                                                                                                                                                                                                                                                                                                                                                   |                            |     |     |     |     |     |     |     |                    |      |      | 5 Hours |      |
| Listening – conversations, advertisements, expert talks – Speaking – real-life conversations, greetings, telephonic communication – Reading – short stories, articles, autobiographies – Writing – autobiographical writing, blogs, summaries, checklists – Language Development – subject-verb agreement, commonly confused words, reported speech, idiomatic expressions.               |                            |     |     |     |     |     |     |     |                    |      |      |         |      |
| Module 2                                                                                                                                                                                                                                                                                                                                                                                  |                            |     |     |     |     |     |     |     |                    |      |      |         |      |
| Formal and Technical Expression                                                                                                                                                                                                                                                                                                                                                           |                            |     |     |     |     |     |     |     |                    |      |      | 5 Hours |      |
| Listening – podcasts, documentaries – Speaking – oral presentation with visuals, expressing opinions, debates, group discussions – Reading – biographies, travelogues, innovations – Writing – reports, agenda and minutes, formal letters, proposals, job application and resume – Language Development – cause & effect expressions, degrees of comparison, acronyms and abbreviations. |                            |     |     |     |     |     |     |     |                    |      |      |         |      |
| Career Competencies                                                                                                                                                                                                                                                                                                                                                                       |                            |     |     |     |     |     |     |     |                    |      |      | 5 Hours |      |
| Listening – expert and technical talks, recommendations and solutions – Speaking – debates, GDs, professional presentations – Reading – analytical reading of reports and articles – Writing – proposals.                                                                                                                                                                                 |                            |     |     |     |     |     |     |     |                    |      |      |         |      |

| Practical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 30 Hours |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <p><b>Listening</b><br/>         Listen to real-life talks, ads, or expert speeches and summarize key ideas, tone, and purpose.<br/>         Summarize podcasts or documentaries on innovation and social issues, focusing on theme and tone.<br/>         Summarize expert talks, webinars, or panel discussions highlighting key insights and practical takeaways.</p> <p><b>Speaking</b><br/>         Practice greetings, introductions, and telephonic role plays using correct etiquette and clarity.<br/>         Deliver presentations and join debates or discussions using formal communication.<br/>         Deliver professional presentations and participate in debates or GDs on industry or ethical topics.</p> <p><b>Reading</b><br/>         Read short stories or articles to identify main ideas, tone, and writer's perspective.<br/>         Analyze biographies or articles for key ideas, tone, and cause-effect links.<br/>         Analyze technical reports or journal articles for key arguments, data, and recommendations.</p> <p><b>Writing</b><br/>         Compose short autobiographies, blog posts, summaries, or checklists based on given topics.<br/>         Draft reports, proposals, and job applications with clarity and structure.<br/>         Prepare proposals, technical reports, formal emails, resumes, and cover letters.</p> <p><b>Language Development</b><br/>         Reinforce grammar, vocabulary and idiomatic usage through quizzes and practice exercises.<br/>         Practice grammar, connectors, comparisons, and workplace vocabulary<br/>         Practice verbal analogies, phrasal verbs, and vocabulary through quizzes and games</p> |          |
| <b>Term Work Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |          |
| Role Play, Mind Mapping, Data Conversion, Poster Interpretation, JAM (Just a Minute)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |
| <b>Self-Learning Activity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |
| <ol style="list-style-type: none"> <li><b>MOOCs:</b> Online NPTEL English or communication course.<br/> <b>NPTEL link:</b> <a href="https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr26_ed67">https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr26_ed67</a></li> <li><b>MOOC:</b> NPTEL course on Business Communication or English; submit certificate or 150-word summary.<br/> <b>NPTEL link:</b> <a href="https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg128">https://onlinecourses.swayam2.ac.in/e-learning/preview/imb26_mg128</a></li> <li><b>MOOC:</b> NPTEL course on Professional Communication or Workplace English; submit certificate or 150-word reflection.<br/> <b>NPTEL link:</b> <a href="https://onlinecourses.nptel.ac.in/noc26_hs25/preview">https://onlinecourses.nptel.ac.in/noc26_hs25/preview</a></li> <li><b>TED Talk Analysis:</b> Summarize key lessons from a biography or travelogue.</li> <li><b>Review:</b> Draft a report or business letter with proper tone and format.</li> <li><b>Review:</b> Summarize a career-related article or success story (150 words).</li> <li><b>Writing:</b> Draft a formal email, proposal, or report using workplace tone.</li> <li><b>Career Task:</b> Update your LinkedIn profile with skills and certifications; share reflections in class.</li> </ol>                                                                                                                                                                                                                                                                                                                                             |          |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>15 Hours</b> |
| <b>Practical</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>30 Hours</b> |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>45 Hours</b> |
| <b>Textbooks:</b> <ol style="list-style-type: none"> <li>1. Raman, Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford University Press.</li> <li>2. Bailey, Stephen. Academic Writing: A Practical Guide for Students. Routledge, New York, 2011.</li> </ol> <b>References:</b> <ol style="list-style-type: none"> <li>1. Raman, Meenakshi, Sharma, Sangeeta. Technical Communication. Principles and Practice. Oxford University Press, New Delhi, 2014.</li> <li>2. Muralikrishnan &amp; Mishra Sunitha, Communication skills for Engineers 2nd ed. Pearson, Tamil Nadu, India 2011. P. Kiranmai and Rajeevan, Geetha. Basic Communication Skills, Foundation Books, New Delhi, 2013.</li> <li>3. Vesilind Aarne P., Public Speaking and Writing Skills for Engineering Students (2nd Ed), Lakeshore press, 2007</li> <li>4. Richards, Jack C. Interchange Students' Book – 2. Cambridge University Press, New Delhi, 2015.</li> </ol> |                 |



and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal – Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period

### MANUFACTURING TECHNOLOGY

**3 Hours**

Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel -Copper and gold Coins as source of history – Minting of Coins – Beads making-industries Stone beads -Glass beads – Terracotta beads -Shell beads/ bone beads – Archeological evidences – Gem stone types described in Silappathikaram

### Module 2

### AGRICULTURE AND IRRIGATION TECHNOLOGY

**3 Hours**

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.

### SCIENTIFIC TAMIL & TAMIL COMPUTING

**3 Hours**

Development of Tamil language in the fields of science and technology – Emergence of scientific terminology in Tamil – Contributions of scholars and institutions in promoting Scientific Tamil – Tamil computing and digital evolution – Unicode development, Tamil typing systems, and digital archives – Government and institutional initiatives such as Sorkuvai for preserving and promoting Tamil in the digital era.

### Term Work Activity

Assignments, Case Study

**Theory**

**15 Hours**

**Total**

**15 Hours**

### Textbooks:

1. TAMILS AND TECHNOLOGY-Dr.A.Boobalan VRB PUBLISHERS PVT LTD,6/50,Venkatesa Nagar 1 st street,Virukambakkam, Chennai-600 092.

### References:

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation Tamil Nadu) Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
6. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
7. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                          |                    |     |       |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------|-----|-------|---|
| 26HS005                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | தமிழரும் தொழில்நுட்பமும் | L                  | T   | P     | C |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                          | 1                  | 0   | 0     | 1 |
| Prerequisite                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                          | Assessment Pattern |     |       |   |
| இந்திய மற்றும் பிராந்திய வரலாறு/<br>கலாச்சாரம் பற்றிய புரிதல்                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          | CIA                | SEE | Total |   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                          | 40                 | 60  | 100   |   |
| Course Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                          |                    |     |       |   |
| <ul style="list-style-type: none"> <li>• <b>டிஜிட்டல் பாதுகாப்பை ஆய்வு செய்தல்:</b> தமிழ் கணினி, டிஜிட்டல் ஆவணக்காப்பகம் மற்றும் மொழி கருவிகள் ஆகியவை எவ்வாறு கலாச்சார மரபுகளைப் பாதுகாக்கின்றன என்பதை மதிப்பீடு செய்தல்.</li> <li>• <b>நவீன தொழில்நுட்ப பயன்பாட்டை ஆராய்தல்:</b> உலகெங்கிலும் உள்ள தமிழ் சமூகங்கள் தங்களுக்குள் தொடர்புகொள்ள சமூக ஊடகங்கள், மென்பொருள்கள் மற்றும் செயற்கை நுண்ணறிவை (AI) எவ்வாறு பயன்படுத்துகின்றன என்பதை ஆராய்தல்.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                          |                    |     |       |   |
| Course Outcomes (COs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          |                    |     |       |   |
| <p>பாடநெறி முடிவில், மாணவர்கள் பின்வருவனவற்றை செய்யக்கூடியவர்களாக இருப்பார்கள்:</p> <ol style="list-style-type: none"> <li>1. சங்க கால நெசவு மற்றும் மண்பாண்டத் தொழில்நுட்பங்களின் (கருப்பு மற்றும் சிவப்பு மட்பாண்டங்கள் போன்றவை) நுட்பங்களையும் அவற்றின் முக்கியத்துவத்தையும் பகுப்பாய்வு செய்தல்; மட்பாண்டங்களில் உள்ள கீறல் குறியீடுகளின் (Graffiti) விளக்கங்களையும் இதனுள் உள்ளடக்குதல்.</li> <li>2. சங்க கால வீடுகள் மற்றும் நடுகற்கள் முதல் கோவில்களின் (எ.கா., மாமல்லபுரம், சோழர், நாயக்கர்) கட்டடக் கலை விவரங்கள் வரை, பண்டைய தமிழ்நாட்டில் பயன்படுத்தப்பட்ட வடிவமைப்பு மற்றும் கட்டுமானத் தொழில்நுட்பங்களை விவரித்தல் மற்றும் வேறுபடுத்துதல்; மேலும் பல்வேறு காலகட்டங்களில் (செட்டிநாடு மற்றும் இந்தோ-சாராசனிக் கட்டடக்கலை உட்பட) அவற்றின் பரிணாம வளர்ச்சியை ஆராய்தல்.</li> <li>3. முக்கியத் தொழில்கள் சார்ந்த உற்பத்திச் செயல்முறைகளை விளக்குதல்; குறிப்பாகக் கப்பல் கட்டும் கலை, பல்வேறு உலோகவியல் நடைமுறைகள் (இரும்பு உருக்குதல், எஃகு, செம்பு/தங்க நாணயங்கள் தயாரிப்பு) மற்றும் மணி செய்யும் கலையில் (கல், கண்ணாடி, சுடுமண், சங்கு) பயன்படுத்தப்பட்ட பல்வேறு தொழில்நுட்பங்களை விளக்குதல்.</li> <li>4. பண்டைய மற்றும் இடைக்காலத் தமிழ்ச் சமூகத்தின் தொழில்நுட்ப, வர்த்தக மற்றும் பொருளாதார நிலப்பரப்பை மறுகட்டமைப்பு செய்வதற்கும் புரிந்துகொள்வதற்கும், தொல்லியல் மற்றும் இலக்கியச் சான்றுகளை (சிலப்பதிகாரம் போன்றவை) முதன்மை ஆதாரங்களாகக் கொண்டு மதிப்பிடுதல்.</li> </ol> |                          |                    |     |       |   |

**Articulation Matrix**

| COs  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO 1 | 3   |     | 2   |     |     |     | 2   |     |     | 2    |      |      |      |      |
| CO 2 | 3   | 2   | 2   | 3   | 3   | 3   | 2   |     |     | 2    |      |      |      |      |
| CO 3 | 3   | 2   | 2   |     |     |     |     |     |     | 2    | 3    |      |      |      |
| CO 4 | 3   | 2   | 2   |     |     |     |     |     |     | 2    |      |      |      |      |
| CO 5 | 3   | 2   |     |     | 3   | 3   | 2   |     |     | 2    | 3    |      |      |      |

**Module 1****நெசவு மற்றும் மட்பாண்டத் தொழில்நுட்பம்****3 Hours**

சங்ககாலத்தில் நெசவுத்தொழில்- பாணை தொழில் நுட்பம்- கருப்பு சிவப்பு பாண்டங்கள்- பாண்டங்களில் கீறல் குறியீடுகள்

**வடிவமைப்பு மற்றும் கட்டிட தொழில்நுட்பம்****3 Hours**

சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் -சங்க காலத்தில் வீட்டுப் பொருட்களின் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருள்களும் நடுகல்லும்- சிலப்பதிகாரத்தில் மேடை வடிவமைப்பு பற்றிய விவரங்கள் - மாமல்லபுர சிற்பங்களும் கோவில்களும் -சோழர் காலத்து பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத்தலங்கள்- நாயக்கர் கால கோயில்கள் மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மீனாட்சியம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால்-செட்டிநாட்டு வீடுகள் -பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ சாரா செனிக் கட்டிடக்கலை

**உற்பத்தித் தொழில்நுட்பம்****3 Hours**

கப்பல் கட்டும் கலை -உலோகவியல் -இரும்பு தொழிற்சாலை- இரும்பு உருக்குதல் ,எஃகு- வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் -நாணயங்கள் அச்சடித்தல்- மணி உருவாக்கும் தொழிற்சாலைகள்- கல்மனைகள், கண்ணாடி மணிகள்- சுடுமண் மணிகள் -சங்கு மணிகள்-எலும்புத் துண்டுகள்- தொல்லியல் சான்றுகள் -சிலப்பதிகாரத்தில் மணிகளின் வகைகள்

**Module 2****வேளாண்மை மற்றும் நீர் பாசனத் தொழில்நுட்பம்****3 Hours**

அணை- ஏரி, குளங்கள், மதகு- சோழர்காலக் குமிழித்தோம்பின் முக்கியத்துவம்- கால்நடை பராமரிப்பு -கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள்- கடல்சார அறிவு - மீன்வளம் -முத்து மற்றும் முத்து குளித்தல் -பெருங் கடல் குறித்த பண்டைய அறிவு- அறிவுசார் சமூகம்

|                                                                                                                                                                                                                   |  |                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------|
| <b>அறிவியல் தமிழ் மற்றும் கணித்தமிழ்</b>                                                                                                                                                                          |  | <b>3 Hours</b>  |
| அறிவியல் தமிழின் வளர்ச்சி -கணித்தமிழ் வளர்ச்சி -தமிழ் நூல்களை மின் பதிப்பு செய்தல்- தமிழ் மென்பொருட்கள் உருவாக்கம் -தமிழ் இணைய கல்விக்கழகம் - தமிழ் மின் நூலகம்- இணையத்தில் தமிழ் அகராதிகள் - சொற் குவைத் திட்டம் |  |                 |
| <b>Term Work Activity</b>                                                                                                                                                                                         |  |                 |
| Assignments, Case Study                                                                                                                                                                                           |  |                 |
|                                                                                                                                                                                                                   |  | <b>Theory</b>   |
|                                                                                                                                                                                                                   |  | <b>15 Hours</b> |
|                                                                                                                                                                                                                   |  | <b>Total</b>    |
|                                                                                                                                                                                                                   |  | <b>15 Hours</b> |
| <b>பாடநூல்கள்:</b>                                                                                                                                                                                                |  |                 |
| 1. தமிழரும் தொழில்நுட்பமும் - டாக்டர் அ. பூபாலன் VRB பதிப்பகம் பிரைவேட் லிமிடெட், 6/50, வெங்கடேசா நகர் 1-வது தெரு, விருகம்பாக்கம், சென்னை - 600 092.                                                              |  |                 |
| <b>துணைநூல்கள்:</b>                                                                                                                                                                                               |  |                 |
| 1. Social Life of Tamils (தமிழர்களின் சமூக வாழ்க்கை) - டாக்டர் கே.கே. பிள்ளை (TNTB & ESC மற்றும் RMRL ஆகியவற்றின் கூட்டு வெளியீடு) - (அச்சில் உள்ளது)                                                             |  |                 |
| 2. Social Life of the Tamils - The Classical Period (தமிழர்களின் சமூக வாழ்க்கை - செவ்வியல் காலம்) - டாக்டர் ச. சிங்காரவேலு (வெளியீடு: உலகத் தமிழாராய்ச்சி நிறுவனம்)                                               |  |                 |
| 3. Historical Heritage of the Tamils (தமிழர்களின் வரலாற்றுப் பாரம்பரியம்) - டாக்டர் ச.வ. சுப்பிரமணியன், டாக்டர் கே.டி. திருநாவுக்கரசு (வெளியீடு: உலகத் தமிழாராய்ச்சி நிறுவனம்)                                    |  |                 |
| 4. The Contributions of the Tamils to Indian Culture (இந்தியப் பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்புகள்) - டாக்டர் ம. வளர்மதி (வெளியீடு: உலகத் தமிழாராய்ச்சி நிறுவனம்)                                           |  |                 |
| 5. கீழடி - 'வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்' (கூட்டு வெளியீடு: தொல்லியல் துறை மற்றும் தமிழ்நாடு பாடநூல் மற்றும் கல்விச் சேவைகள் கழகம், தமிழ்நாடு)                                                          |  |                 |
| 6. Studies in the History of India with Special Reference to Tamil Nadu (இந்திய வரலாற்றாய்வுகள் - தமிழ்நாட்டைச் சிறப்புக்குறிப்பாகக் கொண்டு) - டாக்டர் கே.கே. பிள்ளை (வெளியீடு: நூலாசிரியர்)                      |  |                 |
| 7. பொருநை நாகரிகம் (கூட்டு வெளியீடு: தொல்லியல் துறை மற்றும் தமிழ்நாடு பாடநூல் மற்றும் கல்விச் சேவைகள் கழகம், தமிழ்நாடு)                                                                                           |  |                 |
| 8. Journey of Civilization: Indus to Vaigai (நாகரிகப் பயணம்: சிந்து முதல் வைகை வரை) - இரா. பாலகிருஷ்ணன் (வெளியீடு: RMRL) - துணைநூல். (வெளியீடு: நூலாசிரியர்)                                                      |  |                 |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Experiment 6</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>3 Hours</b>  |
| File operations – reading, writing, and processing text and CSV files.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |
| <b>Experiment 7</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>3 Hours</b>  |
| Exception handling programs with user-defined exceptions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |
| <b>Experiment 8</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>3 Hours</b>  |
| Programs using classes, objects, and inheritance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |
| <b>Experiment 9</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>3 Hours</b>  |
| Numerical computation and data analysis using NumPy and Pandas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |
| <b>Experiment 10</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>3 Hours</b>  |
| Visualization of data using Matplotlib (line, bar, scatter plots).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |
| <b>Practical</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>30 Hours</b> |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>30 Hours</b> |
| <b>References:</b> <ol style="list-style-type: none"> <li>1. McKinney, W., Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Jupyter, O'Reilly Media, 3rd Edition, Sebastopol, 2022.</li> <li>2. Thareja, R., Python Programming using Problem Solving Approach, Oxford University Press, 2nd Edition, New Delhi, 2021.</li> <li>3. Lutz, M., <i>Learning Python</i>, O'Reilly Media, 5th Edition, Sebastopol, 2013.</li> <li>4. Matthes, E., <i>Python Crash Course: A Hands-On, Project-Based Introduction to Programming</i>, No Starch Press, 2nd Edition, San Francisco, 2019.</li> <li>5. Vasiliev, Y., Python for Data Science: A Hands-On Introduction, No Starch Press, 1st Edition, San Francisco, 2022.</li> <li>6. VanderPlas, J., Python Data Science Handbook: Essential Tools for Working with Data, O'Reilly Media, 1st Edition, Sebastopol, 2016. Severance, C., Python for Everybody: Exploring Data Using Python 3, CreateSpace Independent Publishing, 1st Edition, Michigan, 2016.</li> <li>7. Chen, D.Y., Pandas for Everyone: Python Data Analysis, Addison-Wesley Professional, 1st Edition, Boston, 2018.</li> <li>8. Arora, S. and Deore, P., Hands-On Data Analysis with NumPy and Pandas, Packt Publishing, 1st Edition, Birmingham, 2019</li> </ol> |                 |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Experiment 9</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>3 Hours</b>  |
| Validate a feedback form using JavaScript.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |
| <b>Experiment 10</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>3 Hours</b>  |
| Develop a mini-project integrating HTML, Tailwind CSS, and JavaScript (e.g., product showcase, quiz app, or to-do list).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |
| <b>Practical</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>30 Hours</b> |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>30 Hours</b> |
| <b>References:</b> <ol style="list-style-type: none"> <li>1. Duckett, J., HTML &amp; CSS: Design and Build Websites, Wiley, 1st Edition, 2011.</li> <li>2. Haverbeke, M., Eloquent JavaScript, No Starch Press, 3rd Edition, 2018.</li> <li>3. Wathan, A., Refactoring UI / Tailwind CSS Documentation, Tailwind Labs, 1st Edition, 2020.</li> <li>4. Meyer, E.A., CSS: The Definitive Guide, O'Reilly Media, 4th Edition, 2017.</li> <li>5. Nixon, R., Learning PHP, MySQL &amp; JavaScript, O'Reilly Media, 6th Edition, 2021.</li> <li>6. MDN Web Docs – HTML, CSS, and JS Developer Guide, Mozilla Foundation, Online Resource, 2024.</li> </ol> |                 |