



**MANAKULA VINAYAGAR INSTITUTE OF TECHNOLOGY**

Approved by AICTE, New Delhi and Affiliated to Pondicherry University

Accredited by NBA & NAAC 'A' Grade

Kalitheerthalkuppam, Puducherry - 605107

Accredited by



**(An Autonomous Institution)**

**Curriculum & Syllabus**

**For**

**UG Degree Course**

**in**

**B.Tech**

**Computer Science and Engineering**


**R 2025**

**2025-26**

| S.No.        | Category   | AICTE      | PU R-2023  | MIT Proposed CSE R-2025 |
|--------------|--|------------|------------|-------------------------|
| 1            | Humanities and Social Sciences, including Management courses (HS)  | 16         | 13         | 14                      |
| 2            | Basic Science courses (BS)   | 23         | 24         | 18                      |
| 3            | Engineering Science courses including workshop, drawing, basics of electronics/electrical/mechanical/computer etc. (ES)            | 29         | 26         | 29                      |
| 4            | Professional core courses (PC)   | 59         | 68         | 64                      |
| 5            | Professional Elective courses relevant to chosen specialization/branch (PE)  | 12         | 12         | 12                      |
| 6            | Open subjects – Electives from other technical and /or emerging subjects (OE)  | 09         | 09         | 9                       |
| 7            | Project work, seminar and internship in industry or elsewhere (PA)   | 15         | 17         | 16                      |
| 8            | EEC –Employability Enhancement Courses (EEC)   | -          | -          | 0                       |
| 9            | Mandatory Courses (MCC)<br>[Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition] | non-credit | non-credit | non-credit              |
| 10           | Certification Courses(CCC)   | non-credit | non-credit | non-credit              |
| <b>Total</b> |  | <b>163</b> | <b>169</b> | <b>162</b>              |

### SUMMARY OF ALL COURSES

| S.No         | Course Category | I         | II        | III       | IV        | V         | VI        | VII       | VIII      | Total Credits |
|--------------|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------------|
| 1            | HS              | 2         | 3         | 3         | 3         | 3         |           |           |           | 14            |
| 2            | BS              | 4         | 8         | 3         | 3         |           |           |           |           | 18            |
| 3            | ES              | 13        | 12        | 4         |           |           |           |           |           | 29            |
| 4            | PC              |           |           | 12        | 15        | 15        | 15        | 7         |           | 64            |
| 5            | PE              |           |           |           |           |           | 6         | 3         | 3         | 12            |
| 6            | OE              |           |           |           |           | 3         |           | 3         | 3         | 9             |
| 7            | PA              |           |           |           | 1         |           | 1         | 5         | 9         | 16            |
| 8            | EEC             | -         | -         | -         | -         | -         | -         |           |           | -             |
| 9            | MCC*            | -         | -         | -         | -         |           |           |           |           |               |
| 10           | CCC*            |           | -         |           | -         |           | -         |           | -         |               |
| <b>Total</b> |                 | <b>19</b> | <b>23</b> | <b>22</b> | <b>22</b> | <b>21</b> | <b>22</b> | <b>18</b> | <b>15</b> | <b>162</b>    |

  
**Dr.S. PARISELVAM, ME.,Ph.D.,**  
 Professor and Head  
 Dept. of Computer Science & Engineering  
 Manakula Vinayagar Institute of Technology  
 Madagadipet, Puducherry - 605 107.

| SEMESTER I                                  |             |  |          |    |    |    |       |           |       |     |     |
|---|-------------|--|----------|----|----|----|-------|-----------|-------|-----|-----|
| S.No  | Course Code | Course Title   | Category | L  | T  | P  | SL+TW | Credits   | MARKS |     |     |
|   |             |  |          |    |    |    |       |           | IA    | UE  | TM  |
| INDUCTION PROGRAM- Universal Human values-I |             |  |          |    |    |    |       |           |       |     |     |
| THEORY COURSES                              |             |  |          |    |    |    |       |           |       |     |     |
| 1.  | 25UMAT11    | Matrices and Calculus                                    | BS       | 45 | 15 | 0  | 60    | 120/30 =4 | 40    | 60  | 100 |
| 2.  | 25UECT12    | Basic Electronics Engineering                            | ES       | 45 | 0  | 0  | 45    | 90/3 =3   | 40    | 60  | 100 |
| 3.  | 25UHST13    | Universal Human Values-II                                | HS       | 30 | 0  | 0  | 30    | 60/30 =2  | 40    | 60  | 100 |
| 4.  | 25UCST14    | Computational Thinking                                   | ES       | 45 | 0  | 0  | 45    | 90/30 =3  | 40    | 60  | 100 |
| INTEGRATED COURSE                           |             |  |          |    |    |    |       |           |       |     |     |
| 5.  | 25UCSI15    | Problem solving using Python                             | ES       | 45 | 0  | 30 | 45    | 120/30=4  | 50    | 50  | 100 |
| PRACTICAL COURSES                           |             |  |          |    |    |    |       |           |       |     |     |
| 6.  | 25UECP16    | Basic Electronics Engineering Lab                        | ES       | 0  | 0  | 30 | -     | 30/30 =1  | 60    | 40  | 100 |
| 7.  | 25UGEP17    | Fabrication Lab  | ES       | 0  | 0  | 30 | -     | 30/30 =1  | 60    | 40  | 100 |
| 8.  | 25UGEP18    | Design Thinking and Idea Lab                             | ES       | 0  | 0  | 30 | -     | 30/30 =1  | 60    | 40  | 100 |
| EMPLOYABILITY ENHANCEMENT COURSE            |             |  |          |    |    |    |       |           |       |     |     |
| 9.  | 25UPCE11    | Career Development Skills                                | EEC      | 0  | 0  | 30 | -     | 0         | -     | -   | -   |
| MANDATORY COURSES                           |             |  |          |    |    |    |       |           |       |     |     |
| 10.   | 25UMCC11    | IKS–Concepts and applications in Engineering and Science | MCC      | 15 | 0  | 15 |       | 0         | -     | -   | -   |
| 11.   | 25UMCC12    | Holistic Wellness  | MCC      | 0  | 0  | 30 |       | 0         | -     | -   | -   |
| Total                                       |             |  |          |    |    |    |       | 19        | 390   | 410 | 800 |

| SEMESTER II                       |            |  |          |    |    |    |       |           |       |     |     |
|-----------------------------------|------------|--|----------|----|----|----|-------|-----------|-------|-----|-----|
| S.No                              | CourseCode | CourseTitle                              | Category | L  | T  | P  | SL+TW | Credits   | MARKS |     |     |
|                                   |            |  |          |    |    |    |       |           | IA    | UE  | TM  |
| THEORY COURSES                    |            |  |          |    |    |    |       |           |       |     |     |
| 1.                                | 25UMAT21   | Differential Equations and Transforms    | BS       | 45 | 15 | 0  | 60    | 120/30 =4 | 40    | 60  | 100 |
| 2.                                | 25UCST22   | Computer Organization and Architecture   | ES       | 45 | 0  | 0  | 45    | 90/30 =3  | 40    | 60  | 100 |
| 3.                                | 25UPHT23   | Applied Physics for Computing Engineers  | BS       | 45 | 0  | 0  | 45    | 90/30 =3  | 40    | 60  | 100 |
| 4.                                | 25UECT24   | Digital System Design                    | ES       | 30 | 15 | 0  | 45    | 90/30 =3  | 40    | 60  | 100 |
| INTEGRATED COURSES                |            |  |          |    |    |    |       |           |       |     |     |
| 5.                                | 25UCSI25   | Programming in C                         | ES       | 45 |    | 30 | 45    | 120/30=4  | 50    | 50  | 100 |
| 6.                                | 25UHSI26   | Professional Communication for Engineers | HS       | 15 | 0  | 60 | 15    | 90/30 =3  | 50    | 50  | 100 |
| PRACTICAL COURSES                 |            |  |          |    |    |    |       |           |       |     |     |
| 7.                                | 25UPHP27   | Applied Physics Lab                      | BS       | 0  | 0  | 30 | -     | 30/30 =1  | 60    | 40  | 100 |
| 8.                                | 25UECP28   | Digital System Design Lab                | ES       | 0  | 0  | 30 | -     | 30/30 =1  | 60    | 40  | 100 |
| 9.                                | 25UGEP29   | Engineering Graphics and Auto CAD Lab    | ES       | 0  | 0  | 30 | -     | 30/30 =1  | 60    | 40  | 100 |
| EMPLOYABILITY ENHANCEMENT COURSES |            |  |          |    |    |    |       |           |       |     |     |
| 10.                               | 25UPCE21   | Communication Skills                     | EEC      | 0  | 0  | 30 |       | 0         | -     | -   | -   |
| 11.                               | 25UCCC21   | Certification Course I                   | CCC      | 0  | 0  | 0  |       | 0         | -     | -   | -   |
| MANDATORY COURSES                 |            |  |          |    |    |    |       |           |       |     |     |
| 12.                               | 25UMCC21   | IKS in Humanities and Social Science     | MCC      | 15 | 0  | 15 |       | 0         | -     | -   | -   |
| 13.                               | 25UMCC22   | Environmental Science & Sustainability   | MCC      | 0  | 0  | 30 |       | 0         | -     | -   | -   |
| Total                             |            |  |          |    |    |    |       | 23        | 440   | 460 | 900 |

## **SEMESTER–I**

|  |                       |                                       |   |   |             |        |
|--|-----------------------|---------------------------------------|---|---|-------------|--------|
| 25UMAT11   | MATRICES AND CALCULUS | Category                              | L | T | P           | Credit |
|  |                       | BS                                    | 3 | 1 | 0           | 4      |
| <b>Course Prerequisite</b><br>Higher Secondary Level Mathematics   |                       |                                       |   |   |             |        |
| <b>Course Objective</b> <ul style="list-style-type: none"> <li>To understand and gain the knowledge of matrix algebra, partial differentiation, double integration, triple integration and their application, curl, divergence. To familiar with vector differential operators, integral theorems (Green's, Stoke's, Gauss divergence).</li> </ul> |                       |                                       |   |   |             |        |
| <b>SYLLABUS</b>  |                       |                                       |   |   |             |        |
| <b>UNIT I</b>  |                       | <b>MATRICES</b>                       |   |   | <b>(12)</b> |        |
| Eigenvalues and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigen values and Eigenvectors- Cayley-Hamilton Theorem, Diagonalization of matrices. Reduction of a quadratic form to canonical form by orthogonal transformation -Nature of quadratic forms.   |                       |                                       |   |   |             |        |
| <b>UNIT II</b>   |                       | <b>FUNCTIONS OF SEVERAL VARIABLES</b> |   |   | <b>(12)</b> |        |
| Partial derivatives-Total derivative- Differentiation of implicit functions, Change of variables- Jacobians and their properties-Taylor's series for functions of two variables- Maxima and minima, Lagrange's method of undetermined multipliers.   |                       |                                       |   |   |             |        |
| <b>UNIT III</b>  |                       | <b>INTEGRAL CALCULUS</b>              |   |   | <b>(12)</b> |        |
| Multiple Integral – Change of order of integration (Cartesian form). Applications: Areas as a double integral (Cartesian form) – Volume as a triple integral (Cartesian form).   |                       |                                       |   |   |             |        |
| <b>UNIT IV</b>   |                       | <b>VECTOR DIFFERENTIATION</b>         |   |   | <b>(12)</b> |        |
| Scalar and vector valued functions-gradient, tangent plane – directional derivative-divergence and curl- scalar and vector potentials. Statement of vector identities-simple problems.   |                       |                                       |   |   |             |        |
| <b>UNIT V</b>  |                       | <b>VECTOR INTEGRATION</b>             |   |   | <b>(12)</b> |        |
| Line, surface and volume integrals- statements of Green's, Stoke's and Gauss Divergence theorems – verification and evaluation of vector integrals using them.   |                       |                                       |   |   |             |        |
| <b>TOTAL PERIODS: 60</b>   |                       |                                       |   |   |             |        |
| <b>TEXT BOOKS</b>  |                       |                                       |   |   |             |        |
| 1. Veerarajan T., “Engineering Mathematics – I and II”, Tata McGraw-Hill, New Delhi, 2014 and 2015.  |                       |                                       |   |   |             |        |
| 2. Dr. M.K. Venkataraman, “Engineering Mathematics – Volume I and Volume II”, The National   |                       |                                       |   |   |             |        |

Publishing Company, Chennai 2008.

### REFERENCE BOOKS

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43<sup>rd</sup> Edition, 2014.
2. Ramana B.V., “Higher Engineering Mathematics”, Tata McGraw-Hill, New Delhi, 2010.
3. Bali N.P and Manish Goyal., “A Text Book of Engineering Mathematics”, Laxmi Publications(P) Ltd, 2011. Erwin Kreyszig, Advanced Engineering Mathematics (9<sup>th</sup> Edition), John Wiley & Sons, New Delhi, 2011.

### Online Courses/NPTEL/SWAYAM:

1. Differential Equations for Engineers: <https://nptel.ac.in/courses/111106100>
2. Calculus of Several Real Variables: <https://nptel.ac.in/courses/111104125>
3. Engineering Mathematics – I: <https://nptel.ac.in/courses/111105121>
4. Matrix Analysis with Applications: <https://nptel.ac.in/courses/111107112>

### Course Outcome

On the successful completion of the course, students will be able to

|     |   |            |
|-----|---|------------|
| CO1 | Find eigenvalues and eigenvectors, verify the Cayley-Hamilton theorem, and perform orthogonal diagonalization.                                | Apply (K3) |
| CO2 | Compute partial derivatives, determine total derivatives, Jacobians, employ Taylor’s series, and find extremes of functions of two variables. | Apply (K3) |
| CO3 | Demonstrate proficiency in evaluating double integration and triple integration and using them to compute area and volume.                    | Apply (K3) |
| CO4 | Compute gradients, divergence, curl, directional derivatives, and apply vector identities to solve vector field problems.                     | Apply (K3) |
| CO5 | Apply Green’s theorem, Stoke’s theorem and Gauss divergence theorem.  | Apply (K3) |

| CO-PO -Mapping - MATRICES AND CALCULUS |     |     |     |     |     |     |     |     |     |      |      |      |      |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| COs                                    | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| CO1                                    | 3   | 2   | 2   | 2   |     |     |     |     |     | 1    |      | 1    | 1    |
| CO2                                    | 3   | 2   | 2   | 2   |     |     |     |     |     | 1    |      | 1    | 1    |
| CO3                                    | 3   | 2   | 2   | 2   |     |     |     |     |     | 1    |      | 1    | 1    |
| CO4                                    | 3   | 2   | 2   | 2   |     |     |     |     |     | 1    |      | 1    | 1    |
| CO5                                    | 3   | 2   | 2   | 2   |     |     |     |     |     | 1    |      | 1    | 1    |

| Assessment Methodology                                     | Assessment Tools     | Marks     |
|--|----------------------|-----------|
| Test   |                      | 25        |
| Problem based Assignment                                   | Moodle / Google form | 5         |
| Simulation (Python/Matlab/Scilab) Based Project assignment | Demo and viva        | 5         |
| Attendance   |                      | 5         |
| <b>Total</b>   |                      | <b>40</b> |



3

- Basic knowledge about electronic circuits

- To learn the fundamental skills in the construction of electronics circuit design and develop various electronic systems.

**TOTAL PERIODS: 45**

**TEXTBOOKS:**

1. Albert Malvino and David J Bates, “Electronic Principles”, Tata McGraw–Hill, 9<sup>th</sup> Edition, 2021. (Unit 1 & 2)
2. Boylestad, “Electronic Devices and Circuits Theory”, Pearson Education, 11<sup>th</sup> Edition, 2013. (Unit 1, 2 & 3)
3. Morris Mano, “Digital design”, PHI Learning, 4<sup>th</sup> Edition, 2016. (Unit 4)
4. Ramakanth A. Gayakwad, “Op-Amps and Linear Integrated Circuits”, PHI, 4<sup>th</sup> Edition, 2015. (Unit 5)
5. D. Roy Chowdhury, “Linear Integrated Circuits”, New Age International Pvt.Ltd., 5<sup>th</sup> Edition, 2018. (Unit 5)

**REFERENCES:**

1. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, Pearson/PHI, 10<sup>th</sup> Edition, 2010.
2. David A. Bell, “Electronic Devices and Circuits”, Oxford, 5<sup>th</sup> Edition, 2009.
3. S. Salivahanan, Kumar, Vallavaraj, “Electronic Devices and Circuits”, TATA McGraw Hill, 2<sup>nd</sup> Edition, 2003.
4. David A, “Operational Amplifiers & Linear ICs”, Oxford Uni. Press, 3<sup>rd</sup> Edition, 2005. (Unit 5)

**ONLINE / NPTEL Courses:**

1. Introduction to Basic Electronics: <https://archive.nptel.ac.in/courses/122/106/122106025/>
2. Basic Electronics: <https://archive.nptel.ac.in/courses/108/101/108101091/>

**Course Outcome**

On the successful completion of the course, students will be able to

|     |   |                 |
|-----|---|-----------------|
| CO1 | Understand the semiconductor physics of the intrinsic, p, and n materials.        | Understand (K2) |
| CO2 | Understand the function and operation of diodes, transistors and amplifiers.      | Understand (K2) |
| CO3 | Analyze the performance of BJT & FETs and its uses in amplifiers and oscillators. | Analyze (K3)    |
| CO4 | Analyze and design operational amplifier circuits.                                | Analyze (K3)    |
| CO5 | Understand the architecture, functions & their applications of IC 741 OP-Amp.     | Understand (K2) |

**CO-PO Mapping -BASIC ELECTRONICS ENGINEERING**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|

|     |   |   |   |  |   |  |  |  |   |   |  |   |   |
|-----|---|---|---|--|---|--|--|--|---|---|--|---|---|
| CO1 | 3 | 2 | 2 |  | 2 |  |  |  | 1 | 1 |  | 1 | 1 |
| CO2 | 3 | 2 | 2 |  | 2 |  |  |  | 1 | 1 |  | 1 | 1 |
| CO3 | 3 | 2 | 2 |  | 2 |  |  |  | 1 | 1 |  | 1 | 1 |
| CO4 | 3 | 2 | 2 |  | 2 |  |  |  | 1 | 1 |  | 1 | 1 |
| CO5 | 3 | 2 | 2 |  | 2 |  |  |  | 1 | 1 |  | 1 | 1 |

| <b>Assessment Methodology</b>                              | <b>Assessment Tools</b> | <b>Marks</b> |
|--|-------------------------|--------------|
| Test   |                         | 25           |
| Problem based Assignment                                   | Moodle / Google form    | 5            |
| Simulation (Python/Matlab/Scilab) Based Project assignment | Demo and viva           | 5            |
| Attendance   |                         | 5            |
| <b>Total</b>   |                         | <b>40</b>    |

|                 |                                    |                 |          |          |          |               |
|-----------------|------------------------------------|-----------------|----------|----------|----------|---------------|
| <b>25UHST13</b> | <b>UNIVERSAL HUMAN VALUES - II</b> | <b>Category</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>Credit</b> |
|                 |                                    | <b>HS</b>       | <b>2</b> | <b>0</b> | <b>0</b> | <b>2</b>      |

**Course Objective:**

- To highlight the plausible implications of such a holistic understanding in terms of ethical human conduct, trustful, mutually fulfilling human behaviour, and mutually enriching interaction with Nature.

| <b>SYLLABUS</b>  |            |
|--|------------|
| <b>UNIT I INTRODUCTION TO VALUE EDUCATION</b>  | <b>(6)</b> |
| Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity the Basic Human Aspirations, Happiness and Prosperity Current Scenario, Method to Fulfil the Basic Human Aspirations. |            |
| <b>UNIT II HARMONY IN THE HUMAN BEING</b>  | <b>(6)</b> |
| Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.  |            |
| <b>UNIT III HARMONY IN THE FAMILY AND SOCIETY</b>  | <b>(6)</b> |
| Harmony in the Family, the Basic Unit of Human Interaction, Trust, Foundational Value in Relationship, Respect, Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.  |            |
| <b>UNIT IV HARMONY IN THE NATURE/EXISTENCE</b>   | <b>(6)</b> |
| Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence. Describing, Defining, Classifying, providing examples or evidence, writing introduction and conclusion.            |            |
| <b>UNIT V IMPLICATIONS OF THE HOLISTIC UNDERSTANDING</b>   | <b>(6)</b> |
| Natural Acceptance of Human Values, Definitive- ness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Hu- man Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-   |            |

Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

**TOTAL PERIODS: 30**

**TEXT BOOKS:**

1. Premvir Kapoor, "Professional Ethics and Human Values", Khanna Book Publishing Company, New Delhi, 2022.
2. R R Gaur, R Asthana, G P Bagaria, "The Textbook - A Foundation Course in Human Values and Professional Ethics", Excel Books, New Delhi, 2nd Revised Edition, 2019.
3. RR Gaur, R Asthana, G P Bagaria, "The Teacher's Manual- Teachers Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, 2019.

**REFERENCES:**

1. Annie Leonard, "The Story of Stuff", 2011.
2. A.N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. Mohandas Karamchand Gandhi, "The Story of My Experiments with Truth", FP classic, 2009.
4. A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, "Van Vidya: Ek Parichaya", 1999.

**Course Outcome**

On the successful completion of the course, students will be able to

|     |  |                 |
|-----|--|-----------------|
| CO1 | Understand holistic vision of life.  | Understand (K2) |
| CO2 | Enhance socially responsible behavior.   | Understand (K2) |
| CO3 | Understand the responsibility of environmental work.                           | Understand (K2) |
| CO4 | Understand the Competence and Capabilities for Maintaining Health and Hygiene. | Understand (K2) |
| CO5 | Appreciate the aspiration for excellence (merit) and gratitude for all.        | Understand (K2) |

| CO-PO Mapping - UNIVERSAL HUMAN VALUES II |     |     |     |     |     |     |     |     |     |      |      |      |      |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| COs                                       | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| CO1                                       | –   | –   | –   | –   | 2   | 2   | 3   | 2   | –   | –    | 2    | –    | 2    |
| CO2                                       | –   | –   | –   | –   | 3   | 2   | 3   | 3   | 2   | –    | 2    | –    | 2    |
| CO3                                       | –   | –   | –   | –   | 2   | 3   | 3   | 2   | –   | –    | 2    | –    | 2    |
| CO4                                       | 1   | –   | –   | –   | 2   | –   | 2   | 2   | 2   | –    | –    | –    | 2    |
| CO5                                       | 1   | –   | –   | –   | –   | 2   | 2   | 3   | 2   | –    | 2    | –    | 2    |

| Assessment Methodology       | Assessment Tools                 | Marks     |
|------------------------------|----------------------------------|-----------|
| Test                         |                                  | 25        |
| Case study analysis          | Group discussion and report      | 5         |
| Value-based project proposal | Presentation and peer evaluation | 5         |
| Attendance                   |                                  | 5         |
| <b>Total</b>                 |                                  | <b>40</b> |

|   |                        |          |   |   |   |        |
|---|------------------------|----------|---|---|---|--------|
| 25UCST14  | COMPUTATIONAL THINKING | Category | L | T | P | Credit |
|   |                        | ES       | 3 | 0 | 0 | 3      |
| <b>Course Prerequisite</b><br>Higher Secondary Level Mathematics and General computer usage.  |                        |          |   |   |   |        |
| <b>Course Objective</b><br>To develop computational thinking skills through understanding data, pattern recognition, algorithms, decomposition, abstraction, modeling, and complexity analysis in problem-solving and automation. |                        |          |   |   |   |        |

| <b>SYLLABUS</b>   |  |
|---|--|
| <b>UNIT I INTRODUCTION TO COMPUTATIONAL THINKING (9)</b>  | Understanding the concepts: Decomposition, pattern recognition / data representation, generalization / abstraction and Algorithms. Complexity, Modeling, Automation, Analysis, visualization.  |
| <b>UNIT II UNDERSTANDING DATA AND PATTERN RECOGNITION (9)</b>   | Performing analytics on numeric data using any spreadsheet software and visualizing the data using charts, histograms, scatter plots, graphs, Logical thinking – reasoning, Pattern recognition in data, data sequences, puzzles, nonograms. Data Encryption – ciphering sentences and Compression |
| <b>UNIT III DECOMPOSITION AND ALGORITHMIC THINKING (9)</b>  | Decomposition, Algorithmic thinking – creating oral algorithms for everyday tasks – visualizing algorithms through sequence of steps, pseudocode, flow charts, selection, iteration, functions and procedures  |
| <b>UNIT IV ABSTRACTION AND MODELING: (9)</b>  | Abstraction and Modeling, Automata and Finite State Machine, Object Description, Objects and Objects based modeling – Repair, Reuse, Recycle.  |
| <b>UNIT V UNDERSTANDING COMPLEXITY: (9)</b>   | Understanding complexity, sorting algorithms, search algorithms, Debugging, enhancing the clarity of a program – documentation, style, idioms, Automation and Simulation, AI, and Computational thinking.  |
| <b>TOTAL PERIODS: 45</b>  |  |
| <b>TEXT BOOKS:</b><br>1. Karl Beecher, Computational Thinking – A Beginner's Guide to Problem-Solving and Programming, BCS Learning, 2017.<br>2. Venkatesh G, Madhavan Mukund, Computational Thinking, Notion Press, 1st Edition, 2021.<br>3. A.DavidD.Riley,KennyA.Hunt, Computational Thinking for the Modern Problem Solver, CRC Press, 2015 |  |

**REFERENCE BOOKS**

1. David Clark, Computational and Algorithmic Thinking Book 2, AMT Publishing, 2016.
2. Paul Curzon, “Computing Without Computers: A Gentle Introduction to Computer Programming, Data Structures, and Algorithms”, 2014.
3. Wang Paul S, From computing to computational thinking, CRC Press, 2016.
4. Peter J. Denning, Matti Tedre, Computational Thinking, MIT Press, 2019.
5. Paolo Ferragina, Fabrizio Luccio, Computational Thinking\_ First Algorithms, Then Code, Springer International Publishing, 2018.
6. Aman Yadav, Ulf Berthelsen, Computational Thinking in Education\_ A Pedagogical Perspective, Routledge, 2021.
7. Zhiwei Xu, Jialin Zhang, Computational Thinking\_ A Perspective on Computer Science, Springer, 2021.

**Course Outcomes**

On the successful completion of the course, students will be able to

|     |  |                 |
|-----|--|-----------------|
| CO1 | Explain the key concepts of decomposition, pattern recognition, abstraction, algorithms, complexity, modeling, automation, and visualization.  | Understand (K2) |
| CO2 | Recall the fundamental concepts of data analytics, visualization techniques, pattern recognition, and basic data encryption methods.   | Remember (K1)   |
| CO3 | Apply decomposition and algorithmic thinking to design and represent algorithms for everyday tasks using pseudocode, flowcharts, and control structures such as selection, iteration, functions, and procedures. | Apply (K3)      |
| CO4 | Apply the concepts of abstraction and modeling to represent systems using automata, finite state machines, and object-based models focusing on repair, reuse, and recycle principles.                            | Apply (K3)      |
| CO5 | Analyze the efficiency of sorting and search algorithms and debug program errors.  | Analyze (K4)    |

**CO-PO Mapping - COMPUTATIONAL THINKING**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 3   | 2   |     |     |     |     |     |     |     | 2    | 3    | 2    | 1    |
| CO2 | 3   |     |     |     | 3   |     |     |     |     |      | 2    | 2    | 1    |
| CO3 | 3   | 3   | 3   | 3   |     |     |     |     |     | 2    | 3    | 2    | 1    |
| CO4 | 3   | 3   | 3   |     |     |     |     |     |     | 3    | 3    | 2    | 1    |
| CO5 | 3   | 3   | 2   | 3   |     |     |     |     | 2   | 2    | 3    | 2    | 1    |



| <b>Assessment Methodology</b> | <b>Assessment Tools</b> | <b>Marks</b> |
|-------------------------------|-------------------------|--------------|
| Test                          |                         | 25           |
| Problem based Assignment      | Moodle/Google form      | 5            |
| Project based                 | Demo and viva           | 5            |
| Attendance                    |                         | 5            |
| <b>Total</b>                  |                         | <b>40</b>    |

|                 |                                     |                 |          |          |          |               |
|-----------------|-------------------------------------|-----------------|----------|----------|----------|---------------|
| <b>25UCSI15</b> | <b>PROBLEM SOLVING USING PYTHON</b> | <b>Category</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>Credit</b> |
|                 |                                     | <b>ES</b>       | <b>3</b> | <b>0</b> | <b>1</b> | <b>4</b>      |

**Course Prerequisite:**

- Basic Programming skills

**Course Objective:**

- To impart the knowledge of Python basic structure, components, object storage, exception handling, and graphics toolkit using Tinker

**SYLLABUS**

**UNIT I INTRODUCTION (9)**

History - Features -basic syntax - Data types - variables - Manipulating Numbers - Text Manipulations - Control Statements- Python Built-in Functions.

**UNIT II COMPONENTS OF PYTHON PROGRAMMING (9)**

Operator Basics - Numbers - String - List - Tuples - Dictionaries - Files - Object Storage - Type Conversion - Type Comparison - Statements – Assignments.

**UNIT III FUNCTIONS AND PACKAGE (9)**

Classes and Objects - creating a class, class methods, class inheritance. Functions Definition and Execution - Arguments - Return Values - Advanced Function Calling - Modules - Importing modules – Packages and Interfaces - Creating a module.

**UNIT IV EXCEPTION HANDLING AND FILES (9)**

Exception Handling- Building in Exceptions- Files, File operations, reading a file content, writing a file, modifying files pos, controlling file I/O, Manipulating file paths.

**UNIT V GUI PROGRAMMING AND GRAPHICS (9)**

GUI Programming toolkits – Introduction to Tkinter – Creating GUI widgets – Resizing – Configuring widget options – Creating Layouts – Radio buttons – Check boxes – Dialog boxes – Drawing using Turtle

**TOTAL PERIODS: 45**

**TEXTBOOKS:**

1. Martin C. Brown, “The Complete Reference - Python”, Tata McGraw Hill Indian Edition, 2010. (UNIT 1-4)
2. Alan D. Moore Python GUI programming with Tkinter: Design and build functional and user-friendly GUI applications,2021. (Unit-5)

**REFERENCES**

1. Wesley J Chun, -Core Python Applications Programming, Prentice Hall, 2012. Eric Matthes, “A Hands-On, Project-Based Introduction to Programming”, 2nd Edition,2019.

**ONLINE/ NPTEL COURSES:**

1. Programming, Data Structures and Algorithms using Python-

|   |  |                |
|---|--|----------------|
| <a href="https://nptel.ac.in/courses/106106145">https://nptel.ac.in/courses/106106145</a><br>2. The Joy of Computing using Python- <a href="https://nptel.ac.in/courses/106106182">https://nptel.ac.in/courses/106106182</a> Python for Data Science- <a href="https://nptel.ac.in/courses/106106212">https://nptel.ac.in/courses/106106212</a> |  |                |
| <b>Course Outcomes:</b><br>On the successful completion of the course, students will be able to   |  |                |
| <b>CO1</b>  | Understand Python's basic concepts, data types, variables, and control statements. | Understand(K2) |
| <b>CO2</b>  | Understand the components of Python programming and storage statements.            | Understand(K2) |
| <b>CO3</b>  | Understand the functions, modules, packages, and interfaces in Python.             | Understand(K2) |
| <b>CO4</b>  | Understand the exception handling techniques and file operations.                  | Understand(K2) |
| <b>CO5</b>  | Develop an application using GUI toolkits and widgets.                             | Apply(K3)      |

#### **PRACTICE EXERCISES:**

1. Identify and solve simple real-life/scientific/technical problems. (Electricity Billing, Retail shop billing, Sin series, etc).
2. Python programming using simple statements and expressions (exchange the values of two variables, circulatethe values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists and tuples.
5. Implementing real-time/technical applications using Sets and dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets &Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of a shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
9. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age, validity, student mark range validation)
10. Exploring Pygame tool. Developing a game activity using Pygame, like bouncing ball, car race, etc.

**TOTAL PERIODS: 15**

**CO PO Mapping - PROBLEM SOLVING USING PYTHON**

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

| Assessment Methodology      | Assessment Tools            | Marks |
|-----------------------------|-----------------------------|-------|
| Theory Test                 |                             | 15    |
| Coding assignments          | Online submission           | 10    |
| Mini project implementation | Code demo and documentation | 10    |
| Model Practical             |                             | 10    |
| Attendance                  |                             | 5     |
| <b>Total</b>                |                             | 50    |

|          |                                     |          |   |   |   |        |
|----------|-------------------------------------|----------|---|---|---|--------|
| 25UECP16 | BASIC ELECTRONICS<br>ENGINEERINGLAB | Category | L | T | P | Credit |
|          |                                     | ES       | 0 | 0 | 2 | 1      |

|  |
|--|
| <b>Course Prerequisite:</b><br>Nil   |
| <b>Course Objective:</b> <ul style="list-style-type: none"> <li>To design and analyze electronic circuits such as diodes, rectifiers, Zener diode, BJT, FET. To verify the basic logic operations and simple arithmetic circuits using logic gates.</li> </ul> |

|  |  |            |
|--|--|------------|
| <b>LIST OF EXPERIMENTS</b> <ol style="list-style-type: none"> <li>Measurement of different signal parameters using oscilloscope.</li> <li>V-I characteristics of an ordinary p-n junction diode.</li> <li>Full wave rectifier, with and without filter.</li> <li>Half-wave rectifier and observe output waveform and measure ripple</li> <li>Zener diode as a voltage regulator.</li> <li>Input and output characteristics of BJT. (CE, CB)</li> <li>Input and output characteristics of FET.</li> <li>Op-Amp based inverting and non-inverting amplifier.</li> <li>Op-Amp based differentiator and integrator.</li> <li>Op-Amp based adder and subtractor.</li> <li>555 timer A stable and Monostable</li> <li>RC phase shift oscillator</li> </ol> <p style="text-align: right;"><b>Total Periods:30</b></p> |  |            |
| <b>Course Outcomes:</b><br>On the successful completion of the course, students will be able to  |  |            |
| CO1  | Understand the characteristics of basic electronic devices. Apply problem-solving skills, recognize and utilize the characteristics of diodes, rectifiers & transistors. | Apply (K3) |
| CO2  | Interpret the Op-Amp-based inverting and non-inverting amplifier circuit.  | Apply (K3) |
| CO3  | Integrate diverse applications of Op-Amp in differentiator, integrator.  | Apply (K3) |
| CO4  | Interpret Op-Amp based inverting adder and subtractor  | Apply (K3) |
| CO5  | Interpret RC phase shift oscillator  | Apply (K3) |

| <b>CO PO Mapping - BASIC ELECTRONICS ENGINEERING LABORATORY</b> |            |            |            |            |            |            |            |            |            |             |             |             |             |
|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| <b>CO</b>   | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PSO1</b> | <b>PSO2</b> |
| 1   | 3          | 2          | 3          | 2          | 3          | 2          | -          | 1          | 1          | -           | 3           | 3           | 2           |
| 2   | 3          | 2          | 3          | 2          | 3          | 2          | -          | 1          | 1          | -           | 3           | 3           | 2           |
| 3   | 3          | 2          | 3          | 2          | 3          | 2          | -          | 1          | 1          | -           | 3           | 3           | 2           |
| 4   | 3          | 2          | 3          | 2          | 3          | 2          | -          | 2          | 1          | -           | 3           | 3           | 2           |
| 5   | 3          | 3          | 3          | 2          | 3          | 2          | -          | 3          | 1          | 3           | 3           | 3           | 2           |

| <b>Assessment Methodology</b> | <b>Assessment Tools</b> | <b>Marks</b> |
|-------------------------------|-------------------------|--------------|
| Laboratory Conduction         | Observation             | 10           |
| Record work                   |                         | 10           |
| Model exam                    |                         | 15           |
| Viva                          |                         | 5            |
| Virtual lab assignment        | Review                  | 10           |
| Attendance                    |                         | 10           |
| <b>Total</b>                  |                         | 60           |

|          |                 |          |   |   |   |        |
|----------|-----------------|----------|---|---|---|--------|
| 25UGEP17 | FABRICATION LAB | Category | L | T | P | Credit |
|          |                 | ES       | 0 | 0 | 2 | 1      |

**Course Prerequisite**

NIL

**Course Objective**

To practice the usage of various tools towards the assembly and disassembly of different items/equipment and modern computer tools and advanced manufacturing/fabrication processes.

**LIST OF EXPERIMENTS**
**(A). Dis-assembly & Assembly Practices**

- i. Tools and its handling techniques.
- ii. Dis-assembly and assembly of home appliances – Grinder Mixer Grinder, Ceiling Fan, Table Fan & Washing Machine.
- iii. Dis-assembly and assembly of Air-Conditioners & Refrigerators.
- iv. Dis-assembly and assembly of a Bicycle.

**(B). Welding Practices**

- i. Welding Procedure, Selection & Safety Measures.
- ii. Power source of Arc Welding – Gas Metal Arc Welding & Gas Tungsten Arc Welding processes.
- iii. Hands-on session of preparing base material & Joint groove for welding.
- iv. Hands-on session of MAW, GMAW, GTAW, on Carbon Steel & Stainless Steel plates/pipes, for fabrication of a simple part.

**(C)Electrical Wiring Practices**

- i. Electrical Installation tools, equipment & safety measures.
- ii. Hands-on session of basic electrical connections for Fuses, Miniature Circuit Breakers and Distribution Box,
- iii. Hands-on session of electrical connections for Lighting, Fans, Calling Bells.
- iv. Hands-on session of electrical connections for Motors & Uninterruptible Power Supply.

**(D)Electronics Components / Equipment Practices**

- i. Electronic components, equipment & safety measures.
- ii. Dis-assembly and assembly of Computers.

|   |
|---|
| iii. Hands-on session of Soldering Practices in a Printed Circuit Breaker.                          |
| iv. Hands-on session of Bridge Rectifier, Op-Amp and Transimpedance amplifier.                      |
| v. Hands-on session of integration of sensors and actuators with a Microcontroller.                 |
| vi. Demonstration of Programmable Logic Control Circuit.  |
| <b>(E). Contemporary Systems</b>  |
| i. Demonstration of Solid Modelling of components.  |
| ii. Demonstration of Assembly Modelling of components.  |
| iii. Fabrication of simple components/parts using 3D Printers.                                      |
| iv. Demonstration of cutting of wood/metal in different complex shapes using Laser Cutting Machine. |
| <b>Total Periods:30</b>   |

**Course Outcomes:**

On the successful completion of the course, students will be able to

|     |  |                 |
|-----|--|-----------------|
| CO1 | Assemble and disassemble various items/equipment.  | Understand (K2) |
| CO2 | Make simple parts using suitable welding processes.  | Apply (K3)      |
| CO3 | Set up wiring of distribution boards, machines, etc.   | Apply (K3)      |
| CO4 | Utilize the electronic components to fabricate simple equipment, aided with sensors and actuators. | Apply (K3)      |
| CO5 | Take advantage of modern manufacturing practices   | Apply (K3)      |

**CO PO Mapping - FABRICATION LAB**

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



| <b>Assessment Methodology</b> | <b>Assessment Tools</b> | <b>Marks</b> |
|-------------------------------|-------------------------|--------------|
| Laboratory Conduction         | Observation             | 10           |
| Record work                   |                         | 10           |
| Model exam                    |                         | 15           |
| Viva                          |                         | 5            |
| PCB design and fabrication    | Working prototype demo  | 5            |
| 3D Model contest              | Review                  | 5            |
| Attendance                    |                         | 10           |
| <b>Total</b>                  |                         | 60           |

|          |                              |          |   |   |   |        |
|----------|------------------------------|----------|---|---|---|--------|
| 25UGEP18 | DESIGN THINKING AND IDEA LAB | Category | L | T | P | Credit |
|          |                              | ES       | 0 | 0 | 2 | 1      |

#### Course Prerequisite

- Basic Knowledge of Science and interest in creative problem solving

#### Course Objective

- To introduce students to the principles, methodologies, and frameworks of design thinking for solving real-world problems. To cultivate user-centric, empathetic, and creative thinking through experiential learning and hands-on activities.

| Syllabus   |            |
|--|------------|
| <b>UNIT I FUNDAMENTALS OF DESIGN THINKING</b>  | <b>(6)</b> |
| Design Thinking Process: Types of the thinking process, Common methods to change the human thinking process, Design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, the need of design thinking; An approach to design thinking, Design thinking Process model, Design thinking tools.<br><b>Case Studies:</b> General, Engineering and Service applications<br><b>Activities:</b> Identify Opportunity and Scope of the Project. Explore the possibilities and prepare a design brief   |            |
| <b>UNIT II: EMPATHIZE AND DEFINE</b>   | <b>(6)</b> |
| Design thinking phases, how to empathize, Role of empathy in design thinking, the purpose of empathy maps, Things to be done prior to empathy mapping, Activities during and after the session, Understanding empathy tools: Customer Journey Map, Personas.<br><b>Define-</b> Methods of Define Phase: Storytelling, Critical items diagrams, Define success<br><b>Activities:</b> Apply the methods of empathizing and Define Phases Finalize the problem statement  |            |
| <b>UNIT III IDEATION</b>   | <b>(6)</b> |
| Challenges in idea generation, Visualize, Empathize, and Ideate method, Importance of visualizing and empathizing before ideating, Applying the method, Create Thinking, Generating Design Ideas, Lateral Thinking, Analogies, Brainstorming, Mind mapping, National Group Technique, Synectic's, Development of work, Analytical Thinking, Group Activities. Ideation Tools: How Might We? (HMW), Storyboard, Brainstorming. What is design innovation? A mindset for innovation, and asking "What if?" asking "What wows?" and "What works?"<br><b>Activities-</b> Apply the methods of Ideate Phase: Generate Lots of Ideas |            |
| <b>UNIT IV PROTOTYPING</b>   | <b>(6)</b> |
| What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products; Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype.<br><b>Activities:</b> Apply the Methods of the Prototype Phase: Create prototypes for selected ideas   |            |

**UNIT V TESTING PROTOTYPES****(6)**

Prototyping for digital products: What's unique for digital products, Preparation; Prototyping for physical products: What's unique for physical products, Preparation; Testing prototypes with users. Create a Pitch-Plan for scaling up-Road map for Implementation, Fine-tuning and Submission of the project report

**Activities:** Collect feedback; iterate and improve ideas  
Present your solution using the Storytelling method

**Total Periods:30****TEXTBOOKS:**

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd.
2. IdrisMootee, Design Thinking for Strategic Innovation,2013, John Wiley & Sons Inc

**REFERENCE BOOKS**

1. Peter G. Rowe, Design Thinking: Understanding How Designers Think and Work, MIT Press, 1991.
2. Don Norman, The Design of Everyday Things, Basic Books, 2013.
3. Tom Kelley and David Kelley, Creative Confidence: Unleashing the Creative Potential within Us All, Crown Business, 2013.
4. Todd Zaki Warfel, Prototyping: A Practitioner's Guide, Rosenfeld Media, 2009.
5. Clive L. Dym, Patrick Little, Elizabeth J. Orwin, Engineering Design: A Project-Based Introduction, Wiley, 2011.
6. Karl T. Ulrich and Steven D. Eppinger, Product Design and Development, McGraw-Hill Education, 2015.
7. Charles Platt, Make: Electronics: Learning Through Discovery, Maker Media, 2011.

**Course Outcome**

On the successful completion of the course, students will be able to

|     |   |                 |
|-----|---|-----------------|
| CO1 | Understand the fundamentals of design thinking, including its origin, process models, and tools, and apply them to identify opportunities and develop a design brief. | Understand (K2) |
| CO2 | Apply empathy tools and defining methods to understand user needs and formulate clear problem statements in design thinking.  | Apply (K3)      |
| CO3 | Generate creative and innovative ideas using ideation techniques such as brainstorming, mind mapping, and lateral thinking.   | Apply (K3)      |
| CO4 | Apply prototyping techniques to translate ideas into tangible models through iterative development of low-fidelity prototypes.  | Apply (K3)      |
| CO5 | Interpret feedback from prototype testing and iteratively improve the design to better align with user needs.   | Analyze (K4)    |

| <b>CO-PO Mapping - DESIGN THINKING AND IDEA LAB</b> |            |            |            |            |            |            |            |            |            |             |             |             |             |
|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| <b>Cos</b>  | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PSO1</b> | <b>PSO2</b> |
| CO1   | 3          | 2          | 3          | –          | –          | –          | –          | –          | 1          | 2           | 2           | 2           | 2           |
| CO2   | 2          | 3          | 3          | –          | –          | 2          | –          | 1          | 2          | 2           | 2           | 2           | 2           |
| CO3   | 2          | 3          | 3          | –          | –          | 2          | –          | 1          | 2          | 2           | –           | 2           | 2           |
| CO4   | 2          | 2          | 3          | 2          | 2          | –          | –          | 2          | 2          | 3           | 2           | 2           | 2           |
| CO5   | 2          | 3          | 3          | 1          | 2          | 1          | 2          | 1          | 2          | –           | 3           | 2           | 2           |

| <b>Assessment Methodology</b> | <b>Assessment Tools</b> | <b>Marks</b> |
|-------------------------------|-------------------------|--------------|
| Laboratory Conduction         | Observation             | 10           |
| Record work                   |                         | 10           |
| Model exam                    |                         | 15           |
| Viva                          |                         | 5            |
| Virtual lab assignment        | Review                  | 10           |
| Attendance                    |                         | 10           |
| <b>Total</b>                  |                         | <b>60</b>    |

|          |                          |          |   |   |   |        |
|----------|--------------------------|----------|---|---|---|--------|
| 25UPCE11 | CAREER DEVELOPMENTSKILLS | Category | L | T | P | Credit |
|          |                          | EEC      | 0 | 0 | 2 | 0      |

**Prerequisite:** Basic communication skills and foundational knowledge of workplace behaviour

**Preamble/ Course Objective**

To empower students with the skills for self-discovery, goal achievement, effective time management, and personal effectiveness, alongside foundational knowledge in career planning, emotional intelligence, higher education, competitive exams, and entrepreneurship

## SYLLABUS

|   |            |
|---|------------|
| <b>UNIT1</b>  | <b>(6)</b> |
| <b>Career Planning:</b> Introduction to Career Planning - Self-Assessment for Career Planning - Exploring Career Options- Developing a Career Plan;<br><b>Goal Settings:</b> Understanding Goal Setting - Setting Effective Goals - Action Plan Development - Practical Exercises   |            |
| <b>UNIT 2</b>   | <b>(6)</b> |
| <b>Motivation</b> – I:Definition and Importance of Motivation - Types of Motivation - Theories of Motivation - Factors Affecting Motivation<br><b>Personality Effectiveness:</b> Components of Personality Effectiveness - Communication Skills - /Interpersonal Skills - Practical Exercises<br><b>Building Personality and Discipline:</b> Introduction to Personality Development - Building Positive Habits - Discipline and Self-Control - Practical Application   |            |
| <b>UNIT 3</b>   | <b>(6)</b> |
| <b>Grooming, hygiene and Cleanliness:</b> Personal Hygiene Practices - Body Grooming Techniques - Environmental Cleanliness - Mental and Social Impact of Grooming and Hygiene.<br><b>Attitudes, Manners and Behaviour:</b> Understanding Attitudes - Developing Positive Attitudes - Manners and Etiquette - Procedures and Protocols  |            |
| <b>UNIT 4</b>   | <b>(6)</b> |
| <b>Self- Awareness &amp; Self Confidence:</b> Introduction to Self-Awareness- Understanding Strengths and Weaknesses- Building Self-Confidence- Practical Application<br><b>Time Management:</b> Introduction to Time Management - Planning and Prioritizing Tasks-Overcoming Procrastination- Practical Time Management<br><b>Stress Management:</b> Understanding Stress- Stress Management Techniques-Coping Strategies- Practical Application<br><b>Emotional Intelligence:</b> Introduction to Emotional Intelligence- Managing Emotions- Social Awareness and Relationship Management-Practical Exercises |            |

UNIT 5

(6)

Introduction to Higher Education, Competitive exams: Overview of Higher Education- Competitive Exams Overview - Exam Preparation Techniques

Introduction to Entrepreneurship: Understanding Entrepreneurship- Developing a Business Idea - Business Planning

Text Book

1. Soft skills for Managers by Dr. T. KALYANA CHAKRAVATHI

Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education

Reference Book

1. The Emotionally Intelligent Workplace by DANIEL GOLEMAN.

2. Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P. SREEHARI, J SAVITHRI.

3. Top Talking in English (international communication skills) by CHARLES T. RAJENDRA

Soft skills by RAJ LAKSHMI SURYAVANSHI, Gurucool Publishing

Course Outcome

On the successful completion of the course, the students will be able to

|     |   |            |
|-----|---|------------|
| CO1 | Help students assess themselves, explore career options, and set actionable goals through structured planning.                  | Apply (K3) |
| CO2 | Develop motivation, enhance personality effectiveness, and instill discipline for personal and professional growth.             | Apply (K3) |
| CO3 | Build awareness and practice of grooming, hygiene, positive attitudes, manners, and professional behavior.                      | Apply (K3) |
| CO4 | Strengthen self-awareness, time and stress management, and emotional intelligence for balanced personal development.            | Apply (K3) |
| CO5 | Introduce students to higher education paths, competitive exams, and the fundamentals of entrepreneurship and business planning | Apply (K3) |

CO-PO MAPPING- CAREER DEVELOPMENTSKILLS

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 |     |     |     |     |     |     |     | 2   | 2   | 2    | 2    | -    | 1    |
| CO2 |     |     |     |     | 2   |     |     | 2   |     |      | 2    | -    | 1    |
| CO3 |     |     |     |     |     |     | 2   | 2   |     |      | 2    | -    | 1    |
| CO4 |     |     |     |     |     |     |     | 2   | 2   |      | 2    | -    | 1    |
| CO5 |     |     |     |     |     | 2   | 2   |     |     |      | 2    | -    | 1    |

|          |  |          |   |   |   |        |
|----------|--|----------|---|---|---|--------|
| 25UMCC11 | IKS – CONCEPTS AND APPLICATIONS IN ENGINEERING AND SCIENCE | Category | L | T | P | Credit |
|          |  | MCC      | 0 | 0 | 2 | 0      |

#### Course Prerequisite

- Basic understanding of science and engineering fundamentals

#### Course Objective

- Familiarize students with traditional Indian knowledge systems and their scientific foundations
- Explore the integration of ancient wisdom with modern engineering practices
- Understand sustainable technologies and innovations rooted in Indian traditions
- Develop appreciation for indigenous knowledge in solving contemporary challenges
- Foster research mindset towards validating and modernizing traditional practices

### SYLLABUS

#### UNIT I INTRODUCTION TO INDIAN KNOWLEDGE SYSTEMS

Historical overview of Indian Knowledge Systems - Scientific methodology in ancient India - Major texts and scholars: Vedas, Upanishads, Charaka Samhita, Sushruta Samhita - Transmission and preservation of knowledge - Contemporary relevance and global recognition.

#### UNIT II: MATHEMATICS AND ASTRONOMY IN ANCIENT INDIA

Indian contributions to mathematics: Zero, decimal system, trigonometry - Aryabhata, Brahmagupta, Bhaskara's contributions - Astronomical observations and calendar systems - Navigation techniques and geographical knowledge - Applications in modern engineering calculations.

#### UNIT III: METALLURGY, MATERIALS, AND ARCHITECTURE

Ancient Indian metallurgy: Iron pillar of Delhi, Wootz steel - Traditional building materials and techniques - Architectural marvels: Structural engineering principles - Water harvesting and management systems - Sustainable construction practices.

#### UNIT IV: RENEWABLE ENERGY AND CLIMATE CHANGE

Ayurveda: Principles and scientific validation - Traditional agricultural practices and crop management - Biodiversity conservation methods - Food preservation techniques - Biotechnology applications in traditional practices

#### UNIT V: INTEGRATION WITH MODERN SCIENCE AND TECHNOLOGY

Validating traditional knowledge through modern scientific methods - Case studies of successful IKS-modern science integration - Intellectual property and traditional knowledge

|   |  |                 |
|---|--|-----------------|
| protection -Research opportunities and career prospects - Future directions and challenges  |  |                 |
| <b>TEXTBOOKS:</b><br>1. Subhash Kak, “The Nature of Physical Reality”, Mount Meru Publishing, 2016<br>2. B.V. Subbarayappa, “Indian Astronomy: A Source Book”, Nehru Centre, 2008<br>3. Kapila Vatsyayan, “Traditional Indian Art and Culture”, Cambridge University Press, 2015  |  |                 |
| <b>REFERENCE BOOKS &amp; WEB RESOURCES</b><br>1. P.P. Divakaran, “The Mathematics of India: Concepts, Methods, Connections”, Springer, 2018<br>2. S.N. Sen, “Ancient Indian History and Civilization”, New Age International, 2010<br>3. National Mission for Manuscripts - <a href="http://www.namami.gov.in">www.namami.gov.in</a><br>4. Digital Library of Traditional Ecological Knowledge - <a href="http://www.frlht.org">www.frlht.org</a><br>5. CSIR Traditional Knowledge Digital Library - <a href="http://www.tkdil.res.in">www.tkdil.res.in</a> |  |                 |
| <b>Course Outcome</b><br>On the successful completion of the course, students will be able to   |  |                 |
| CO1   | Understand the historical development and scientific basis of Indian Knowledge Systems   | Understand (K2) |
| CO2   | Analyze traditional Indian practices in mathematics, astronomy, metallurgy, and medicine | Analyze (K4)    |
| CO3   | Apply IKS principles to contemporary engineering and scientific problems                 | Apply(K3)       |
| CO4   | Evaluate the sustainability aspects of traditional Indian technologies                   | Evaluate (K5)   |
| CO5   | Create innovative solutions by integrating traditional knowledge with modern science     | Create (K6)     |

| CO PO Mapping - IKS – CONCEPTS AND APPLICATIONS IN ENGINEERING AND SCIENCE |     |     |     |     |     |     |     |     |     |      |      |      |      |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| COs  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| CO1  | 2   | 1   | -   | -   | 1   | -   | 2   | 1   | 2   | 1    | 3    | -    | 2    |
| CO2  | 3   | 2   | 2   | 1   | 2   | -   | 1   | 1   | 2   | 2    | 3    | -    | 2    |
| CO3  | 3   | 3   | 2   | 2   | 2   | 1   | 2   | 2   | 2   | 2    | 2    | -    | 2    |
| CO4  | 2   | 2   | 2   | 2   | 3   | 2   | 3   | 2   | 3   | 3    | 3    | -    | 2    |
| CO5  | 3   | 3   | 3   | 3   | 3   | 2   | 2   | 2   | 3   | 3    | 2    | -    | 2    |



|   |                   |          |   |   |   |        |
|---|-------------------|----------|---|---|---|--------|
| 25UMCC12  | HOLISTIC WELLNESS | Category | L | T | P | Credit |
|   |                   | MCC      | 1 | 0 | 1 | 0      |
| <b>Course Prerequisite</b> <ul style="list-style-type: none"><li>• Nil</li></ul>  |                   |          |   |   |   |        |
| <b>Course Objective</b> <ul style="list-style-type: none"><li>• Foundational concepts of holistic wellness, emphasizing the integration of physical, mental, emotional, and internal well-being. Create a balanced lifestyle that promotes overall health and happiness through practical activities.</li><li>• Explore advanced techniques in mental, emotional, and spiritual well-being, with an emphasis on creating sustainable wellness habits.</li></ul> |                   |          |   |   |   |        |

| SYLLABUS  |
|---|
| <b>UNIT I INTRODUCTION TO HOLISTIC AND PHYSICAL WELLNESS</b><br>Overview of holistic wellness: physical, mental, emotional, and internal health- The importance of balance in overall well-being. Importance of physical activity and exercise- Understanding nutrition and its role in health- Sleep hygiene and its impact on well-being.<br>Hands-on activity: Self-assessment of current wellness status. Designing a personalized fitness and nutrition plan                               |
| <b>UNIT II: MENTAL AND EMOTIONAL WELLNESS:</b><br>Stress management techniques- The role of Yoga, mindfulness and meditation in mental health- Emotional intelligence and its impact on relationships.<br><b>Hands-on activity:</b> Practicing Yoga, mindfulness and emotional regulation exercises.  |
| <b>UNIT III: INTEGRATING WELLNESS PRACTICES:</b><br>Combining physical, mental, emotional, and Internal wellness practices into daily life - Developing a balanced wellness plan.<br><b>Hands-on activity:</b> Creating a comprehensive personal wellness plan.   |
| <b>UNIT IV: EMOTIONAL RESILIENCE AND ADVANCED MINDFULNESS</b><br>Deepening mindfulness practices for enhanced mental clarity- Exploring different forms of meditation (e.g., guided, transcendental, movement-based). Building emotional resilience through positive psychology practices- Cognitive-behavioural strategies for managing stress and anxiety.<br><b>Hands-on activity:</b> Developing and practicing a resilience toolkit. Daily meditation practice and journaling reflections. |
| <b>UNIT V: INTERNAL GROWTH AND SUSTAINING WELLNESS PRACTICES:</b><br>Exploring the deeper aspects of internal wellness and self-actualization- Reflective practices for discovering life purpose and meaning. Strategies for maintaining wellness habits over the long term- Adapting wellness plans to life changes and challenges-<br><b>Hands-on activity:</b> Revising and finalizing a long-term personal wellness plan. Creating a vision board or personal mission statement             |

**TEXTBOOKS:**

1. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
2. Rosenberg, Marshall Bertram., Nonviolent Communication: A Language of Life., Puddle Dancer Press, Encinitas, CA (2015).
3. Patel, Kamlesh. Heartfulness Way: Heart-Based Meditations for Spiritual Transformation, Kamlesh Patel, 2018.

**REFERENCE BOOKS**

1. B.K.S Iyengar., Yoga: The Path to Holistic Health., Dorling Kindersley Limited, City of Publication (2001)
2. Goleman Daniel., Emotional Intelligence., Bloomsbury India, India, (2021).
3. James Allen., As a Man Thinketh., Maple Press, Noida, (2010)
4. Swami Budhanandha., Will power and its development., Advaita Ashrama Mayavati, Pithoragarh, Himalayas from its Publication Department, Calcutta. (2001)
5. Kalderdon Adizes Ichak., What Matters in Life: Lessons I Learned from Opening My Heart ., WS Press, Newtown, PA (2023)
6. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
7. Lipton, Bruce., The Biology of Belief 10th Anniversary Edition: Unleashing the Power of Consciousness, Matter & Miracles, Hay House, Carlsbad (2015).

**WEB RESOURCES**

1. Learning Suryanamskar
2. Yoga for well-being
3. Nutritional Educational contents
4. Introduction to Psychology
5. Guided Meditation
6. Simplified physical exercises instructions
7. Simplified Physical Exercises
8. Life skills and value education
9. James Allen Library

**Course Outcome**

On the successful completion of the course, students will be able to

|     |   |                 |
|-----|---|-----------------|
| CO1 | Understand the basic principles of holistic wellness.<br>Apply strategies for maintaining physical health, including nutrition and exercise | Understand (K2) |
| CO2 | Practice mindfulness techniques to enhance mental and emotional well-being.   | Analyze (K4)    |
| CO3 | Develop a personal wellness plan incorporating various aspects of holistic health.  | Apply (K3)      |
| CO4 | Apply advanced techniques in mindfulness, meditation, and stress management.  | Evaluate (K5)   |
| CO5 | develop resilience and adaptability in maintaining wellness. Refine and sustain a personalized holistic wellness plan.                      | Create (K6)     |

| CO PO Mapping -HOLISTIC WELLNESS |     |     |     |     |     |     |     |     |     |      |      |      |      |
|----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| COs                              | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| CO1                              |     |     |     |     |     | 2   |     | 2   |     |      |      | -    | 2    |
| CO2                              |     |     |     |     |     | 2   |     |     |     |      |      | -    | 2    |
| CO3                              |     |     |     |     |     | 2   |     |     |     |      | 3    | -    | 2    |
| CO4                              |     |     |     |     |     | 2   |     |     |     |      | 3    | -    | 2    |
| CO5                              |     |     |     |     |     | 2   |     |     |     |      | 3    | -    | 2    |

## **SEMESTER–II**

|          |                                       |          |   |   |   |        |
|----------|---------------------------------------|----------|---|---|---|--------|
| 25UMAT21 | DIFFERENTIAL EQUATIONS AND TRANSFORMS | Category | L | T | P | Credit |
|          |                                       | BS       | 3 | 1 | 0 | 4      |

### Course Prerequisite

- Engineering Mathematics-I

### Course Objective

- To introduce mathematical tools to solve first order differentiation equations.
- To gain knowledge of problem-solving techniques of PDE.
- To understand concept of the Laplace transform.
- To inculcate the computation knowledge in Laplace transforms.
- To acquaint with Fourier Transform techniques used in a wide variety of situations involving functions that are not necessarily periodic.

## SYLLABUS

### UNIT I ORDINARY DIFFERENTIAL EQUATIONS (12)

Differential Equations (Higher order): Linear differential equations of higher order – with constant coefficients, the operator D, Euler 's linear equation of higher order with variable coefficients - simultaneous linear differential equations, solution by variation of parameters method.

### UNIT II PARTIAL DIFFERENTIAL EQUATIONS(12)

Formation of partial differential equations- Solutions of standard types of first order partial differential equations- Lagrange's linear equation- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

### UNIT III LAPLACE TRANSFORM (12)

Existence conditions-Transforms of elementary functions- Properties, Transform of unit step function and unit impulse function -Transforms of derivatives and integrals- Transforms of Periodic Functions- Initial and final value theorems.

### UNIT IV INVERSE LAPLACE TRANSFORM (12)

Inverse Laplace Transforms – Properties, Convolution theorem, Application - Solution of ordinary differential equations with constant coefficients -Solution of simultaneous ordinary differential equations.

### UNIT V FOURIER TRANSFORM (12)

Fourier Integral theorem (statement only), Fourier transform and its inverse – Properties, Fourier sine and cosine transform - Properties, Convolution and Parseval's identity.

**TOTAL PERIODS:60**

### TEXTBOOKS:

1. Veerarajan T., "Engineering Mathematics – I and II", Tata McGraw-Hill, New Delhi, 2014 and

2015.

Dr. M.K. Venkataraman, "Engineering Mathematics – Volume I and Volume II", The National Publishing Company, Chennai 2008.

#### REFERENCE BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43<sup>rd</sup> Edition, 2015.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.
3. Bali N.P and Manish Goyal., "A Text Book of Engineering Mathematics", Laxmi Publications(P) Ltd, 2011.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 9<sup>th</sup> Edition, 2011.

#### ONLINE COURSES/NPTEL/SWAYAM:

1. Laplace Transform:<https://nptel.ac.in/courses/111106139>
2. Partial Differential Equations:<https://nptel.ac.in/courses/111101153>
3. Advanced Engineering Mathematics:<https://nptel.ac.in/courses/111107119>

#### Course Outcome

On the successful completion of the course, students will be able to

|     |  |            |
|-----|--|------------|
| CO1 | Solve higher order differential equations  | Apply(K3)  |
| CO2 | Formulate and solve various types of partial differential equations  | Apply (K3) |
| CO3 | Apply Laplace transforms and initial and final value theorems to solve engineering problems involving step, impulse and periodic functions.    | Apply(K3)  |
| CO4 | Apply Laplace transforms to solve ordinary differential equations with constant coefficients and simultaneous ordinary differential equations  | Apply(K3)  |
| CO5 | Apply Fourier transform techniques, including Fourier integral theorem, properties of Fourier transforms, convolution, and Parseval's identity | Apply(K3)  |

#### CO-PO Mapping - DIFFERENTIAL EQUATIONS AND TRANSFORMS

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PS O1 | PS O2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-------|-------|
| CO1 | 3   | 2   | 2   | 2   |     |     |     |     | 1   |      | 1    | 2     | 1     |
| CO2 | 3   | 2   | 2   | 2   |     |     |     |     | 1   |      | 1    | 2     | 1     |
| CO3 | 3   | 2   | 2   | 2   |     |     |     |     | 1   |      | 1    | 2     | 1     |
| CO4 | 3   | 2   | 2   | 2   |     |     |     |     | 1   |      | 1    | 2     | 1     |
| CO5 | 3   | 2   | 2   | 2   |     |     |     |     | 1   |      | 1    | 2     | 1     |

| <b>Assessment Methodology</b>                     | <b>Assessment Tools</b>          | <b>Marks</b> |
|---|----------------------------------|--------------|
| Test  |                                  | 25           |
| Mathematical modeling assignment                  | Analytical solution presentation | 5            |
| Transform applications project<br>(MATLAB/Python) | Demo and viva                    | 5            |
| Attendance  |                                  | 5            |
| <b>Total</b>                                      |                                  | <b>40</b>    |

|          |  |          |   |   |   |        |
|----------|--|----------|---|---|---|--------|
| 25UCST22 | COMPUTER ORGANIZATION AND ARCHITECTURE | Category | L | T | P | Credit |
|          |  | PC       | 3 | 0 | 0 | 3      |

**Course Prerequisite:**

- Computational Thinking

**Course Objective:**

- To learn the basic components of computer, instruction set architecture, memory hierarchy, Input Output Operations, basic processing concept and Pipelining.

**SYLLABUS**

**UNIT 1 BASIC STRUCTURE OF COMPUTER & ISA (9)**

Computer Types - Functional Units –Basic operational Concepts – Memory Location and Addresses-Instruction and Instruction sequencing-Addressing Modes-IA32 Registers –IA32 Addressing –IA 32 instructions-Program flow control –Logic and shift rotate operations.

**UNIT-II INPUT OUTPUT ORGANIZATION (9)**

Accessing I/O Devices-Interrupts-Hardware-Enabling and Disabling Interrupts-Handling Multiple Devices-Exceptions-Direct Memory Access-Buses-Synchronous Bus – Asynchronous Bus-Standard I/O interfaces

**UNIT-III MEMORY SYSTEM (9)**

Basic Concepts – RAM memory-Internal organization of Memory Chip-Static Memory – Dynamic Memory-Read Only Memory –Memory Hierarchy-cache memory-Mapping Functions-Replacement Algorithms-Performance Considerations-Virtual Memory-Secondary Storage.

**UNIT-IV BASIC PROCESSING UNIT(9)**

Fundamental Concepts-Execution of Complete Instruction-Multiple Bus Organization-Hardwired Control-Micro programmed control-Microinstructions-Micro program sequencing-wide branch addressing.

**UNIT-V PIPELINING (9)**

Basic Concepts – Data Hazard – Instruction Hazard-Influence on Instruction Set- Datapath and Control Considerations – Superscalar Operations

**TOTAL PERIODS:45**

**TEXTBOOKS:**

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, “Computer Organization “, Fifth Edition, Tata McGraw-Hill, 2011.

**REFERENCES**

1. M. Morris Mano, “Digital Logic and Computer Design”, Pearson Education, 2016
2. William Stallings, “Computer Organization and Architecture – Designing for Performance”Tenth Edition, Pearson Education, 2016.
3. David A.Patterson and John L.Hennessy, “Computer Organization and Design: The Hardware/Software Interface”, Elsevier,5th Edition, 2014.



|   |   |                 |
|---|---|-----------------|
| <b>WEB RESOURCES:</b>   |   |                 |
| 1. Introduction to Computer Systems and its sub modules:<br><a href="https://nptel.ac.in/courses/106103068">https://nptel.ac.in/courses/106103068</a><br>2. Computer Organization and Architecture: <a href="https://nptel.ac.in/courses/106106166">https://nptel.ac.in/courses/106106166</a><br>3. Computer Organization and Architecture A Pedagogical Aspect:<br><a href="https://nptel.ac.in/courses/106103180">https://nptel.ac.in/courses/106103180</a> |   |                 |
| <b>Course Outcome</b>   |   |                 |
| On the successful completion of the course, students will be able to  |   |                 |
| <b>CO1</b>  | Infer the functional units of computer and basic operations, studying about IA 32 Registers and Addressing modes, Shift/Rotate Instructions.  | Understand (K2) |
| <b>CO2</b>  | Discuss about the Accessing of I/O Devices, Interrupt working principles, Use Of Interrupts in Operating Systems, Pentium Interrupt Structure, Direct Memory Access, Busses, Standard I/O Interfaces. | Understand (K2) |
| <b>CO3</b>  | Discuss the Basic Concepts of memory system, Semiconductor RAM Memories, Read-Only Memories, Memory Hierarchy, Cache Memories, Performance Considerations, Virtual memory, Secondary Storage.         | Understand (K2) |
| <b>CO4</b>  | Infer Some Fundamental Concepts of processing unit ,Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Micro programmed Micro program Control                      | Understand (K2) |
| <b>CO5</b>  | Interpreting the Pipelining Concepts, Data Hazards, Instruction Hazards, Influence On Instructions Sets, Data path and Control Considerations, Superscalar Operations, Performance Considerations     | Understand (K2) |

| <b>CO-PO MAPPING - COMPUTER ORGANIZATION AND ARCHITECTURE</b> |            |            |            |            |            |            |            |            |            |             |             |             |             |
|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| <b>COs</b>  | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PSO1</b> | <b>PSO2</b> |
| CO1   | 3          | 2          | 1          | 1          | -          | -          | -          | -          | -          | -           | -           | 2           | 1           |
| CO2   | 3          | 2          | 1          | 1          | -          | -          | -          | -          | -          | -           | -           | 2           | 1           |
| CO3   | 3          | 2          | 1          | 1          | -          | -          | -          | -          | -          | -           | -           | 2           | 1           |
| CO4   | 3          | 3          | 1          | 1          | -          | -          | -          | -          | -          | -           | -           | 2           | 1           |
| CO5   | 3          | 3          | 1          | 1          | -          | -          | -          | -          | -          | -           | -           | 2           | 1           |

| <b>Assessment Methodology</b>       | <b>Assessment Tools</b> | <b>Marks</b> |
|-------------------------------------|-------------------------|--------------|
| Test                                |                         | 25           |
| Problem based Assignment            | Moodle / Google form    | 5            |
| Simulation Based Project assignment | Demo and viva           | 5            |
| Attendance                          |                         | 5            |
| <b>Total</b>                        |                         | <b>40</b>    |

|          |  |          |   |   |   |        |
|----------|--|----------|---|---|---|--------|
| 25UPHT23 | APPLIED PHYSICS FOR<br>COMPUTING ENGINEERS | Category | L | T | P | Credit |
|          |  | BS       | 3 | 0 | 0 | 3      |

|   |  |
|---|--|
| <b>Course Prerequisite</b>  |  |
| <ul style="list-style-type: none"> <li>Solid-state physics basics, Atomic models and bonding, Semiconductor theory.</li> </ul>  |  |
| <b>Course Objective:</b>  |  |
| <ul style="list-style-type: none"> <li>To make the students understand the importance in studying electrical properties of materials, semiconductor physics, wave function in quantum mechanics and its practical application in technologies. To inculcate an idea of the significance of nanostructures, quantum confinement, ensuing nano device applications and quantum computing.</li> </ul>  |  |
| <b>SYLLABUS</b>   |  |
| <b>UNIT I ELECTRICAL PROPERTIES OF MATERIALS (9)</b>  |  |
| Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential: Bloch theorem – metals and insulators - Energy bands in solids– tight binding approximation - Electron effective mass – concept of hole.                                 |  |
| <b>UNIT II SEMICONDUCTOR PHYSICS (9)</b>  |  |
| Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in Ntype& P-type semiconductors – Carrier transport: Velocity-electric field relations – drift and diffusion transport - Einstein’s relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions - Ohmic contacts – tunnel diode - Schottky diode – MOS capacitor - power transistor. |  |
| <b>UNIT III QUANTUM PHYSICS (9)</b>   |  |
| De Broglie hypothesis of matter waves; properties of matter wave; Wave function; Physical interpretation of wave function; Heisenberg uncertainty principle; non existence of electron in nucleus; Schrodinger ‘s time dependent wave equation; time independent wave equation; Particle trapped in one dimensional infinite potential well, – tunneling (qualitative) - scanning tunneling microscope, Quantum Computing.  |  |
| <b>UNIT IV OPTICAL PROPERTIES OF MATERIALS (9)</b>  |  |
| Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and Semiconductors (concepts only) - photo current in a P- N diode – solar cell –photo detectors - LED – Organic LED – Laser diodes – excitons - quantum confined Stark effect – quantum dot laser.  |  |
| <b>UNIT V NANODEVICES AND QUANTUM COMPUTING (9)</b>   |  |
| Introduction - quantum confinement– quantum structures:quantum wells, wires and dots — band gap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade-resonant-tunneling diode – single electron transistor – quantum cellular automata - Quantum system for information processing - quantum states – classical bits – quantum bits or qubits – CNOT gate -multiple qubits – Bloch sphere –quantum gates – advantage of quantum computing over classical computing                 |  |
| <b>TOTAL PERIODS: 45</b>  |  |

**TEXTBOOKS**

1. Umesh K Mishra & Jasprit Singh, “Semiconductor Device Physics and Design”, Springer, 2008.
  2. Wahab, M.A. “Solid State Physics: Structure and Properties of Materials”. Narosa Publishing House, 2009.
  3. Kasap, S.O. “Principles of Electronic Materials and Devices”, McGraw-Hill Education, 2007
  4. Bhattacharya, D.K. & Poonam, T. —Engineering Physics. Oxford University Press, 2015.
  5. Jasprit Singh, —Semiconductor Devices: Basic Principles, Wiley 2012.
- Garcia, N. & Damask, A. —Physics for Computer Science Students. Springer-Verlag, 2012

**REFERENCES**

1. Charles Kittel, Introduction to Solid State Physics, WileyIndiaEdition, 2019.
2. Y.B.Band and Y. Avishai, Quantum Mechanics with Applications to Nanotechnology and Information Science, Academic Press, 2013.
3. V.V. Mitin, V.A.Kochelap and M.A.Stroscio ,Introduction to Nanoelectronics, Cambridge Univ. Press, 2008.G.W.Hanson, Fundamentals of Nanoelectronics, Pearson Education (Indian Edition) 2009

**Course Outcome**

On the successful completion of the course, students will be able to

|            |  |                 |
|------------|--|-----------------|
| <b>CO1</b> | Understand the effect of periodic potentials on electron motion using Bloch’s theorem, and distinguish between metals, semiconductors, and insulators based on electronic band structure.                  | Understand (K2) |
| <b>CO2</b> | Relate theoretical principles to real-world applications in electronics and IT hardware, fostering the ability to choose and apply suitable semiconductor devices in practical systems.                    | Understand (K2) |
| <b>CO3</b> | Understand and explain the properties of matter waves and particles in a one-dimensional infinite potential well and understand the quantization of energy levels.   | Understand (K2) |
| <b>CO4</b> | Understand the basic mechanisms of light absorption, emission, and scattering in various materials. Explore the function of photo detectors and their application in light-sensing technologies.           | Understand (K2) |
| <b>CO5</b> | Understand classical bits and quantum bits (qubits), and understand their representation using quantum states. Apply basic quantum logic gates, such as the CNOT gate, and explore multi-qubit operations. | Understand (K2) |

| <b>CO-PO Mapping- APPLIED PHYSICS FOR COMPUTING ENGINEERS</b> |            |            |            |            |            |            |            |            |            |             |             |             |             |
|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| <b>COs</b>  | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PSO1</b> | <b>PSO2</b> |
| CO1   | 3          | 3          | 3          | -          | -          | 2          | -          | -          | -          | -           | 2           | -           | 1           |
| CO2   | 3          | 3          | 3          | -          | -          | 2          | -          | -          | -          | -           | 2           | -           | 1           |
| CO3   | 3          | 3          | 3          | -          | -          | 2          | -          | -          | -          | -           | 2           | -           | 1           |
| CO4   | 3          | 3          | 3          | -          | -          | 2          | -          | -          | -          | -           | 2           | -           | 1           |
| CO5   | 3          | 3          | 3          | -          | -          | 2          | -          | -          | -          | -           | 2           | -           | 1           |

| <b>Assessment Methodology</b> | <b>Assessment Tools</b> | <b>Marks</b> |
|-------------------------------|-------------------------|--------------|
| Test                          |                         | 25           |
| MCQ unit wise 10 questions    | Moodle / Google form    | 5            |
| Virtual lab based assignment  | Demo and viva           | 5            |
| Attendance                    |                         | 5            |
| <b>Total</b>                  |                         | <b>40</b>    |

|          |                       |          |   |   |   |        |
|----------|-----------------------|----------|---|---|---|--------|
| 25UECT24 | DIGITAL SYSTEM DESIGN | Category | L | T | P | Credit |
|          |                       | ES       | 2 | 1 | 0 | 3      |

### Course Prerequisite

- Basic knowledge on electronic devices

### Course Objective

- To design combinational logic circuits and Sequential logic circuits, including multiplexers, decoders, encoders, adders, subtractors, flip-flops and Latches. To learn the basics of IoT devices and types of boards.

## SYLLABUS

### UNIT-I BASIC CONCEPTS (9)

Number System: Binary Number Representations – Signed Numbers and Complements, Unsigned, Fixed Point, and Floating-Point numbers. Addition and subtraction with 1's and 2's complements. Codes for detecting and correcting errors: Even and Odd parity codes

### UNIT-II BOOLEAN ALGEBRA (9)

Boolean Algebra: Basic theorems- Postulates- Duality – Boolean Function- Canonical form- Standard form. Simplification of Boolean Function: Karnaugh Map Method. Basic Theorems - Simplification of K-map functions.

### UNIT – III COMBINATIONAL LOGIC DESIGN (9)

Combinational Logic Design: Half adder - Full adder– Parallel Adder- Carry Look Ahead Adder – BCD Adder – Magnitude Comparator – Encoders and Decoders – Multiplexers – Code converters – Parity generator, Parity checker.

### UNIT – IV SEQUENTIAL CIRCUITS (9)

Sequential Circuits: General model of sequential circuits –latches – Master-slave Configuration- Flip-Flops - Concept of State – State diagram – State Table. Design of Synchronous counters- Asynchronous counters- Shift Register- PN Sequence generator.

### UNIT – V PROGRAMMABLE LOGIC DEVICES (9)

Programmable Logic Devices: PROM – EPROM – EEPROM- Programmable Logic Array (PLA) – Programmable Array Logic (PAL) -Realization of combinational circuits using PROM, PLA, and PAL.

**TOTAL PERIODS: 45**

### TEXTBOOK(S)

1. M. Morris Mano and Michael D. Ciletti, Digital Design: With an Introduction to the Verilog HDL and System Verilog, 2018, 6th Edition, Pearson Pvt. Ltd.

### REFERENCE BOOKS

1. Ming-Bo Lin, Digital Systems Design and Practice: Using Verilog HDL and FPGAs, 2015, 2nd Edition, Create Space Independent Publishing Platform.
2. Samir Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, 2009, 2nd edition, Prentice Hall of India Pvt. Ltd.

|   |  |                |
|---|--|----------------|
| 3. Stephen Brown and Zvonko Vranesic, Fundamentals of Digital Logic with Verilog Design, 2013, 3rd Edition, McGraw-Hill Higher Education. |  |                |
| <b>ONLINE/ NPTEL COURSES:</b>   |  |                |
| 1. Digital Circuits: <a href="https://onlinecourses.nptel.ac.in/noc23_ee115">https://onlinecourses.nptel.ac.in/noc23_ee115</a>            |  |                |
| 2. Digital Circuits Design: <a href="https://onlinecourses.nptel.ac.in/noc22_ee110">https://onlinecourses.nptel.ac.in/noc22_ee110</a>     |  |                |
| 3. Microelectronics: Devices to Circuits: <a href="https://nptel.ac.in/courses/108107142">https://nptel.ac.in/courses/108107142</a>       |  |                |
| <b>Course Outcome</b>   |  |                |
| On the successful completion of the course, students will be able to  |  |                |
| <b>CO1</b>  | Understand the application of number representation and basic codes.                                 | Understand(K2) |
| <b>CO2</b>  | Understand Boolean algebra and its foundational theorems and use of the Karnaugh map simplification. | Understand(K2) |
| <b>CO3</b>  | Design and analyse Combinational Logic Design and Programmable Logic Devices.                        | Analyse(K4)    |
| <b>CO4</b>  | Design and construct Combinational Logic circuits and Synchronous Sequential Circuits.               | Analyse(K4)    |
| <b>CO5</b>  | Design and implement combinational logic circuits using PROM, PLA, and PAL                           | Apply(K3)      |

| <b>CO-PO MAPPING - DIGITAL SYSTEM DESIGN</b> |            |            |            |            |            |            |            |            |            |             |             |             |             |
|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| <b>CO</b>                                    | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PSO1</b> | <b>PSO2</b> |
| 1  | 3          | 3          | 2          | -          | -          | -          | -          | -          | -          | -           | 2           | 1           | 1           |
| 2  | 3          | 3          | 3          | 2          | -          | -          | -          | -          | -          | -           | 2           | 1           | 1           |
| 3  | 3          | 3          | 3          | 2          | 2          | -          | -          | -          | -          | -           | 2           | 1           | 1           |
| 4  | 3          | 3          | 3          | 2          | 2          | -          | -          | -          | -          | -           | 2           | 1           | 1           |
| 5  | 3          | 2          | 3          | -          | 2          | -          | -          | -          | -          | -           | 2           | 1           | 1           |

| <b>Assessment Methodology</b>         | <b>Assessment Tools</b> | <b>Marks</b> |
|---------------------------------------|-------------------------|--------------|
| Theory Test                           |                         | 15           |
| Logic design project                  | Hardware implementation | 10           |
| Digital system simulation (TINKERCAD) | Demo and viva           | 10           |
| Model Practical                       |                         | 10           |
| Attendance                            |                         | 5            |
| <b>Total</b>                          |                         | <b>50</b>    |

|          |                  |          |   |   |   |        |
|----------|------------------|----------|---|---|---|--------|
| 25UCSI25 | PROGRAMMING IN C | Category | L | T | P | Credit |
|          |                  | ES       | 3 | 0 | 2 | 4      |

### Course Prerequisite

- Basic programming skills.

### Course Objective

- To impart the knowledge of basic programming constructs of C language, arrays and strings, functions, structures, pointers and input/output file handling.

## SYLLABUS

### UNIT I INTRODUCTION TO PROGRAMMING PARADIGMS: (9)

Introduction to programming paradigms – Applications of C Language – Structure of C program – C programming: Data Types – Constants – Enumeration Constants – Keywords – Operators: Precedence and Associativity – Expressions – Input/Output statements, Assignment statements – Decision making statements – Switch statement – Looping statements – Compilation process.

### UNIT II DECISION MAKING, ARRAYS AND STRINGS(9)

Introduction to Arrays: Declaration, Initialization – One dimensional array – Two dimensional arrays – String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

### UNIT III FUNCTIONS AND POINTERS (9)

Modular programming – Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference.

### UNIT IV STRUCTURES AND UNION (9)

Structure – Nested structures – Pointer and Structures – Array of structures – Self-referential structures – typedef – Union – Storage classes and Visibility.

### UNIT V FILE MANAGEMENT AND DYNAMIC MEMORY ALLOCATION(9)

Files- Types of file processing, I/O Operations of File, Random access file, Command line arguments, Dynamic memory allocation – malloc, calloc, free, Preprocessor directive, Macro substitution, Compiler control directive.

**TOTAL PERIODS: 45**

### TEXTBOOKS:

1. Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2016.
2. E. Balagurusamy, “Programming in C” McGraw-Hill, 8th Edition, 2019.
3. Kernighan, B.W and Ritchie, D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.

**REFERENCE BOOKS:**

2. Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”, 8<sup>th</sup> edition, Pearson Education, 2018.
3. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
4. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, 2<sup>nd</sup> Edition, Oxford University Press, 2013.
5. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, 1st Edition, Pearson Education, 2013

**ONLINE/ NPTEL COURSES:**

1. C for Everyone: Programming Fundamentals- <https://www.coursera.org/learn/c-for-everyone>
2. Art of C programming -[https://onlinecourses.swayam2.ac.in/cec24\\_cs05/preview](https://onlinecourses.swayam2.ac.in/cec24_cs05/preview)
3. Introduction to Programming in C.- [https://onlinecourses.nptel.ac.in/noc22\\_cs40/preview](https://onlinecourses.nptel.ac.in/noc22_cs40/preview)

**Course Outcomes:**

On the successful completion of the course, students will be able to

|     |   |                 |
|-----|---|-----------------|
| CO1 | Demonstrate knowledge on C Programming constructs and develop simple program in C using basic constructs. | Understand (K2) |
| CO2 | Apply arrays and string operations to solve basic problems using C  | Apply (K3)      |
| CO3 | Develop modular programs using functions, recursion, and pointers   | Apply (K3)      |
| CO4 | Implement user-defined data types using structures, unions, and manage memory dynamically.                | Apply (K3)      |
| CO5 | Implement file operations and manage memory dynamically using pointers and preprocessor directives.       | Apply (K3)      |



**PRACTICE EXERCISES:**

1. Study of Compilation and execution of simple C programs
2. Simple computational problems using arithmetic expressions (Arithmetic Operations, Area & circumference of a circle)
3. Problems involving if-then-else structures (ODD/EVEN numbers, Greatest Numbers)
4. Iterative problems e.g., sum of series (Factorial, Sum of Digits)
5. 1D and 2D, multi-dimensional arrays, traversal
6. Matrix problems, String operations (Addition, Subtraction, Multiplication, Palindrome String Operations, String Handling Functions)
7. Simple functions (nCr Program, Swapping using call-by-reference)
8. Programming for solving Numerical methods problems (Palindrome Checking, Searching and Sorting Names)
9. Recursive functions (Factorial using Recursion)
10. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
11. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
12. Files: reading and writing, File pointers, file operations, random access, processor directives

**TOTAL PERIODS: 15****CO-PO Mapping - PROGRAMMING IN C**

| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 3   | 2   | 2   | 1   | 2   | –   | –   | –   | 2   | –    | 1    | 3    | 2    |
| CO2 | 3   | 2   | 3   | 2   | 2   | –   | –   | –   | 1   | –    | 1    | 3    | 2    |
| CO3 | 3   | 2   | 3   | 3   | 2   | –   | –   | –   | 2   | –    | 1    | 3    | 2    |
| CO4 | 3   | 2   | 3   | 3   | 3   | –   | –   | –   | 2   | –    | 1    | 3    | 2    |
| CO5 | 3   | 2   | 3   | 2   | 3   | –   | –   | –   | 2   | –    | 1    | 3    | 2    |

| Assessment Methodology      | Assessment Tools            | Marks     |
|-----------------------------|-----------------------------|-----------|
| Theory Test                 |                             | 15        |
| Coding assignments          | Online submission           | 10        |
| Mini project implementation | Code demo and documentation | 10        |
| Model Practical             |                             | 10        |
| Attendance                  |                             | 5         |
| <b>Total</b>                |                             | <b>50</b> |



|  |   |     |     |     |     |     |     |     |                |      |      |      |      |
|--|---|-----|-----|-----|-----|-----|-----|-----|----------------|------|------|------|------|
| <b>UNIT-IV VISUALIZATION AND CLASSIFICATION (3)</b><br><br>Listening – TED talks Speaking – Interviewing a celebrity/Famous Personality Reading – Company profiles, Business Letters Vocabulary– Discourse Markers, Linking words and Phrases Collocation. Grammar – Pronouns, Conjunction, Preposition Writing – Interpretation of Charts and Graphs<br><b>LAB ACTIVITY:</b> Picture Description, about purchasing a product, Summarizing a TED talk, Role play, Narrating an unforgettable event(12)                                     |   |     |     |     |     |     |     |     |                |      |      |      |      |
| <b>UNIT V EXPRESSION COMMUNICATION (3)</b><br><br>Listening – Watching Movies / Listening to Dialogues and Conversations Speaking – Role play, Panel Discussion, Debate Reading – Blogs, Novels, Short Stories Vocabulary – Phrasal Verbs Grammar– Simple/Compound/Complex Sentences, Error Spotting, Punctuation. Writing – Descriptive Essay, Dialogue Writing<br><b>LAB ACTIVITY:</b> Listening /Reading Comprehension, Developing a story using given Vocabulary, Mini Presentation on General topic (ICT tools), Group Discussion(12) |   |     |     |     |     |     |     |     |                |      |      |      |      |
| <div>THEORY PERIODS: 15</div> <div>PRACTICAL PERIODS: 60</div>   |   |     |     |     |     |     |     |     |                |      |      |      |      |
| <b>TEXTBOOKS</b><br>Technical Communication: Principles and Practice Meenakshi Raman & Sangeeta Sharma Oxford University Press 3rd Edition (or latest)<br>Communication Skills Sanjay Kumar & Pushp Lata, Oxford University Press, 2nd Edition (2015)<br>Effective Technical Communication: M. Ashraf Rizvi, McGraw-Hill Education, 2nd Edition (2017)   |   |     |     |     |     |     |     |     |                |      |      |      |      |
| <b>REFERENCE BOOK</b><br>1. A Course Book on Technical English By Lakshmi Narayanan, Scitech Publications (India) Pvt. Ltd.(English For Technical Communication (With CD) By Aysha Viswamohan, McGraw-Hill Education, ISBN : 0070264244.)<br>2. Effective Communication Skill, Kulbhusan Kumar, R S Salaria, Khanna Publishing House.<br>3. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.   |   |     |     |     |     |     |     |     |                |      |      |      |      |
| <b>Course Outcome</b><br>On the successful completion of the course, students will be able to  |   |     |     |     |     |     |     |     |                |      |      |      |      |
| CO1  | Use appropriate words in a professional context.                                    |     |     |     |     |     |     |     | Understand(K2) |      |      |      |      |
| CO2  | Gain understanding of basic grammatic structures and use them in right context.     |     |     |     |     |     |     |     | Understand(K2) |      |      |      |      |
| CO3  | Speak fluently and accurately in formal and informal communicative contexts         |     |     |     |     |     |     |     | Understand(K2) |      |      |      |      |
| CO4  | Write definitions, descriptions, narrations and essays on various topics            |     |     |     |     |     |     |     | Understand(K2) |      |      |      |      |
| CO5  | Express their opinions effectively in both oral and written medium of communication |     |     |     |     |     |     |     | Analyze(K3)    |      |      |      |      |
| <b>CO-PO MAPPING - PROFESSIONAL COMMUNICATION FOR ENGINEERS</b>  |   |     |     |     |     |     |     |     |                |      |      |      |      |
| COs  | PO1   | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9            | PO10 | PO11 | PSO1 | PSO2 |
| CO1  | 1   | 1   | -   | -   | 2   | -   | -   | -   | -              | 3    | 2    | -    | 2    |
| CO2  | 1   | 2   | -   | -   | 2   | -   | -   | 2   | -              | 3    | 2    | -    | 2    |
| CO3  | 1   | 2   | -   | -   | -   | -   | -   | 1   | -              | 3    | 2    | -    | 2    |
| CO4  | 1   | 3   | -   | -   | 3   | -   | 1   | 2   | -              | 3    | 2    | -    | 2    |
| CO5  | 1   | 2   | -   | -   | 2   | -   | 1   | 3   | -              | 3    | 2    | -    | 2    |

| Assessment Methodology              | Assessment Tools | Marks     |
|-------------------------------------|------------------|-----------|
| Test                                |                  | 15        |
| Listening and reading Comprehension | Online tool      | 5         |
| Speaking assessment ( Oral)         | review           | 10        |
| Online assessment test              | Online tool      | 10        |
| Content creation Competition        | Peer review      | 5         |
| Attendance                          |                  | 5         |
| <b>Total</b>                        |                  | <b>50</b> |

|  |                     |          |   |   |   |        |
|--|---------------------|----------|---|---|---|--------|
| 25UPHP27   | APPLIED PHYSICS LAB | Category | L | T | P | Credit |
|  |                     | BS       | 0 | 0 | 2 | 1      |
| Course Prerequisite: <ul style="list-style-type: none"><li>Knowledge on solid-state physics basics</li></ul>   |                     |          |   |   |   |        |
| Course Objective: <ul style="list-style-type: none"><li>To improve the knowledge about the theory learned in the class. To improve ability to analyze experimental result and write laboratory report.</li></ul> |                     |          |   |   |   |        |

| <b>LIST OF EXPERIMENTS</b>   |  |              |
|--|--|--------------|
| 1. Determination of angle of divergence of a laser beam using laser.<br>2. Determination of particle size of lycopodium powder using semiconductor laser.<br>3. Determination of wavelength of laser light using semiconductor laser diffraction.<br>4. Determination of numerical aperture and acceptance angle in an optical fiber.<br>5. Determination of Dispersive power of a prism using Spectrometer.<br>6. Determination of wavelength of mercury spectrum – spectrometer grating .<br>7. Determination of band gap of a semiconductor.<br>8. Determination of solar cell characteristics. |  |              |
| <b>TOTAL PERIODS: 30</b>   |  |              |
| <b>Course Outcome</b><br>On the successful completion of the course, students will be able to  |  |              |
| <b>CO1</b>   | Perform the experiments based on laser and fiber optics and its characteristics. | Analyse (K4) |
| <b>CO2</b>   | Perform the experiments using a spectrometer.                                    | Analyse (K4) |
| <b>CO3</b>   | Perform experiments on semiconductor devices and analyze their characteristics.  | Analyse (K4) |
| <b>CO4</b>   | Perform experiments on band gap of semiconductor                                 | Analyse (K4) |
| <b>CO5</b>   | Perform experiments on solar cell characteristics.                               | Analyse (K4) |

| <b>CO PO Mapping-APPLIED PHYSICS LAB</b> |            |            |            |            |            |            |            |            |            |             |             |             |             |
|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| <b>COs</b>                               | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PSO1</b> | <b>PSO2</b> |
| <b>CO1</b>                               | 2          | 2          | 2          | 2          | -          | 2          | -          | -          | 1          | -           | 2           | -           | -           |
| <b>CO2</b>                               | 2          | 2          | 2          | 2          | -          | 1          | -          | -          | 1          | -           | 2           | -           | -           |
| <b>CO3</b>                               | 2          | 2          | 2          | 2          | -          | 2          | -          | -          | 1          | -           | 2           | -           | -           |
| <b>CO4</b>                               | 2          | 2          | 2          | 2          | -          | 1          | -          | -          | 1          | -           | 2           | -           | -           |
| <b>CO5</b>                               | 2          | 2          | 2          | 2          | -          | 2          | -          | -          | 2          | -           | 2           | -           | -           |

| <b>Assessment Methodology</b> | <b>Assessment Tools</b> | <b>Marks</b> |
|-------------------------------|-------------------------|--------------|
| Laboratory Conduction         | Observation             | 10           |
| Record work                   |                         | 10           |
| Model exam                    |                         | 15           |
| Viva                          |                         | 5            |
| Virtual lab assignment        | Review                  | 5            |
| STEM based model creation     | Presentation            | 5            |
| Attendance                    |                         | 10           |
| <b>Total</b>                  |                         | <b>60</b>    |

|          |                           |          |   |   |   |        |
|----------|---------------------------|----------|---|---|---|--------|
| 25UECP28 | DIGITAL SYSTEM DESIGN LAB | Category | L | T | P | Credit |
|          |                           | ES       | 0 | 0 | 2 | 1      |

**Course Prerequisite:**

- Basic knowledge on electronic devices

**Course Objective:**

- To design universal logic gates, Boolean expressions, and implement logic circuits. To design and test combinational and sequential circuits, including adders, subtractors, multiplexers, demultiplexers, flip-flops, counters, and shift registers.

### LIST OF EXPERIMENTS

1. Study Of Logic Gates
2. A) Design and Implementation of Adder  
B) Design And Implementation of Subtractor
3. Design And Implementation of Binary to Gray Code and Gray to Binary.
4. Design And Implementation Of 4-Bit Binary Adder/ Subtractor and BCD Adder Using IC7483
4. Design And Implementation 4-Bit Magnitude Comparator Using Logic Gates.
5. Design And Implementation of 4:1 Multiplexer Using Logic Gates.
6. Design And Implementation of Priority Encoder.
7. Study Of Flip-Flops Using Gates
- 8 Design and Implementation of Ring Counter and Johnson Counter Using a Shift Register IC.
9. Design And Implementation 3-Bit Binary Up/Down Counter Using ICs.
10. Simulation Of Combinational Circuits Using LTspice Tools.
11. Design And Implementation Of 4-Bit Adder-Subtractor and BCD Adder Using IC7483

**TOTAL PERIODS: 30**

**Course Outcome**

On the successful completion of the course, students will be able to

|            |   |                |
|------------|---|----------------|
| <b>CO1</b> | Analyze and verify the functionality of basic and universal logic gates.                              | Understand(K2) |
| <b>CO2</b> | Simplify Boolean expressions and implement corresponding digital circuits.                            | Understand(K2) |
| <b>CO3</b> | Design and test combinational circuits such as adders, subtractors, multiplexers, and demultiplexers. | Understand(K2) |
| <b>CO4</b> | Construct and verify sequential circuits including flip-flops, shift registers, and counters.         | Understand(K2) |
| <b>CO5</b> | Simulate and validate digital circuits using VHDL tools.  | Understand(K2) |

**CO PO Mapping**

| <b>COs</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PSO1</b> | <b>PSO2</b> |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| <b>CO1</b> | 2          | 2          | 2          | 2          | -          | 2          | -          | -          | 1          | -           | 2           | 1           | 1           |
| <b>CO2</b> | 2          | 2          | 2          | 2          | -          | 1          | -          | -          | 1          | -           | 2           | 1           | 1           |
| <b>CO3</b> | 2          | 2          | 2          | 2          | -          | 2          | -          | -          | 1          | -           | 2           | 1           | 1           |
| <b>CO4</b> | 2          | 2          | 2          | 2          | -          | 1          | -          | -          | 1          | -           | 2           | 1           | 1           |
| <b>CO5</b> | 2          | 2          | 2          | 2          | -          | 2          | -          | -          | 2          | -           | 2           | 1           | 1           |

| <b>Assessment Methodology</b> | <b>Assessment Tools</b> | <b>Marks</b> |
|-------------------------------|-------------------------|--------------|
| Laboratory Conduction         | Observation             | 10           |
| Record work                   |                         | 10           |
| Model exam                    |                         | 15           |
| Viva                          |                         | 5            |
| Virtual lab assignment        | Review                  | 5            |
| Circuit Construction Task     | demo                    | 5            |
| Attendance                    |                         | 10           |
| <b>Total</b>                  |                         | 60           |



|          |   |          |   |   |   |        |
|----------|---|----------|---|---|---|--------|
| 25UGEP29 | ENGINEERING GRAPHICS AND<br>AUTOCAD LAB | Category | L | T | P | Credit |
|          |   | ES       | 0 | 0 | 2 | 1      |

**Course Prerequisite:**

- Students should have a fundamental understanding of engineering mathematics and basic geometric concepts, including lines, angles, shapes, and spatial visualization skills, typically covered in secondary school education

**Course Objective:**

- To develop knowledge of standard practices in engineering drawing, including lettering, line work, dimensioning, and projection techniques.
- To enable students to construct and interpret conic sections, spirals, involutes, helix curves, and projections of points, lines, planes, and solids.
- To understand the development and intersection of surfaces like cylinder-cylinder and cylinder-cone, essential for fabrication and design.
- To build skills in creating accurate isometric and orthographic projections for effective engineering communication.
- To introduce students to AutoCAD for creating 2D engineering drawings, enhancing their ability to use modern engineering tools.

**LIST OF EXPERIMENTS**

**UNIT-I**

Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning. Conic sections, Involute, Spirals, Helix.

**UNIT-II**

Projection of Points, Lines and planes, Projection of Solids.

**UNIT-III**

Sections of solids and Development of surfaces

**UNIT-IV**

Isometric projections and Conversion of pictorial to Orthographic views

**UNIT-V**

Computer Aided Drafting: Introduction to Computer Graphics and Drafting, AutoCAD, 2-D diagrams of simple geometries using Auto- CAD script.

**TOTAL PERIODS: 30**

**TEXTBOOKS**

- Computer Aided Drafting: Introduction to Computer Graphics and Drafting, AutoCAD, 2-D diagrams of simple geometries using Auto- CAD script.

**REFERENCES**

- N.D.Bhatt, Engineering Drawing, 49<sup>th</sup> edition, Chorotar Publishing House, 2006.
- K.Venugopal, Engineering Drawing and Graphics + AutoCAD, 4<sup>th</sup> edition, New Age International Publication Ltd., 2004.
- David Icook and Robert NMc Dougal, Engineering Graphics and Design with computer applications, Holt – Sounders Int. Edn. 1985.
- James D Bethune and et.al., Modern Drafting, Prentice Hall Int., 1989.

**Web Resources**

- <https://nptel.ac.in/courses/112/103/112103019/>

|  |   |                 |
|--|---|-----------------|
| 2. <a href="https://archive.org/details/engineeringdrawingndbhatt">https://archive.org/details/engineeringdrawingndbhatt</a> |   |                 |
| <b>Course Outcome</b><br>On the successful completion of the course, students will be able to                                |   |                 |
| <b>CO1</b>   | Understand and apply the principles of engineering drawing standards, including lettering, line types, dimensioning, and accurately construct conic sections, spirals, involutes, and helix curves. | Understand (K2) |
| <b>CO2</b>   | Interpret and generate projections of solid objects and their sectional views, aiding in better understanding of internal features in engineering components.                                       | Analyse(K4)     |
| <b>CO3</b>   | Develop the lateral surfaces of solids essential for manufacturing and fabrication processes.   | Analyse(K4)     |
| <b>CO4</b>   | Create and interpret isometric and orthographic projections of engineering objects to effectively communicate design intent.  | Analyse(K4)     |
| <b>CO5</b>   | Utilize computer-aided drafting tools, particularly AutoCAD, to produce accurate 2D engineering drawings of simple geometries, enhancing proficiency in modern engineering software.                | Analyse(K4)     |

| CO PO Mapping |     |     |     |     |     |     |     |     |     |      |      |      |      |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| COs           | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| CO1           | 2   | 2   | 2   | 2   | -   | 2   | -   | -   | 1   | -    | 2    | -    | -    |
| CO2           | 2   | 2   | 2   | 2   | -   | 1   | -   | -   | 1   | -    | 2    | -    | -    |
| CO3           | 2   | 2   | 2   | 2   | -   | 2   | -   | -   | 1   | -    | 2    | -    | -    |
| CO4           | 2   | 2   | 2   | 2   | -   | 1   | -   | -   | 1   | -    | 2    | -    | -    |
| CO5           | 2   | 2   | 2   | 2   | -   | 2   | -   | -   | 2   | -    | 2    | -    | -    |

| Assessment Methodology    | Assessment Tools | Marks     |
|---------------------------|------------------|-----------|
| Laboratory Conduction     | Observation      | 10        |
| Record work               |                  | 10        |
| Model exam                |                  | 15        |
| Viva                      |                  | 5         |
| Virtual lab assignment    | Review           | 5         |
| Circuit Construction Task | demo             | 5         |
| Attendance                |                  | 10        |
| <b>Total</b>              |                  | <b>60</b> |

|          |                      |          |   |   |   |        |
|----------|----------------------|----------|---|---|---|--------|
| 25UPCE21 | COMMUNICATION SKILLS | Category | L | T | P | Credit |
|          |                      | EEC      | 0 | 0 | 2 | 0      |

**Prerequisite: Professional Competency I**

Preamble/ Course Objective: Ability to plan and manage their career paths effectively.

It focuses on developing self-assessment, goal setting, and decision-making skills.

**Course objective:** Students will learn to research career options and align them with personal strengths and values

| SYLLABUS  |     |
|---|-----|
| <b>UNIT 1:</b><br><b>Motivation – II:</b> Intrinsic vs. Extrinsic Motivation- Goal Setting and Achievement - Building and Sustaining Motivation<br><b>Interpersonal skills:</b> Effective Communication - Active Listening - Conflict Resolution - Teamwork and Collaboration   | (6) |
| <b>UNIT 2:</b><br><b>Listening Skills:</b> Roles and Responsibilities in a Team - Building Trust and Respect Among Team Members – Effective Team Communication<br><b>Conversation skills:</b> Starting and Maintaining a Conversation - Non-Verbal Communication Cues- Active Listening and Responding.   | (6) |
| <b>UNIT 3:</b><br><b>Reading Skills:</b> Skimming and Scanning Techniques – Critical reading and Interpretation<br><b>Writing Skills:</b> Grammar and Syntax - Clarity and Conciseness- Audience Awareness  | (6) |
| <b>UNIT 4:</b><br><b>Presentation Speaking Skills:</b> Speech Structure and Organization – Verbal Delivery Techniques<br><b>Public speaking skills:</b> Confidence and overcoming Anxiety –Effective message Delivery<br>SWOT Analysis: Identifying Internal Factors – Analyzing External Factors   | (6) |
| <b>UNIT 5:</b><br><b>Team Building:</b> Roles and Responsibilities in a team – Communication and Trust – Conflict resolution and Problem Solving<br><b>Active Sessions:</b> Debate – Picture Connector  | (6) |
| <b>Text Book</b> <ol style="list-style-type: none"> <li>1. Soft skills for Managers by Dr. T. KALYANA CHAKRAVATHI</li> <li>2. Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education</li> </ol>   |     |
| <b>Reference Book</b> <ol style="list-style-type: none"> <li>3. The Emotionally Intelligent Workplace by DANIEL GOLEMAN.</li> <li>4. Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P. SREEHARI, J SAVITHRI.</li> <li>3. Top Talking in English (international communication skills) by CHARLES T. RAJENDRA</li> </ol> |     |

| 4. Soft skills by RAJ LAKSHMI SURYAVANSHI, Gurucool Publishing           |  |           |
|--|--|-----------|
| <b>Course Outcome</b>  |  |           |
| On the successful completion of the course, the students will be able to |  |           |
| <b>CO1</b>   | Develop sustained motivation and enhance interpersonal skills for effective communication and teamwork.          | Apply(K3) |
| <b>CO2</b>   | Build active listening and conversation skills essential for collaborative and respectful team interactions      | Apply(K3) |
| <b>CO3</b>   | Strengthen reading comprehension and writing clarity through critical analysis and audience-focused expression.  | Apply(K3) |
| <b>CO4</b>   | Improve public speaking and presentation skills while fostering self-assessment through SWOT analysis.           | Apply(K3) |
| <b>CO5</b>   | Promote team collaboration and communication through practical activities like debates and group problem-solving | Apply(K3) |

| CO-PO MAPPING - COMMUNICATION SKILLS |     |     |     |     |     |     |     |     |     |      |      |      |      |
|--------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| COs                                  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| CO1:                                 |     |     |     |     |     |     |     | 2   | 2   | 2    | 2    | -    | 2    |
| CO2:                                 |     |     |     |     |     |     |     |     | 3   | 3    |      | -    | 2    |
| CO3:                                 |     |     |     |     |     |     |     |     |     | 3    |      | -    | 2    |
| CO4:                                 |     |     |     |     |     |     |     | 2   |     | 2    | 2    | -    | 2    |
| CO5:                                 |     |     |     |     |     |     |     |     | 3   | 3    |      | -    | 2    |

|          |                                      |          |   |   |   |        |
|----------|--------------------------------------|----------|---|---|---|--------|
| 25UMCC21 | IKS IN HUMANITIES AND SOCIAL SCIENCE | Category | L | T | P | Credit |
|          |                                      | MCC      | 1 | 0 | 1 | 0      |

**Course Prerequisite:**

- Basic understanding of Indian history and culture

**Course Objective:**

- This course explores Indian Knowledge Systems in the context of humanities and social sciences, providing students with a deeper understanding of India's intellectual heritage.

**Course Outcomes:**

On the successful completion of the course, students will be able to:

|     |   |                 |
|-----|---|-----------------|
| CO1 | Understand the philosophical foundations and methodologies of Indian knowledge systems in the humanities. | Understand (K2) |
| CO2 | Analyze Indian contributions to literature, arts, social organization, and governance systems             | Analyze (K4)    |
| CO3 | Apply principles from Indian philosophical traditions to contemporary social and ethical issues           | Apply (K3)      |
| CO4 | Evaluate the relevance and adaptability of traditional knowledge in modern social contexts                | Evaluate (K5)   |
| CO5 | Create connections between ancient wisdom and contemporary challenges in society                          | Create (K6)     |

**SYLLABUS**

**UNIT I:** Philosophical Foundations of Indian Knowledge Systems - Darshanas (Schools of Philosophy): Samkhya, Yoga, Nyaya, Vaisheshika, Mimamsa, Vedanta - Epistemology in Indian philosophy: Pramanas (means of knowledge) - Ethics and moral philosophy in Indian traditions - Concept of Dharma, Artha, Kama, and Moksha - Comparative study with Western philosophical traditions(3)

**UNIT II:** Indian Literary and Artistic Traditions - Sanskrit literature: Vedas, Upanishads, Puranas, Epics (Ramayana, Mahabharata) - Classical poetry and drama: Kalidasa, Bhartrhari, Bhasa - Regional literature and folk traditions - Indian classical music and dance: Theoretical foundations - Visual arts: Sculpture, painting, and architectural styles - Aesthetics in Indian

tradition: Rasa theory and Alamkara shastra (3)

**UNIT III:** Social Organization and Governance - Ancient Indian social structure and organization - Varna and Ashrama systems: Historical context and evolution - Village self-governance: Panchayati Raj origins - Arthashastra: Principles of statecraft and administration - Justice system: Dharmashastra and Rajadharma - Economic systems: Trade, agriculture, and crafts(3)

**UNIT IV:** Educational Systems and Knowledge Transmission - Gurukula system: Teacher-student relationship - Ancient universities: Nalanda, Takshashila, Vikramshila - Oral tradition and preservation of knowledge - Women's education in ancient India - Integration of spiritual and material learning - Comparison with modern educational approach (3)

**UNIT V:** Contemporary Relevance and Applications - Indian knowledge systems in modern governance - Traditional conflict resolution mechanisms - Environmental consciousness in Indian traditions - Community-based development models - Gender studies: Women in Indian philosophical traditions - Relevance of Indian ethics in corporate governance - Cultural preservation and modernization challenges (3)

### **LEARNING ACTIVITIES**

Research Projects:

1. Philosophical Analysis Project
  - Study of a specific philosophical school
  - Comparison with contemporary thought
  - Presentation of findings
2. Literary Heritage Study
  - Analysis of classical texts
  - Cultural significance evaluation
  - Creative interpretation through modern media
3. Social Systems Research
  - Historical analysis of governance models
  - Contemporary applications study

- ## TEXTBOOKS

- ## REFERENCE BOOKS

[illegible]

|  |   |          |   |   |   |        |
|--|---|----------|---|---|---|--------|
| 25UMCC2<br>2   | ENVIRONMENTAL SCIENCE AND<br>SUSTAINABILITY | Category | L | T | P | Credit |
|  |   | MCC      | 0 | 0 | 2 | 0      |
| Course Prerequisite: <ul style="list-style-type: none"><li>Basic knowledge of chemistry, biology, and physics.</li></ul>   |   |          |   |   |   |        |
| Course Objective: <ul style="list-style-type: none"><li>Understand fundamental concepts of environmental science and ecology</li><li>Analyze environmental problems and their engineering solutions</li><li>Develop awareness about sustainable development and green technologies</li><li>Explore renewable energy systems and waste management strategies</li><li>Foster environmental consciousness and responsible engineering practices</li></ul> |   |          |   |   |   |        |

| <b>SYLLABUS</b>  |
|--|
| <b>UNIT I INTRODUCTION TO ENVIRONMENTAL SCIENCE AND ECOLOG(6)</b><br>Definition, scope and importance of environmental science - Structure and function of ecosystems - Biogeochemical cycles: Carbon, nitrogen, phosphorus, sulfur cycles - Biodiversity and its conservation - Environmental impact assessment principles.                                   |
| <b>UNIT II ENVIRONMENTAL POLLUTION AND CONTROL (6)</b><br>Air pollution: Sources, effects, and control measures - Water pollution: Industrial and domestic sources, treatment methods - Soil pollution: Causes, effects, and remediation techniques - Noise pollution: Sources, effects, and control - Solid waste management: 3R principles, waste-to-energy. |
| <b>UNIT III SUSTAINABLE DEVELOPMENT AND GREEN TECHNOLOGIES(6)</b><br>Concept of sustainable development and SDGs - Life cycle assessment (LCA) principles - Green building concepts and LEED certification - Cleaner production and industrial ecology - Environmental management systems (ISO 14001)  |
| <b>UNIT IV RENEWABLE ENERGY AND CLIMATE CHANGE (6)</b><br>Solar energy systems: Photovoltaic and thermal applications - Wind energy: Technology and site assessment - Hydroelectric and geothermal energy systems - Climate change: Causes, effects, and mitigation strategies - Carbon footprint and carbon trading mechanisms                                |
| <b>UNIT V ENVIRONMENTAL REGULATIONS AND CASE STUDIES(6)</b><br>Environmental laws and regulations in India - Environmental clearance procedures - Corporate environmental responsibility - Case studies of environmental disasters and lessons learned - Future trends in environmental technology   |
| <b>TOTAL PERIODS: 30</b>   |



|   |
|---|
| <p><b>TEXT BOOKS</b></p> <ol style="list-style-type: none"> <li>1. G. Tyler Miller Jr., “Environmental Science: Working with the Earth”, Cengage Learning, 2019</li> <li>2. C. Anil Kumar, “Environmental Science and Engineering”, PHI Learning, 2018<br/>Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, 2017</li> </ol> |
|---|

## REFERENCE BOOK & WEB RESOURCES

1. Richard T. Wright, “Environmental Science: Toward a Sustainable Future”, Pearson, 2017
2. Daniel B. Botkin, “Environmental Science: Earth as a Living Planet”, Wiley, 2018
3. Central Pollution Control Board - [www.cpcb.nic.in](http://www.cpcb.nic.in)
4. Ministry of Environment and Forests - [www.moef.gov.in](http://www.moef.gov.in)
5. UN Environment Programme - [www.unep.org](http://www.unep.org)
6. NPTEL Environmental Science Courses - [nptel.ac.in](http://nptel.ac.in)

|   |
|---|
| <p><b>Course Outcome</b></p> <p><b>On the successful completion of the course, students will be able to</b></p> |
|---|

|     |   |                 |
|-----|---|-----------------|
| CO1 | Understand fundamental principles of environmental science and ecosystem dynamics       | Understand (K2) |
| CO2 | Analyze various types of pollution and their impact on human health and the environment | Analyze (K4)    |
| CO3 | Apply principles of sustainable development in engineering design and decision-making   | Apply (K3)      |
| CO4 | Evaluate renewable energy technologies and waste management systems                     | Evaluate (K5)   |
| CO5 | Design environmentally sustainable solutions for engineering problems                   | Apply (K3)      |

[illegible][illegible]