Sri
# SAI RAM
## ENGINEERING COLLEGE
An Autonomous Institution
West Tambaram, Chennai - 44
www.sairam.edu.in

IQAC
Ensuring Quality

*Approved by AICTE, New Delhi*
*Affiliated to Anna University*



## DEPARTMENT OF
# COMPUTER & COMMUNICATION ENGINEERING

## REGULATIONS 2024
*For Students Admitted from the Academic Year 2026-2027 onwards*

NBA NAAC (A+) nirf

## AUTONOMOUS
CURRICULUM AND
# SYLLABUS
## I - II
SEMESTERS

## SRI SAIRAM ENGINEERING COLLEGE

### VISION

To emerge as a "Centre of excellence " offering Technical Education and Research opportunities of very high standards to students, develop the total personality of the individual and instil high levels of discipline and strive to set global standards, making our students technologically superior and ethically stronger, who in turn shall contribute to the advancement of society and humankind.

### MISSION

We dedicate and commit ourselves to achieve, sustain and foster unmatched excellence in Technical Education. To this end, we will pursue continuous development of infra-structure and enhance state-of-the-art equipment to provide our students a technologically up-to date and intellectually inspiring environment of learning, research, creativity, innovation and professional activity and inculcate in them ethical and moral values.

### Educational Organization Management System (EOMS) Policy

We at Sri Sai Ram Engineering College are committed to empower our students not only to excel academically but also imbibe essential values, enabling them to become exemplary global citizens. We build a better nation by fostering excellence and innovative practices in Engineering, Technology and Management Education. We are dedicated to consistently enhancing our systems, infrastructure and services to meet the needs and expectations of all our stakeholders for sustainable growth

## DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

### VISION

To produce globally competent and socially responsible engineers who can address the engineering challenges and excel at an international level, in the advancement of Computer and Communication Engineering through research and academia.

### MISSION

M1 To provide a good environment with latest technological infrastructure facilities, teaching-learning ambience and interaction with industry in the area of Computer and Communication Engineering.

M2 To inculcate graduates with high social responsibility, right attitude, discipline and an inclination towards offering their professional expertise in serving the society.

# AUTONOMOUS CURRICULA AND SYLLABI

## SEMESTER I Regulations 2024

| S. NO | COURSE CODE | COURSE TITLE | WEEK HOURS | | | CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|
| | | | L | T | P | | |
| THEORY | | | | | | | |
| 1 | 24BSMA101 | Matrices and Calculus | 3 | 1 | 0 | 4 | 4 |
| 2 | 24HSEN101 | Communicative English | 3 | 0 | 0 | 3 | 3 |
| 3 | 24BSPH101 | Engineering Physics | 3 | 0 | 0 | 3 | 3 |
| 4 | 24BSCY102 | Environmental Chemistry for Industry 4.0 | 3 | 0 | 0 | 3 | 3 |
| 5 | 24HSTA101 | Heritage of Tamils | 1 | 0 | 0 | 1 | 1 |
| PRACTICALS | | | | | | | |
| 1 | 24ESGE104 | Engineering Practices Laboratory (TVET) | 0 | 0 | 4 | 7 | 2 |
| 2 | 24CSPT101 | Hands-On Course on Programming in C | 1 | 0 | 4 | 5 | 3 |
| VALUE ADDITIONS - I | | | | | | | |
| 1 | 24ESID101 | Idea Engineering Laboratory - I | 0 | 0 | 2 | 2 | 1 |
| 2 | 24ENTP101 | Functional Life Skills | 1 | 0 | 1 | 2 | 1 |
| 3 | 24HSTP101 | Take Charge:College Readiness – I | 1 | 0 | 0 | 1 | 0 |
| ONLINE SUPPLEMENTARY | | | | | | | |
| | | As recommended By BOS | | | | | |
| | | | | | | 31 | 21 |

## SEMESTER II

| S. NO | COURSE CODE | COURSE TITLE | WEEK HOURS | | | CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|
| | | | L | T | P | | |
| THEORY | | | | | | | |
| 1 | 24HSEN201 | Professional English | 2 | 0 | 0 | 2 | 2 |
| 2 | 24BSMA201 | Discrete structures | 3 | 1 | 0 | 4 | 4 |
| 3 | 24BSPH201 | Physics of Electronic Devices | 3 | 0 | 0 | 3 | 3 |
| 4 | 24ITPC201 | Object Oriented Programming Using Java | 3 | 0 | 0 | 3 | 3 |
| 5 | 24COPC201 | Foundations of Data Science | 3 | 0 | 0 | 3 | 3 |
| 6 | 24HSTA201 | Tamils and Technology | 1 | 0 | 0 | 1 | 1 |
| 7 | 24HSNC201 | NCC Course Level 1* | 2 | 0 | 0 | 2 | 0 |
| PRACTICALS | | | | | | | |
| 1 | 24BSPL103 | Physics Laboratory | 0 | 0 | 2 | 2 | 2 |
| 2 | 24ITPL201 | Object Oriented Programming Using Java Laboratory | 0 | 0 | 4 | 4 | 2 |
| 3 | 24COPL201 | Data Science Laboratory | 0 | 0 | 4 | 4 | 2 |
| VALUE ADDITIONS - II | | | | | | | |
| 1 | 24ESID201 | Idea Engineering Laboratory - II | 0 | 0 | 2 | 2 | 1 |
| 2 | 24ENTP201 | Digital Dynamics | 1 | 0 | 1 | 2 | 0 |
| 3 | 24HSTP201 | Take Charge – College Readiness – II | 1 | 0 | 0 | 1 | 0 |
| ONLINE SUPPLEMENTARY | | | | | | | |
| 1 | 24ESMC201 | MS Office (Mandatory-NC) | 0 | 0 | 0 | 0 | 0 |
| | | | | | | 33 | 23 |

*only for NCC cadets

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

**PEO 1** Impart strong foundation in basic sciences, mathematics and engineering fundamentals, knowledge and capability.

**PEO2** Apply design principles and best practices for developing quality products for scientific and business applications.

**PEO 3** Inculcate high professionalism among the students by providing technical and soft skills with ethical standards.

**PEO 4** Promote collaborative learning and spirit of team work through multidisciplinary projects and diverse professional activities.

**PEO 5** Indoctrinate an attitude in the graduates for life- long learning process.

## PROGRAM SPECIFIC OUTCOMES (PSOs)

**PSO 1** Apply appropriate technology for the implementation of modern communication systems

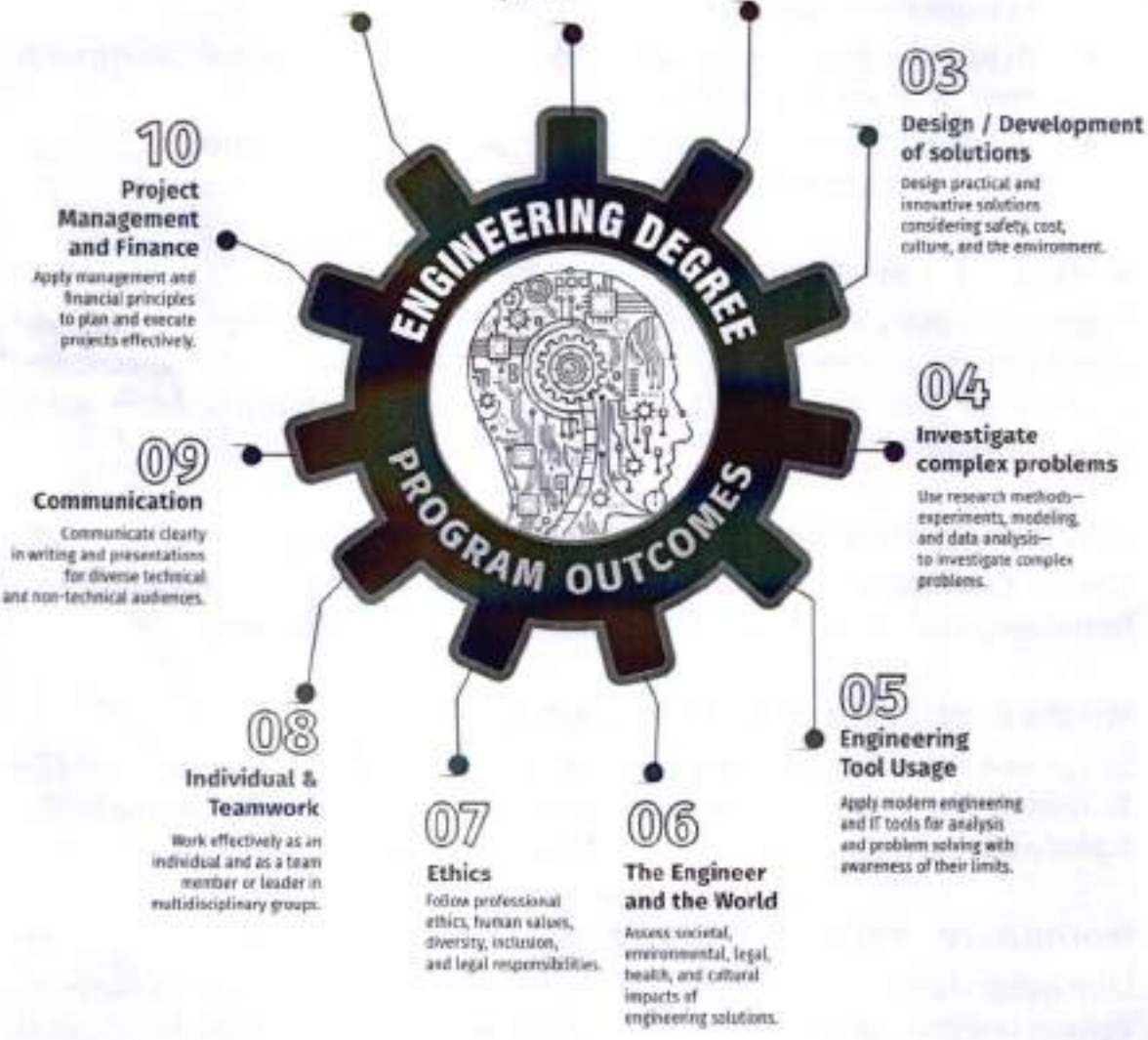
**PSO2** Develop quality software for scientific and business applications by applying software engineering principles and practices .

## COMPONENTS OF THE CURRICULUM (COC)

| Course Component | Curriculum Content (% of total number of credits of the program) | Total number of contact hours | Total Number of credits |
|---|---|---|---|
| Basic Sciences (BS) | 18 | 32 | 30 |
| Engineering Sciences (ES) | 7 | 15 | 12 |
| Humanities and Social Sciences (HS) | 8 | 13 | 13 |
| Professional Electives (EL) | 14 | 23 | 23 |
| Program Core + Program Lab (PC+PL) | 27 | 56 | 46 |
| Program theory with Lab (PW) / Program Lab With Theory (PT) | 5 | 15 | 9 |
| Open Elective (OE) | 7 | 12 | 12 |
| Training & Placement (TP) | 2 | 14 | 4 |
| Innovation & Development (ID) / Project (PJ) | 10 | 32 | 16 |
| Internships (IN) | 2 | 9 | 3 |
| Mandatory Courses (MC) | NA | 4 | NA |
| Total | | **225** | **168** |

# PROGRAMME OUTCOMES(POs)

**PROGRAM OUTCONE REPRESENTS THE KNOWLEDGE, SKILLS AND ATTITUDES THAT THE STUDENTS WOULD BE EXPECTED TO HAVE AT THE END OF THE 4 YEAR ENGINEERING DEGREE PROGRAM**




**01 Engineering Knowledge**
Apply math, science, computing, and engineering knowledge to solve complex engineering problems.

**02 Problem Analysis**
Identify and analyze complex problems using research to draw valid conclusions.

**03 Design / Development of solutions**
Design practical and innovative solutions considering safety, cost, culture, and the environment.

**04 Investigate complex problems**
Use research methods—experiments, modeling, and data analysis—to investigate complex problems.

**05 Engineering Tool Usage**
Apply modern engineering and IT tools for analysis and problem solving with awareness of their limits.

**06 The Engineer and the World**
Assess societal, environmental, legal, health, and cultural impacts of engineering solutions.

**07 Ethics**
Follow professional ethics, human values, diversity, inclusion, and legal responsibilities.

**08 Individual & Teamwork**
Work effectively as an individual and as a team member or leader in multidisciplinary groups.

**09 Communication**
Communicate clearly in writing and presentations for diverse technical and non-technical audiences.

**10 Project Management and Finance**
Apply management and financial principles to plan and execute projects effectively.

**11 Life-long learning**
Engage in independent lifelong learning and adapt to new technologies with critical thinking.

# SEMESTER - I

| COURSE CODE: 24BSMA101 | MATRICES AND CALCULUS | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 | 4 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- To develop a strong foundation in matrix algebra and its applications.
- To introduce the concepts of limits, continuity, differentiation, and optimization for functions of several variables.
- To familiarize students with the principles of vector calculus relevant to engineering problems.
- To provide an understanding of double and triple integrals along with their practical applications.
- To impart knowledge of Fourier series and its significance in engineering analysis.

**MODULE - I MATRICES** **12**

Eigenvalues and eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley-Hamilton theorem (excluding proof) – Symmetric and orthogonal matrices - Reduce the quadratic to canonical form using orthogonal transformation - Nature of quadratic forms.

**MODULE - II FUNCTIONS OF SEVERAL VARIABLES** **12**

Limits, Continuity - Definitions - Partial derivatives - Taylor's series - Jacobians, Maxima and Minima - Method of Lagrange multipliers.

**MODULE - III VECTOR DIFFERENTIATION** **4**

Scalar and vector valued functions - Gradient and directional derivatives – Tangent plane - Divergence and curl - Irrotational and solenoidal vector fields - Scalar and vector potentials - Vector identities (without proof).

**MODULE - IV VECTOR INTEGRATION** **8**

Line integral over a plane curve - Surface integral - Area of a curved surface - Volume integral - Greens, Gauss divergence and Stoke's theorems - Verification and application in evaluating line, surface and volume integrals. (Cube and Cuboids).

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/8/2024



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**MODULE - V MULTIPLE INTEGRALS** **12**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Change of variables from cartesian to polar coordinates - Triple integrals – Volume of solids (Spherical and Cylindrical polar coordinates).

**MODULE - VI FOURIER SERIES** **12**

Fourier series – Convergence of Fourier series - Half range sine and cosine series – Parseval's theorem.

**TOTAL: 60 PERIODS**

**TEXT BOOKS:**

1. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
2. Calculus and Analytic geometry, G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.

**REFERENCES:**

1. Higher Engineering Mathematics, B. V. Ramana, 11th reprint, Tata McGraw-Hill, New Delhi, 2010.
2. Engineering Mathematics for first year, T. Veerarajan, Tata McGraw-Hill, New Delhi, 2008.
3. A text-book of Engineering Mathematics, N.P. Bali and Manish Goyal, 9th Edition, Laxmi Publications, Reprint, 2008.
4. Higher Engineering Mathematics, B. S. Grewal, 40th Edition, Khanna Publishers, New Delhi, 2007.

**WEB REFERENCES:**

1. https://testbook.com/maths/cayley-hamilton-theorem
2. https://www.iitg.ac.in/rafik/Tutorials/MA-102/2013/lect-10.pdf
3. https://ms.unimelb.edu.au/__data/assets/pdf_file/0007/2516596/functions_sev_var.pdf
4. https://www.mecmath.net/VectorCalculus.pdf
5. https://egyankosh.ac.in/bitstream/123456789/64855/1/Unit4.pdf
6. https://williamsgj.people.charleston.edu/Fourier%20Series.pdf

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/Aug



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**ONLINE RESOURCES:**

1. https://www.youtube.com/watch?v=oJDlt_Xv-mM
2. https://www.youtube.com/watch?v=8h3yY0im5XU
3. https://www.youtube.com/watch?v=LGxE_yZYigI
4. https://www.youtube.com/watch?v=ma1QmE1SH3I
5. https://www.youtube.com/watch?v=QPw4GYz5Unc
6. https://www.youtube.com/watch?v=1mMYaPkXcNI

**COURSE OUTCOMES:**

**Upon completion of the course, the student should be able to:**

1. Diagonalize the matrix using orthogonal transformation and apply Cayley Hamilton Theorem to find the inverse and integral powers of a square matrix. (K3)
2. Evaluate the limit, examine the continuity and use derivatives to find extreme values for functions of several variables. (K3)
3. Compute the derivatives of scalar and vector point functions. (K3)
4. Use the vector point function to establish the relation between line, surface and volume integrals. (K3)
5. Apply double and triple integrals to find the area and the volume of a region. (K3)
6. Compute Fourier series expansion of a function. (K3)

**CO-PO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 3 | - | - | - | - | - | - | - | - | - | - |
| CO3 | 3 | - | - | - | - | - | - | - | - | - | - |
| CO4 | 3 | - | - | - | - | - | - | - | - | - | - |
| CO5 | 3 | - | - | - | - | - | - | - | - | - | - |
| CO6 | 3 | - | - | - | - | - | - | - | - | - | - |

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/Oct/2019

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# SEMESTER - I

| COURSE CODE: 24HSEN101 | COMMUNICATIVE ENGLISH | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 3 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- Develop the basic LSRW skills
- Acquire enhanced knowledge of English grammar
- Improve modern and technical vocabulary
- Enhance the communicative and cognitive skills
- Interpret the texts and write reviews critically

**MODULE - I COMMUNICATION PROCESS** 8

Listening – informal conversations - Speaking – self-introduction about friends/ places/ hobbies - Reading comprehension – skimming/ scanning/ predicting – question & answers – objective and descriptive answers - Writing – paragraph writing, personal notes - Language Development – parts of speech, prefix, suffix, word formation

**MODULE - II LANGUAGE BARRIERS, LEVELS AND CHANNELS** 8

Listening –interviews - Speaking – describing a simple process – asking and answering questions - Reading – critical reading – finding key information in a given text – ideation, mind mapping - Writing - dialogue, instructions – Language Development – tenses, framing questions.

**MODULE - III NARRATION AND SUMMATION** 8

Listening - long texts - TED talks - extensive speech on current affairs - Speaking – role plays – asking about routine actions and expressing opinions - Reading- longer texts & making a critical analysis of the given text - Writing – essay (comparative/analytical), jumbled sentences, recommendations - Language Development – writing single sentence definitions, sequence words

**MODULE - IV WRITING MECHANICS** 8

Writing – Free writing, Informal letters, e-mails - accuracy, coherence, brevity – Language Development- single word substitutes, compound words- conditionals

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/5/2024

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**MODULE - V INTERPRETATION SKILLS** 7

Listening- popular speeches and presentations - Speaking - impromptu speeches -Reading - articles – magazines - Writing – review writing, channel conversion – bar diagram/ table, poster/ picture interpretation - Language Development – modal verbs, collocations, 21st century vocabulary

**MODULE - VI COGENT EXPOSITIONS** 7

Listening - Motivational speeches - Speaking - Debates and discussion - Reading - analytical reading - newspapers - Writing - process description - Language Development - voices, sentences expressing purpose, synonyms & antonyms

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Board of Editors. Using English: A Coursebook for Undergraduate Engineers and Technologists. Orient Blackswan Limited, Hyderabad: 2015.
2. A Course in Technical English, D. Praveen Sam and K.N. Shoba, Cambridge University Press, 2020

**REFERENCES:**

1. Anderson, Paul V. Technical Communication: A Reader – Centered Approach. Cengage, New Delhi, 2008.
2. Smith-Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason, USA, 2007.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford, 2007.
4. Chauhan, Gajendra Singh and et.al.Technical Communication (Latest Revised Edition). Cengage Learning India Pvt. Limited, 2018.

**WEB REFERENCES:**

1. https://onlinecourses.nptel.ac.in/noc19_hs31/preview
2. https://www.myenglishpages.com/speaking/#google_vignette

**ONLINE RESOURCES:**

1. https://wwPearson.com/english/catalogue/business-english/technical-english.html
2. https://ww.cambridgeenglish.org/learning-english/free-resources/

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/Oct/24

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**OUTCOMES:**

**Upon completion of the course, the student will be able to:**

1. Apply listening, speaking, reading, and writing skills effectively in academic and real-life communication contexts. (K3)
2. Construct clear and coherent paragraphs and prepare personal notes using appropriate language and structure. (K3)
3. Apply analytical skills to write structured essays, arrange jumbled sentences logically, and develop meaningful recommendations. (K3)
4. Apply email etiquette principles to draft professional emails and informal letters suitable for various contexts. (K3)
5. Apply data interpretation skills to write comprehensive and well-structured reviews. (K3)
6. Use appropriate vocabulary and grammatical structures to participate effectively in discussions and debates. (K3)

**CO-PO, PSO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | - | - | - | 3 | - | 2 | - | - |
| CO2 | - | - | - | - | - | - | - | - | 3 | - | 2 | - | - |
| CO3 | - | - | - | - | - | - | - | - | 3 | - | 2 | - | - |
| CO4 | - | - | - | - | - | - | - | - | 3 | - | 2 | - | - |
| CO5 | - | - | - | - | - | - | - | - | 3 | - | 2 | - | - |
| CO6 | - | - | - | - | - | - | - | - | 3 | - | 2 | - | - |

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/Oct/2025

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# SEMESTER - I

| COURSE CODE: 24BSPH101 | ENGINEERING PHYSICS | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 3 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4,7,9,11 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- To understand the basic concepts of mechanics and its use in engineering applications.
- To understand the concept of waves and lasers and their applications.
- To illustrate the various laws of electromagnetic waves and their applications.
- To apply the concepts of quantum mechanics to engineering studies.
- To understand the basics of crystal for engineering applications.
- To identify the basic principles involved in thermal physics and its applications.

**MODULE - I PROPERTIES OF MATTER** 8

Elasticity – Hooke's law - Poisson's ratio - Stress-strain diagram and its uses - Twisting couple - shaft - Torsion pendulum: theory and experiment - Bending of beams - bending moment - Cantilever: theory and experiment - Uniform and non-uniform bending: theory and experiment - I-shaped girders.

**MODULE - II MECHANICAL WAVES AND LASERS** 7

Waves on a string – standing waves – traveling waves – Energy transfer of a wave – Reflection and refraction of light waves – interference – Theory of air wedge and experiment - Theory of laser – characteristics – Spontaneous and stimulated emission – Einstein's coefficients – population inversion – Nd-YAG laser, CO2 laser – Basic applications of lasers in industry.

**MODULE - III ELECTROMAGNETIC WAVES** 8

The Maxwell's equations – wave equation; Plane electromagnetic waves in vacuum, conditions on the wave field – properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter – polarization – Producing electromagnetic waves – Energy and momentum in EM - Reflection and transmission of electromagnetic waves from a non-conducting medium vacuum interface for normal incidence.

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 21/Sept

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**MODULE - IV BASIC AND APPLIED QUANTUM MECHANICS 7**

Black body radiation – Planck's derivation – Electrons and matter waves – The Schrodinger equation (time-dependent and time-independent forms) – significance of wave function – Normalization – Free particle – particle in an infinite potential well: 1D, 2D and 3D boxes; - Barrier penetration and quantum tunneling (qualitative) – Scanning Tunneling Microscope.

**MODULE - V CRYSTAL PHYSICS 8**

Single crystalline, Polycrystalline and Amorphous materials - single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal - Miller indices - Interplanar distance - X-ray diffraction - Calculation of number of atoms per unit cell - Atomic radius - Coordination number – packing factor for SC, BCC, FCC and HCP structures - Polymorphism and allotropy. Crystal Growth: Chochralski technique - Molecular beam epitaxy.

**MODULE – VI THERMAL PHYSICS 7**

Transfer of heat energy - Conduction, Convection and Radiation - Thermal conductivity, Forbe's method and Lee's disc method - Conduction through compound media - series and parallel methods - Heat exchangers - Refrigerators and Solar water heaters.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. D.K. Bhattacharya & T. Poonam, "Engineering Physics," Oxford University Press, 2015.
2. R.K. Gaur & S.L. Gupta, "Engineering Physics." Dhanpat Rai Publishers, 2012.
3. B.K. Pandey & S. Chaturvedi, "Engineering Physics," Cengage Learning India, 2017.
4. V. Rajendran, "Engineering Physics," McGraw Hill Publications Ltd., New Delhi, 2014.
5. M.N. Avadhanulu and P.G. Kshirsagar, "A textbook of Engineering Physics," S. Chand & Co Ltd., 2016.

**REFERENCES:**

1. D. Halliday, Resnick & J. Walker, "Principles of Physics," Wiley, 2015.
2. R.A. Serway & J.W. Jewett, "Physics for Scientists and Engineers," Cengage Learning, 2010.

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/6/2019



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3. N.K. Verma, "Physics for Engineers," PHI Learning Private Limited, 2014.
4. P.A. Tipler & G. Mosca, "Physics for Scientists and Engineers," W.H. Freeman, 2020.
5. Brijlal and Subramanyam, "Properties of Matter," S. Chand Publishing, 2018.
6. Shatendra Sharma & Jyotsna Sharma, "Engineering Physics," Pearson, 2018.
7. Arthur Beiser. "Concepts of Modern Physics," McGraw-Hill, 6th Edition. 2003.
8. Charles Kittel, "Introduction to Solid State Physics." John Wiley & Sons. 8th Edition, 2005.

**OUTCOMES:**

**Upon completion of the course, the student will be able to:**

1. Apply the concepts of stress, torsion, and bending to study the mechanical behavior of structural elements using theoretical and experimental methods. (K3)
2. Apply the principles of mechanical and light waves, air-wedge interference and laser systems to demonstrate the working of Nd:YAG and $CO_2$ lasers and their industrial applications. (K3)
3. Examine Maxwell's equations and electromagnetic wave theory to analyze ave propagation, polarization and reflection-transmission phenomena in ifferent media. (K4)
4. Utilize the principles of quantum mechanics to explain black body radiation, atter waves, particle confinement in a potential well and tunneling henomena. (K3)
5. Examine and compare the characteristics of various crystal structures, olymorphic forms, and crystal growth techniques. (K4)
6. Apply the principles of heat transfer to determine the thermal conductivity and explain the role of heat exchangers in refrigerators and solar water eaters. (K3)

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/Aug



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**CO-PO, PSO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| CO2 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| CO3 | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - |
| CO4 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| CO5 | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - |
| CO6 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |

# SEMESTER - I

| COURSE CODE: 24BSCY102 | ENVIRONMENTAL CHEMISTRY FOR INDUSTRY 4.0 | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 3 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 1 - 17 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- To gain a comprehensive understanding of environmental chemistry principles, environmental sustainability and monitoring techniques for environmental quality assessment.
- To analyze atmospheric chemistry, climate change, air pollution and chemistry-based technologies for sustainable air quality management.
- To foster a sound understanding of water quality parameters and water treatment techniques for sustainable management.
- To explore the principles of circular chemistry and sustainable technologies for resource recovery and solid waste management. (SWM).
- To examine renewable energy sources, advanced energy storage systems and sustainable energy technologies for sustainable energy management.
- To implement green chemistry principles in the development and application of sustainable functional materials for emerging technologies.

**Recommended in Board of Studies (BoS) Meeting No.** 8 **held on** 12.8.2025



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**MODULE - I PRINCIPLES OF ENVIRONMENTAL CHEMISTRY AND SUSTAINABILITY** **8**

**Environment:** Definition, components, scope and significance of the environment. Role of chemistry in environmental protection and sustainable development. Biogeochemical cycles (carbon, nitrogen and water).

**Environmental Pollutants:** Classification, sources, transport and environmental fate of pollutants.

**Environmental Monitoring:** Environmental sampling, chemical analysis and principles, components, classification and applications of chemical sensors, including gas, electrochemical, optical and biosensors for monitoring air, water and soil quality.

**Emerging Environmental Technologies:** Smart chemical sensors, IoT-enabled environmental monitoring, digital environmental sensing and data-driven environmental management.

**MODULE - II ATMOSPHERIC CHEMISTRY AND CLIMATE SUSTAINABILITY** **7**

Climate change-Greenhouse effect, role of greenhouse gases ($CO_2$, $CH_4$, $N_2O$ and CFCs) in global warming. Chemical and photochemical reactions in the atmosphere. Formation of photochemical smog, PAN and acid rain (causes, effects and control measures). Oxygen and ozone chemistry- Ozone layer depletion (causes, effects and control measures).

**Air pollution:** Major air pollutants ($PM_{2.5}$, $PM_{10}$, $SO_x$, $NO_x$, CO and VOCs).

**Chemistry-based technologies for air pollution control:** Catalytic converters, carbon capture and adsorption using activated carbon.

**Complete combustion of carbon:** Role of oxygen and selected oxidizing agents in promoting complete combustion such as hydrogen peroxide, potassium permanganate and potassium chlorate (relevant chemical reactions)

**MODULE - III SUSTAINABLE WATER CHEMISTRY** **8**

**Importance and scope of water chemistry:** Sources and impurities in water, Water Quality Parameters, Specifications as per WHO/BIS standards. Hardness of water, types, numerical problems on hardness of water. Softening of water: Internal treatment (Lime-soda, Phosphate, Calgon, Sodium Aluminate and Colloidal conditioning). External treatments: Ion exchange and Zeolite processes. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination), nutrition recovery and sludge-to-energy. Desalination of brackish water by Reverse osmosis.

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**Emerging water treatment technologies:** Adsorption, nanotechnology and photo catalysis.

**Sustainable water management:** Water recycling, rainwater harvesting and circular water economy

**MODULE - IV CIRCULAR CHEMISTRY FOR RESOURCE RECOVERY AND WASTE MANAGEMENT** **7**

**Circular Chemistry:** Principles of circular chemistry, 5R principles, waste-to-resource concept and circular economy.

**Chemical Resource Recovery:** Chemical recycling of plastics, biomass valorization, biochar production and urban mining (recovery of valuable metals from e-waste).

**Solid Waste Management:** Waste characterization, AI-enabled waste sorting, High-rate anaerobic digestion and Microbial Electrolysis Cells (MECs) for biogas upgrading.

**Future Landfills:** Waste-to-Energy integrated with Carbon Capture & Utilization (CCU), smart leachate sensors.

E- waste management- Introduction, sources, composition of e-waste, effects of e-waste on environment and human health, Artificial intelligence in e-waste management, extraction of gold from e-waste by bioleaching method.

**MODULE - V SUSTAINABLE CHEMISTRY FOR ENERGY DEVICES** **8**

**Energy Sources :** Renewable and non-renewable energy sources with examples.

**Energy Storage Systems:** Classification of batteries. Construction, working, and applications of Li-ion batteries.

**Next-Generation Energy Devices:** Introduction, construction and working of sodium ion battery for EV applications. Construction and working of ultra-small asymmetric super capacitor and its applications in IoT/wearable devices.

**Sustainable Energy Devices:** Introduction, fuel cells, difference between fuel cell and battery. Construction, working principle, applications and limitations of solid-oxide fuel cell (SOFCs) and solar photovoltaic cell (PV cell). Production of green hydrogen by photo catalytic water splitting by TiO2catalyst and its advantages.

**Need for energy efficiency:** Energy conservation and sustainability - action strategies for sustainable energy management from a future perspective.

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**MODULE - VI GREEN CHEMISTRY AND SUSTAINABLE FUNCTIONAL MATERIALS FOR EMERGING TECHNOLOGIES** 7

**Green Chemistry:** Introduction, 12 Principles of Green Chemistry, properties and applications of green solvents for server heat management. Synthesis and properties of glycerol trioleate ester and its uses in IT infrastructure applications. Green synthesis of ZnO nanoparticles and its uses in magnetic Radio Frequency Identification (RFID) and Internet of Nano Things (IONT) system applications.

**Biomaterials:** Introduction, synthesis and properties of polylactic Acid (PLA) and polyethylene glycol (PEG) and its uses in touch screen applications. Synthesis and properties of Alginate Hydrogel and its uses in Brain-Computer Interfaces (BCIs) applications.

**Biodegradable polymers:** Applications in sustainable packaging materials an environmentally friendly alternatives to conventional plastics.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**


1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Sawyer, C. N., McCarty, P. L., & Parkin, G. F. (Latest Edition). Chemistry for Environmental Engineering and Science. McGraw-Hill.
3. Gilbert M. Masters, Introduction to Environmental Engineering and Science, Pearson.
4. Ravikrishnan A, 'Environmental Science and Engineering', Sri Krishna Hitech Publishing Company Pvt. Ltd, Revised Edition 2020.
5. Kirby W. Beard, Thomas B. Reddy, et al. (Latest Edition). Linden's Handbook of Batteries. McGraw-Hill.
6. Anastas, P. T., & Warner, J. C. Green Chemistry: Theory and Practice. Oxford University Press.


**REFERENCES:**


1. WHO Guidelines for Drinking-water Quality & Air Quality (Latest 2024/2025 Updates on PFAS and PM2.5).
2. UNEP Reports on "Global Environment Outlook" and "Emissions Gap Report" (Current Year).
3. Clair N. Sawyer, Perry L. Mc Carty, Gene F. Parkin, 'Chemistry for Environmental Engineering and Science', Latest Edition, McGraw-Hill.
4. Recent peer-reviewed journal articles on Emerging Contaminants, Green Hydrogen, and Battery Recycling


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**OUTCOMES:**

**Upon completion of the course, the student will be able to:**

1. Analyze the principles of environmental chemistry, environmental pollutants and environmental monitoring techniques, including chemical sensors and smart sensing technologies, to assess environmental quality and sustainability. (K4)
2. Analyze atmospheric chemistry, climate change mechanisms, ozone chemistry, air pollutants and chemistry-based air pollution control technologies to evaluate strategies for sustainable air quality management. (K4)
3. Assess water quality parameters with reference to WHO/BIS standards and analyze conventional and emerging water treatment technologies to recommend sustainable water management practices. (K4)
4. Investigate the principles of circular chemistry, resource recovery techniques and sustainable solid waste management technologies to evaluate sustainable waste management strategies. (K4)
5. Compare renewable energy sources, advanced energy storage systems and sustainable energy technologies to evaluate their applications in sustainable energy management. (K4)
6. Analyze green chemistry principles and sustainable functional materials to evaluate their applications in emerging technologies, including IT infrastructure, smart electronics, and biomaterials. (K4)

**CO-PO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | - | - | - | - | - | 2 | - | - | - | - |
| CO2 | 3 | 2 | - | - | - | 2 | - | - | - | - | - |
| CO3 | 3 | 2 | - | - | - | 2 | - | - | - | - | - |
| CO4 | 3 | 2 | - | - | - | 2 | - | - | - | - | - |
| CO5 | 3 | 2 | - | - | - | 2 | - | - | - | - | - |
| CO6 | 3 | 2 | - | - | - | 2 | 2 | - | - | - | - |

**Recommended in Board of Studies (BoS) Meeting No.** 8 **held on** 12/8/2025



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# SEMESTER - I

| COURSE CODE: 24HSTA101 | HERITAGE OF TAMILS | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 1 | 0 | 0 | 1 | 1 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- Develop interest for classical language and literature to promote Tamil heritage
- Understand the ancient Tamil sculptures, folk and martial arts and contribution of Tamil to the freedom of India

**அலகு ஐ மொழி மற்றும் இலக்கியம்**

இந்திய மொழிக் குடும்பங்கள் ___ திராவிட மொழிகள் ___ தமிழ் ஒரு செம்மொழி ___ தமிழ் செவ்விலக்கியங்கள் ___ சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை ___ சங்க இலக்கியத்தில் பகிர்தல் அறம் ___ திருக்குறளில் மேலாண்மைக் கருத்துகள்

**UNIT I LANGUAGE AND LITERATURE** 5

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural

**அலகு II இடைகால மற்றும் நவீன இலக்கியங்கள்**

தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம்- பக்தி இலக்கியம் ___ ஆழ்வார்கள் மற்றும் நாயன்மார்கள் ___ சிற்றிலக்கியங்கள் ___ தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி ___ தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

**Unit II MEDIEVAL AND MODERN LITERATURE** 5

Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

**அலகு III மரபு ஓ பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை**

நடுகல் முதல் நவீன சிற்பங்கள் வரை ___ ஐம்பொன் சிலைகள் ___ பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் ___ தேர் செய்யும் கலை ___ சுடுமண் சிற்பங்கள் ___ நாட்டுப்புறத் தெய்வங்கள் ___ குமரிமுனையில் திருவள்ளுவர் சிலை ___ இசைக் கருவிகள் ___ மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் ___ தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

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**UNIT III HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 5**

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures> Village deities> Thiruvalluvar Statue at Kanyakumari> Making of musical instruments - Mridhangam> Parai> Veenai> Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

**அலகு IV நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

**UNIT IV FOLK AND MARTIAL ARTS 5**

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

**அலகு V தமிழர்களின் திணைக் கோட்பாடுகள்**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் ___ தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் ___ தமிழர்கள் போற்றிய அறக்கோட்பாடு ___ சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் ___ சங்ககால நகரங்களும் துறைமுகங்களும் ___ சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி ___ கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

**UNIT V THINAI CONCEPT OF TAMILS 5**

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

**அலகு VI இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு**

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு ___ இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் ___ சுயமரியாதை இயக்கம் ___ இந்தியமருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு ___ கல்வெட்டுகள், கையெழுத்துப்படிகள் ___ தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

**UNIT VI CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 5**

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

**TOTAL: 30 PERIODS**

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 21/5/2024

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**TEXT-CUM-REFERENCE BOOKS**

1. தமிழக வரலாறு — மக்களும் பண்பாடும் — கே.கே. பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்)
2. கணினித் தமிழ் — முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி — வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை — ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian> Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - „Sangam City Civilization on the banks of river Vaigai... (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

**OUTCOMES:**

**Upon completion of the course, the learners will be able to:**

1. மொழிக் குடும்பங்களின் வரலாறு மற்றும் தமிழ் இலக்கியங்களை மதிப்பிடுகிறார்கள் Students evaluate the history of language families and Tamil literatures (K3)
2. பக்தி மரபுகளின் தாக்கம் பெற்ற தமிழ் இலக்கியங்களைப் புரிந்துகொள்கிறார்கள் Students understand Tamil literatures influenced by Philosophical and religious traditions (K3)
3. தமிழகத்தின் பாறை, சிற்பம், ஓவியம்- கலை மரபுகளைப் பகுப்பாய்வு செய்கிறார்கள் Students analyze the artistic traditions of Tamil Nadu such as rock art, sculpture, and painting (K3)
4. தமிழக நாட்டுப்புறக் கலைகள் மற்றும் தற்காப்புக் கலைகளின் மாண்புகளை உணர்ந்து கொள்கிறார்கள் Students realize the significance of Tamil Nadu's folk arts and martial arts (K3)
5. பழந்தமிழரின் திணையியல் வாழ்வியலை மீளாய்வு செய்கிறார்கள் Students re-examine the ecological lifestyle (Thinai-based life) of the ancient Tamils (K3)

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6. தேசிய இயக்கம் மற்றும் இந்தியப் பண்பாட்டில் தமிழர்களின் பங்களிப்பினை நினைவுகூர்கிறார்கள் Students recall the contribution of Tamils to the National Movement and Indian culture (K3)

**CO-PO, PSO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| CO2 | 2 | 3 | 3 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| CO3 | 2 | 3 | 3 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| CO4 | 2 | 3 | 3 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| CO5 | 2 | 3 | 3 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| CO6 | 2 | 3 | 3 | - | - | - | - | - | - | - | 2 | 2 | 2 |

# SEMESTER - I

| COURSE CODE: 24ESGE104 | ENGINEERING PRACTICES LABORATORY (TVET) | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 7 | 2 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4,9,12 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- To familiarize students with fundamental engineering workshop practices, including welding, machining, sheet metal work, carpentry, and plumbing, while emphasizing safe working procedures.
- To develop practical skills in electrical and electronic engineering through wiring, measurement, testing, circuit implementation, and troubleshooting using standard laboratory instruments.
- To provide hands-on experience in computer networking, operating system installation, Ethernet cable preparation, wireless network configuration, and basic hardware maintenance.
- To introduce students to AI-assisted software development and mechanical CAD tools for developing simple engineering applications and technical designs.

**Recommended in Board of Studies (BoS) Meeting No.** 11 **held on** 8/5/26



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Mechanical Engineering

- To enable students to integrate multidisciplinary engineering concepts for designing, fabricating, assembling, testing, and maintaining engineering products and household systems.
- To cultivate problem-solving abilities, technical competence, teamwork, and professional safety practices through practical exposure to modern engineering tools, technologies, and maintenance procedures.

**LIST OF EXPERIMENTS:**

**Welding:**

1. Introduction to welding processes, safety procedures, and industrial applications.
2. Fabrication of basic butt, lap, and T-joints using Shielded MIG welding.
3. Manufacturing of a simple fabricated component using welding techniques.
4. Demonstration and exposure to TIG and Arc welding processes.

**Basic Machining:**

5. Introduction to machine tools and workshop safety.
6. Performing basic turning and facing operations on a lathe machine.
7. Drilling operations using standard workshop equipment.
8. Understanding machining parameters and dimensional accuracy.

**Sheet Metal Work:**

9. Introduction to sheet metal materials, tools, and industrial applications.
10. Familiarization with common sheet metal fabrication techniques.
11. Fabrication of simple components such as trays, funnels, toolboxes, and riveted assemblies.
12. Understanding measurement, marking, cutting, bending, and joining operations.

**Plumbing & Carpentry:**

13. Study of common structural joints used in doors, windows, furniture, and roofing systems.
14. Hands-on experience in cutting, shaping, and assembling wooden components.
15. Introduction to household plumbing systems and associated fittings.
16. Assembly of basic pipe connections using different materials and joining methods.

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Mechanical Engineering

**Electrical Engineering Practice**

17. Residential wiring involving two-way switches, indicators lighting systems, fan with regulator, energy meters and protective devices.
18. Measurement of voltage, current, power and power factor in electrical circuits.
19. Energy measurement using a single-phase energy meter.
20. Measurement of earth resistance and electrical safety practices.

**Electronics Engineering Practice**

21. Identification and testing of electronic components and instruments.
22. Resistor colour coding and component characterization.
23. Measurement of AC signal parameters using a Cathode Ray Oscilloscope (CRO).
24. Study and implementation of basic logic gate circuits.
25. Generation and analysis of clock signals.
26. Soldering practices for electronic circuits and PCB assembly.
27. Construction and testing of half-wave and full-wave rectifier circuits.

**Networking**

28. Installation and configuration of operating systems.
29. Ethernet cable preparation and network connectivity setup.
30. Wireless router configuration and network extension techniques.
29. Basic troubleshooting of computer hardware and networking issues.
30. NAS and CCTV configuration demo

**AI-Assisted Software Development**

31. Build your first web pages and set up simple backend servers.
32. Connect smart hardware and IoT devices to your software applications.
33. Use AI prompts as a helpful assistant to write and understand code faster.
34. Create beginner-friendly, connected projects from scratch using AI.
35. Gain a solid foundation in modern, AI-assisted software development.

**Mechanical CAD**

36. Introduction to CAD tools and engineering design workflows.
37. Creation of two-dimensional engineering sketches and drawings.
38. Understanding engineering drawing standards, projections, and views.
39. Development of simple engineering models and technical drawings.

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Mechanical Engineering

**Assembly and dismantling of Household components**

40. Assembly and disassembly of wet grinders and electric fans.
41. Assembly and disassembly of Iron box
42. Assembly and disassembly of computer systems.
43. Assembly and disassembly of Motorcycle
44. Study of air conditioning systems, Pump and LED.
45. Introduction to preventive maintenance and troubleshooting techniques.

**SOFTWARE TOOLS REQUIRED:**

- AI-assisted Development Tools (ChatGPT/GitHub Copilot/Gemini),
- Visual Studio Code,
- Python,
- HTML/CSS/JavaScript,
- Flask (or Node.js),
- Mechanical CAD Software (AutoCAD/Fusion 360/SolidWorks/FreeCAD),
- Cisco Packet Tracer,
- Wireshark,
- PuTTY,
- Tinkercad Circuits/Proteus (optional),
- Git & GitHub,
- Microsoft Office/LibreOffice

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

- Workshop equipment for Welding, Machining, Sheet Metal, Carpentry, Plumbing, Electrical, Electronics, Networking, and Engineering Maintenance experiments, along with the required tools, measuring instruments, accessories, and safety equipment – One set suitable for a batch of 30 students.
- Standalone desktop computers with the above software tools installed – 30 Nos. (Or) Server with the required software supporting 30 terminals or more.
- Personal Protective Equipment (PPE), Fire Extinguishers, First Aid Kits, LCD Projector, and other standard laboratory safety facilities – One set suitable for a batch of 30 students.

**Recommended in Board of Studies (BoS) Meeting No.** 11 **held on** 8/8/26



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Mechanical Engineering

| Equipment | Qty |
|---|---|
| MIG Welding Machine | 10 |
| Arc Welding Machine | 1 |
| TIG Welding Machine | 1 |
| Welding Booth | 10 |
| Welding Safety equipment | 12 |
| Basic Welding Tools | 10 sets |
| Advance Welding tools | 2 sets |
| Centre Lathe Machine | 11 |
| Pillar or Radial Drilling Machine | 1 |
| Bench Grinder | 1 |
| Band Saw | 1 |
| Milling Machine | 1 |
| Sheet Metal Work Bench | 10 |
| Sheet Metal Tool Kit | 10 Sets |
| Sheet Metal Safety Kit | 10 sets |
| Carpentry Work Bench | 5 |
| Carpentry Tool Kit | 10 Sets |
| Carpentry Safety Kit | 10 sets |
| Plumbing Practice Board | 5 |
| Plumbing Tool Kit | 5 Sets |
| Electrical Activity Cabins | 10 |
| Electrical Safety Kits | 10 |
| Electrical Tool Kits | 10 |
| Digital Multimeter | 10 |
| Earth Resistance Tester | 2 |
| DSO | 5 |
| Function Generator | 5 |
| Regulated DC Power Supply | 5 |
| Breadboards | 15 |
| Electronic Component Kits | 15 Sets |
| Soldering Stations | 10 |
| Desktop Computers | 93 |
| USB devices | 30 |
| 6-port Network Switch | 2 |
| Wireless Router | 30 |
| LAN Crimping Kits | 5 |

**Recommended in Board of Studies (BoS) Meeting No.** 11 **held on** 8/8/24



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| | |
|---|---|
| NAS Demo Unit | 1 |
| CCTV Demo Kit | 2 |
| Mechanical CAD Licenses | 30 |
| Wet Grinder | 2 |
| Electric Fan | 5 |
| Electric Iron Box | 5 |
| Computer System | 10 |
| Motorcycle Assembly | 1 |
| Water Pump | 1 |
| Split AC | 1 |
| LED Demo Kit | 2 |
| Tool Kits | 30 |
| Student Work Benches | 20 |
| PPE Kits | 30 Sets |
| Fire Extinguishers | 10 |
| First Aid Kits | 10 |
| LCD Projector | 10 |

**OUTCOMES:**

**At the end of this course, the students should be able to:**

1. Perform basic workshop operations using appropriate tools, materials, and safety practices for manufacturing applications. (K3)
2. Operate electrical and electronic circuits using standard laboratory instruments for measurement and testing. (K3)
3. Configure computer systems and basic networking components to establish and verify connectivity. (K3)
4. Apply AI-assisted software development techniques and Mechanical CAD tools to develop simple engineering solutions. (K3)
5. Demonstrate fabrication, assembly, inspection, and preventive maintenance procedures for basic engineering systems. (K3)
6. Practice professional ethics, teamwork, and safe laboratory procedures while carrying out engineering activities. (K3)

**Recommended in Board of Studies (BoS) Meeting No.** 11 **held on** 8/8/22



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Mechanical Engineering

**CO-PO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | 2 | - | - | - | - | - | - | 3 | 3 |
| CO2 | 3 | - | - | - | 3 | - | - | - | - | - | - | 2 | - |
| CO3 | 2 | - | - | - | 3 | - | - | - | - | - | - | 3 | 2 |
| CO4 | 2 | - | - | - | 3 | - | - | - | - | - | - | 3 | 3 |
| CO5 | 3 | - | - | - | 2 | - | - | 3 | - | - | - | 3 | 2 |
| CO6 | 2 | - | - | - | - | - | 3 | 3 | - | - | - | 3 | 3 |

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# SEMESTER - I

| COURSE CODE: 24CSPT101 | HANDS ON COURSE ON PROGRAMMING IN C | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 1 | 0 | 4 | 5 | 3 |
| NPTEL CODE: 106105171 | SYLLABUS VERSION 1.1 | SDG NO. 4,8,9,12 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- To learn the fundamental concepts and programming constructs of the C programming language.
- To develop C programs using operators, decision-making and looping statements.
- To acquire programming skills using arrays, strings, functions and pointers.
- To understand and implement structures, unions and user-defined data types.

Recommended in Board of Studies (BoS) Meeting No. 9 held on 12.5.26



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**MODULE – I FUNDAMENTALS OF C PROGRAMMING 8**

Introduction to C – Features of C – Structure of a C Program – Compilation and Execution – Character Set – Tokens – Keywords and Identifiers – Constants and Variables – Data Types – Type Conversion – Input and Output Functions – Operators and Expressions – Arithmetic, Relational, Logical, Assignment, Increment/Decrement and Conditional Operators.

**LIST OF EXPERIMENTS:**

1. Write and execute basic C programs using printf() and scanf().
2. Implement programs using different data types and operators.
3. Write programs to perform arithmetic, relational and logical operations.
4. Develop programs for type conversion and evaluation of expressions.
5. Write a C program to generate Floyd's Triangle for the given number of rows.
6. Write programs to calculate simple mathematical problems such as area, simple interest and temperature conversion.

**MODULE – II DECISION MAKING AND LOOPING 8**

Decision Making – if, if-else, nested if and else-if ladder – switch-case statement – Conditional operator – Looping Statements – while, do-while and for loops – Nested loops – break and continue statements.

**LIST OF EXPERIMENTS**

1. Write C programs using if, if-else and nested if statements.
2. Develop a program to find the largest/smallest of given numbers.
3. Implement a menu-driven program using switch-case.
4. Write programs to generate multiplication tables and arithmetic series.
5. Develop programs to find factorial, Fibonacci series and prime numbers.
6. Write programs to check whether a number is palindrome, Armstrong number or perfect number.
7. Develop a menu-driven C program that allows the user to select and display either a normal pyramid or an inverted pyramid based on the user's choice.
8. Implement pattern-generation programs using nested loops.

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**MODULE – III ARRAYS, STRINGS AND FUNCTIONS 8**

Arrays – One-dimensional arrays – Two-dimensional arrays – Array initialization and traversal – Searching and Sorting – Strings – String initialization and manipulation – Standard string functions – User-defined Functions – Function declaration, definition and calling – Function arguments – Return values – Recursive functions – Scope and lifetime of variables.

**LIST OF EXPERIMENTS**

1. Write a C program to read and display elements of a one-dimensional array.
2. Implement linear search and binary search.
3. Implement bubble sort and selection sort.
4. Perform matrix addition, subtraction and multiplication using two-dimensional arrays.
5. Write programs to find the largest, smallest, sum and average of array elements.
6. Implement string operations such as length, copy, concatenate and compare.
7. Develop programs using user-defined functions.
8. Implement recursive functions for factorial and Fibonacci series.

**MODULE – IV POINTERS AND DYNAMIC MEMORY MANAGEMENT 7**

Pointers – Pointer declaration and initialization – Address and indirection operators – Pointer arithmetic – Pointers and arrays – Pointers and strings – Pointers as function arguments – Call by value and call by reference – Dynamic Memory Allocation – malloc(), calloc(), realloc() and free().

**LIST OF EXPERIMENTS**

1. Write a C program to demonstrate the use of pointers and address operators.
2. Implement array operations using pointers.
3. Write a program to swap two numbers using pointers.
4. Develop a program to find the sum and average of array elements using pointers.
5. Implement string manipulation using pointers.
6. Demonstrate dynamic memory allocation using malloc() and calloc().
7. Develop a program using realloc() and free ().

**MODULE – V STRUCTURES, UNIONS AND FILE HANDLING 7**

Structures – Declaration and initialization – Array of structures – Nested structures – Structures and functions – Pointers to structures – Unions – Enumerations – typedef – File Concepts – File opening and closing – Reading and writing files – Character and formatted file operations – File handling functions.

**LIST OF EXPERIMENTS**

1. Create and display student/employee records using structures.
2. Implement an array of structures to store and process multiple records.
3. Write a program using nested structures.
4. Demonstrate the difference between structures and unions.
5. Develop a program using typedef and enumerated data types.
6. Create a text file and perform read and write operations.
7. Develop a program to search and update records stored in a file.

**MODULE – VI PROBLEM SOLVING AND MODULAR PROGRAMMING 7**

Preprocessor Directives – Header Files – Macros – Conditional Compilation – Command Line Arguments – Modular Programming – Standard Library Functions – Program Design and Problem-Solving Techniques – Algorithm Development – Flowcharts – Debugging and Testing – Computational Problem Solving using C.

**LIST OF EXPERIMENTS**

1. Develop programs using user-defined header files.
2. Implement programs using macros and preprocessor directives.
3. Develop a C program using command line arguments.
4. Create a menu-driven application integrating functions, arrays and structures.
5. Develop a mini application such as Student Record Management System.
6. Implement a problem-solving application involving searching, sorting and file handling.
7. Develop, test and debug a complete C application based on a real-world problem.

**TOTAL: 45 PERIODS**

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**TEXT BOOKS:**

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Prentice Hall, 2nd Edition.
2. E. Balagurusamy, "Programming in ANSI C", McGraw Hill Education.
3. Yashavant Kanetkar, "Let Us C", BPB Publications.
4. Reema Thareja, "Programming in C", Oxford University Press.

**REFERENCES:**

1. Herbert Schildt, "C: The Complete Reference", McGraw Hill.
2. Byron S. Gottfried, "Programming with C", McGraw Hill.
3. K. N. King, "C Programming: A Modern Approach", W. W. Norton & Company.
4. Steven Holzner, Java Black Book, New Edition, Dreamtech Press (BPB Publications), 2019.
5. Timothy Budd, "Understanding Object-Oriented Programming with Java", Updated Edition, Pearson Education, 2000.

**WEB REFERENCES:**

1. GNU C documentation and compiler resources.
2. https://www.programiz.com/c-programming
3. https://www.geeksforgeeks.org/c/c-programming-language/
4. https://www.tutorialspoint.com/cprogramming/index.htm
5. https://www.w3schools.com/c/

**OUTCOMES:**

**Upon completion of the course, the student will be able to:**

1. Apply basic C programming constructs including data types, operators, expressions, input/output, control structures, arrays, strings, functions, searching and sorting techniques to solve computational problems. (K3)
2. Analyze pointers, dynamic memory allocation, structures, unions, and user-defined data types to evaluate their impact on memory utilization, data organization and program efficiency. (K4)
3. Analyze C programs involving modular programming, preprocessor directives, file handling, data structures, and integrated programming constructs to determine their effectiveness and efficiency in solving real-world computational problems. (K4)

**Recommended in Board of Studies (BoS) Meeting No.** 9 **held on** 12.5.26



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**CO-PO, MAPPING:**

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

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# SEMESTER - I

| COURSE CODE: 24ESID101 | IDEA ENGINEERING LABORATORY - I | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 2 | 1 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 1-17 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- Understand the principles of Idea Engineering and creative thinking for engineering problem identification.
- Develop critical thinking, computational thinking, information evaluation, and responsible AI skills for informed engineering decision-making.
- Apply empathetic and ethical observation techniques to identify community needs and SDG-aligned challenges.
- Explore rural governance, rural development, appropriate technologies, and government schemes for sustainable community development.
- Analyze real-world problems, user needs, and market opportunities to formulate innovative and actionable problem statements.
- Understand the fundamentals of intellectual property, startup funding, and innovation commercialization to transform ideas into sustainable entrepreneurial ventures.

**Recommended in Board of Studies (BoS) Meeting No.** 8 **held on** 12/oct/25



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**MODULE - I PHILOSOPHY OF IDEA ENGINEERING** 3

Traditional Engineering vs Idea Engineering - Human - centred innovation - People, Process and Purpose Framework - Detect physical problems by observation - User needs and environmental constraints - Innovative mindset - Technical concepts with sustainability and social implications - Creative thinking techniques.

**MODULE - II ANATOMY OF A KNOWLEDGE CONSTRUCTOR** 3

Knowledge Construction - Information vs Knowledge - Critical Thinking and Information Evaluation - Computational Thinking - Information Synthesis - Digital Noise Filtering and Source Credibility - Triangulation method - Algorithmic Literacy and Digital Feed Influence - Responsible Use of AI and Human Judgment - Ethics in Innovation - Wikipedia Model of Collaborative Knowledge Construction

**MODULE - III ART OF EMPATHETIC OBSERVATION** 3

Empathetic Observation in Idea Engineering - Emotional Impact Assessment - Surface Wants vs Deeper Needs - Community Gatekeepers and Trust-Building - Scouts for SDG Problem Identification - Bottlenecks, Blind Spots, and Hidden Needs - Ethical Observation, Data Privacy, Dignity, and Consent

**MODULE - IV LOCALISING GLOBAL CHALLENGES THROUGH SDG's** 4

Community Engagement - Localising Global Challenges - Systems Thinking - Sustainable Development Goals (SDGs) - Millennium Development Goals (MDGs) - Localised Sustainable Development Goals (LSDGs) - Engineering Innovation - Participatory Development - Contextual Mapping - Root Cause Analysis - Stakeholder Analysis - Learning Beyond the Classroom - Social & Field Exposure visits - Ethics in Field Research - Technology for Social Good - Barriers to Sustainable Innovation - Engineers as Change Makers

**MODULE - V ENGAGEMENT IN RURAL DEVELOPMENT** 4

Gram Panchayat – Foundation of Rural Governance - Rural Technology And Appropriate Technology - Government Schemes And Community Development - Social Innovation And Frugal Innovation - AICTE - UBA 2.0

**MODULE - VI PROBLEM IDENTIFICATION AND MARKET GAPS** 4

Introduction to Problem Identification and Opportunity Recognition - Understanding Problems: Root Causes vs. Symptoms - Identifying User Needs and Pain Points - Observation, Research, and Data Collection Techniques -

**Recommended in Board of Studies (BoS) Meeting No.** 8 **held on** 12/08/2025

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Problem Impact Analysis on Individuals, Society, and Industry - Market Gap Analysis and Opportunity Identification - Formulating Clear and Actionable Problem Statements - Prioritising Problems Using Feasibility, Impact, and Innovation Potential - Tools and Techniques for Problem Analysis - Activities, Case Studies, and Practical Exercises

**22 + 8 (Immersion Program) TOTAL: 30 PERIODS**

**REFERENCES:**


1. https://www.india.gov.in/services
2. https://sdgs.un.org/2030agenda
3. https://www.local2030.org/library/375/Sustainable-Development-Goals-and-Gram-Panchayats-Handbook-for-Elected-Representatives.pdf
4. https://sdgknowledgehub.undp.org.in/tag/lsdg/
5. https://www.tnrd.tn.gov.in/constitutionalprovision.html#1


**WEB REFERENCES:**

1. UN Sustainable Development Goals
2. https://srmuniv.digimat.in/nptel/courses/video/109106200/L30.html
3. https://avcce.digimat.in/nptel/courses/video/109106200/L26.html

**OUTCOMES:**

**Upon completion of the course, the student will be able to:**

1. Understand the philosophy of Idea Engineering and apply creative thinking techniques to identify engineering problems.(K2)
2. Apply critical thinking, computational thinking, information evaluation, and ethical use of AI to construct reliable knowledge and support engineering decision-making.(K3)
3. Analyze community needs through empathetic and ethical observation to formulate SDG-aligned, human-centered solutions. (K4)
4. Identify rural development challenges and apply ethical field practices to identify SDG-aligned, sustainable engineering solutions.(K3)
5. Evaluate Gram Panchayat governance, rural technologies, and government schemes to develop sustainable community solutions.(K4)
6. Create and analyze real-world problems, user needs, and market opportunities to formulate actionable problem statements.(K4)

**Recommended in Board of Studies (BoS) Meeting No.** 8 **held on** 12/Oct/2025

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**CO-PO, PSO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | 1 | - | - | - | - | - |
| CO2 | 2 | - | - | - | 2 | - | 1 | - | - | - | 2 |
| CO3 | 1 | 2 | - | - | - | 2 | 2 | 2 | 1 | - | 1 |
| CO4 | 2 | - | - | - | - | 2 | 2 | 2 | - | - | 1 |
| CO5 | 2 | 1 | - | - | - | - | - | 2 | - | - | 1 |
| CO6 | 2 | 2 | - | - | - | 2 | 1 | 2 | - | - | 2 |

# SEMESTER - I

| COURSE CODE: 24ENTP101 | FUNCTIONAL LIFE SKILLS | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 1 | 0 | 1 | 2 | 1 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- Resolve common communication problems
- Observe the effectiveness of nonverbal messages
- Communicate precisely through the digital media
- Understand the importance of empathetic listening
- Explore reading and speaking processes

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/8/2024



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**MODULE - I LISTENING** 5

- Listening and comprehending
- Probing questions
- Barriers to listening
- Reflection from listening

**MODULE - II SPEECH MECHANICS** 5

- Pronunciation
- Enunciation
- Vocabulary
- Fluency
- Common errors

**MODULE - III READING SKILLS** 5

- Techniques of effective reading
- Kinds of reading
- Gathering ideas and information from the text
- Evaluating the ideas and information
- Interpreting the text from multiple angles

**MODULE - IV EMOTIONAL INTELLIGENCE** 5

- Intro on Emotional Intelligence
- Goal Setting
- Positive Thinking
- Stress Management
- Time Management

**MODULE - V PRESENTATION SKILLS** 5

- Types of presentations
- Nonverbal communication
- Understanding the purpose and the audience
- Beginning and closure of presentations
- Presentation tools and strategies

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/8/2019

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**MODULE - VI ARTICULATION ASPECTS** 5

- Perform exercises
- Extempore
- Monologues, Dialogues and Conversation
- Feedback necessity

**TOTAL : 30 PERIODS**

**REFERENCES:**

1. Sen, Madhuchanda.2010, An Introduction to Critical Thinking, Delhi, Pearson.
2. Effective Communication Skills Strategies for Success. Edited by Nitin Bhatnager and Mamta Bhatnager. 2023, Pearson
3. Technical Communication: Principles and Practice, Meenakshi Raman and Sangeeta Sharma. Oxford University Press, 2015

**WEB REFERENCES:**

1. https://swayam.gov.in/nd1_noc19_hs31/preview
2. https://www.myenglishpages.com/speaking/#google_vignette

**OUTCOMES:**

**Upon completion of the course, the student will be able to:**

1. Employ reading, writing, and listening skills to communicate clearly in academic and professional contexts.
2. Demonstrate confident oral communication and presentation skills using appropriate tools and techniques.
3. Interpret ethical, inclusive, and culturally aware communication in team and societal settings

**CO-PO, PSO MAPPING:**

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

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/8/2024



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# SEMESTER - I

| COURSE CODE: 24HSTP101 | TAKE CHARGE : COLLEGE READINESS - I | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 1 | 0 | 0 | 1 | 0 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4,7,8,9,11,12,17 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

The objective of this course is to help students make a successful transition to college life by developing self-awareness, personal responsibility, effective time management, healthy lifestyle practices, and positive social relationships.

**MODULE - I FOUNDATION & TIME MANAGEMENT**

- Foundation
- Take Charge of Your Time
- Activity on Taking Charge of Your Time

**MODULE - II HEALTH & WELL-BEING**

- Take Charge of Your Health
- Activity on Taking Charge of Your Health

**MODULE - III SOCIAL LIFE & RELATIONSHIPS**

- Take Charge of Your Social Life
- Activity on Taking Charge of Your Social Life.

**REFERENCE**

1. Franklin Convey, Take Charge College Readiness, Franklin Convey Education.

This division is well aligned with curriculum design:

- Semester I: Self-management and adjustment to college (Modules I–III).

**Recommended in Board of Studies (BoS) Meeting No.** 8 **held on** 12/08/2025

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**OUTCOMES:**

**Upon completion of the course, the student will be able to:**

1. Apply self-awareness, responsibility, and a growth mindset to adapt effectively to college life. (K3)
2. Apply effective time-management and self-care practices to balance academic responsibilities and personal well-being. (K3)
3. Demonstrate effective communication skills and responsible social behaviour in diverse college environments. (K3)

**CO-PO, MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | - | - | - | - | 2 | - | - | - | - | - |
| CO2 | 1 | - | - | - | - | 2 | - | - | - | - | - |
| CO3 | - | - | - | - | - | 2 | - | - | - | - | - |

Recommended in Board of Studies (BoS) Meeting No. 8 held on 12/October



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# SEMESTER - II

| COURSE CODE: 24HSEN201 | PROFESSIONAL ENGLISH | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 2 | 0 | 0 | 2 | 2 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- Acquire techniques for comprehending and critically analyzing passages
- Improve the communicative competence
- Enhance learners' ability to read and write complex texts, summaries, definitions and reports
- Write effective formal letters and reports
- Develop skills for preparing effective job application

**MODULE - I EFFECTIVE COMMUNICATION** 6

Listening – Listening to conversations/documentaries – Speaking – making conversations in real life occurrences – Reading - short stories, happenings - Writing – autobiographical writing, preparation of checklist – communication and types of communication – Language Development -- subject - verb agreement, commonly confused words – spellings

**MODULE - II BASICS OF TECHNICAL WRITING** 5

Listening – listening to advertisements and products – Speaking - greetings/wishes/excuses and thanks – Reading – articles/novels - Writing - summary of articles, writing modes, formats, compositions - Language Development - reported speech, numerical adjectives

**MODULE - III REPORT WRITING** 4

Listening – listening to podcasts – Speaking - interviewing celebrities – observing and responding. Reading – regular columns of newspapers/ magazines - Writing – reports – feasibility, accident, preparation of agenda and minutes – Language Development - discourse markers

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 21/6/2024

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**MODULE - IV DIVERSE WRITING SKILLS** **5**

Writing – formal letters – inviting guests – acceptance/declining letters - Language Development- degrees of comparison – embedded sentences - acronyms and abbreviations

**MODULE - V CAREER COMPETENCIES** **6**

Listening – expert talks – recommending suggestions & solutions – Speaking – Debate- participating in a group discussion – learning GD strategies – Reading – innovations, ideations - Writing – Job application, resume, – proposals – Language Development – verbal analogies – phrasal verbs

**MODULE - VI LEXICAL ENHANCEMENT** **4**

Listening - technical and general talks - Speaking - oral presentation with visual aids - Reading - successful stories/autobiographies - Writing - writing blogs - Language Development - common errors in English, idiomatic expressions

**TOTAL: 30 PERIODS**

**TEXT BOOKS:**

1. Board of editors. Fluency in English: A Course book for Engineering and Technology. Orient Blackswan, Hyderabad 2016.
2. Raman, Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford University Press.

**REFERENCES:**

1. Bailey, Stephen. Academic Writing: A Practical Guide for Students. Routledge, New York,2011.
2. Raman, Meenakshi, Sharma, Sangeeta. Technical Communication. Principles and Practice. Oxford University Press, New Delhi, 2014.
3. Muralikrishnan & Mishra Sunitha, Communication skills for Engineers 2nd ed. Pearson, Tamil Nadu, India 2011. P. Kiranmai and Rajeevan, Geetha. Basic Communication Skills, Foundation Books, New Delhi, 2013.
4. Vesilind Aarne P., Public Speaking and Writing Skills for Engineering Students (2nd Ed), Lakeshore press, 2007
5. Richards, Jack C. Interchange Students' Book – 2. Cambridge University Press, New Delhi, 2015.

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/8/2019



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**WEB REFERENCES:**

1. https://swayam.gov.in/nd1_noc20_hs21/preview
2. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/109106122/lec1.pdf
3. https://takelessons.com/en-in/search?service=English&sort=1&utm_

**ONLINE RESOURCES:**

1. https://www.coursera.org/specializations/improve-english?
2. https://www.fluentu.com/blog/educator-english/business-english-conversation-topics/

**OUTCOMES:**

**Upon completion of the course, the student will be able to:**

1. Apply knowledge of various types of communication to prepare effective checklists and handle real-life communication contexts. (K3)
2. Analyze and summarize articles and write-ups for clarity and coherence. (K4)
3. Construct feasibility reports, accident reports, survey reports, and meeting minutes using appropriate formats. (K3)
4. Apply writing skills to compose official letters with emphasis, clarity, and correctness. (K3)
5. Develop job applications and technical proposals with structured and professional content. (K4)
6. Apply communication strategies to express opinions effectively in both oral and written forms. (K3)

**CO-PO, PSO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | 1 | - | - | - | 2 | - | - | - | - |
| CO2 | - | - | - | - | 1 | - | - | - | 3 | - | - | - | - |
| CO3 | - | - | - | - | 1 | - | - | - | 2 | - | - | - | - |
| CO4 | - | - | - | - | 1 | - | - | - | 2 | - | - | - | - |
| CO5 | - | - | - | - | 1 | - | - | - | 3 | - | 1 | - | - |
| CO6 | - | - | - | - | 1 | - | - | - | 2 | - | 1 | - | - |

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# SEMESTER - II

| COURSE CODE: 24BSMA201 | DISCRETE STRUCTURES | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 | 4 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- To understand the fundamental concepts of logic, rules of inference, and quantifiers.
- To learn the principles of mathematical induction, permutations, and combinations.
- To gain knowledge of groups and normal subgroups in abstract algebra.
- To develop graph algorithms using the foundational concepts of graph theory.
- To understand the concepts of lattices and Boolean algebra and their applications.

**MODULE - I LOGICS** **9**

Basic Connectives – Truth Tables – Logical Equivalence - The Laws of Logic- Logical Implications - Normal Forms – Rules of Inference – The use of Quantifiers.

**MODULE - II COMBINATORICS** **9**

The Principles of Mathematical Induction – Basic counting techniques – Inclusion and exclusion - Pigeonhole principle – Permutation – Combination.

**MODULE - III ALGEBRAIC STRUCTURES WITH ONE BINARY OPERATION** **12**

Semi Groups– Monoids– Groups - Subgroups – Cosets- Normal subgroups –Lagrange's theorem.

**MODUL - IV GRAPHS** **12**

Graphs - Definition -Special types of Graphs- Matrix representation of Graphs - Graph isomorphism- Path, Cycle, Connectivity - Eulerian and Hamiltonian Graphs.

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**MODULE- V LATTICES** 9

Partial ordering - Posets - Lattices as Posets - Properties of lattices - Lattices as algebraic systems - Sub lattices - Direct product and homomorphism - Some special lattices.

**MODULE - VI BOOLEAN ALGEBRA** 9

Boolean Algebra – Definition – Identities of Boolean Algebra -Demorgan's laws.

**TOTAL: 60 PERIODS**

**TEXT BOOKS:**


1. Discrete Mathematics and its Applications: with Combinatorics and Graph Theory, Kenneth H. Rosen, 7th Edition, Tata McGraw –Hill Education Pvt. Ltd., 2015.
2. Discrete Mathematical Structure with Applications to Computer Science", J.P. Tremblay and R. Manohar, Reprint, McGraw-Hill Education (India), 1997.


**REFERENCES:**


1. Discrete Mathematics with Applications, Susanna S. Epp, 4th edition, Brooks/Cole, Cengage Learning, 2010.
2. Discrete Mathematics, Norman L. Biggs, 2nd Edition, Oxford University Press, 2002.
3. Discrete Mathematics, Seymour Lipschutz, Marc Lipson, Schaum's Outlines Series, 3rd edition, McGraw-Hill Education, 2009.
4. Elements of Discrete Mathematics: A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 4th Edition, Tata McGraw –Hill Education Pvt. Ltd., 2012.


**WEB REFERENCES:**

1. https://web.stanford.edu/class/cs103x/cs103x-notes.pdf
2. https://www.cs.cornell.edu/~rafael/discmath.pdf
3. http://home.iitk.ac.in/~arlal/book/mth202.pdf
4. https://drive.google.com/file/d/1-PqMUlqDim1-AHQK5_zL34I97zHV3W15/view

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**ONLINE RESOURSES:**

1. https://nptel.ac.in/courses/106106183
2. https://www.youtube.com/watch?v=xlUFkMKSB3Y&list=PL0862D1A947252D20
3. https://www.youtube.com/watch?v=4LlTmsfDS4Y&list=PLEAYkSg4uSQ2Wfc_l4QEZUSRdx2ZcFziO&index=13
4. https://www.youtube.com/watch?v=jBsEKyx6Rj0&list=PLwdnzlV3ogoVxVxCTlI45pDVM1aoYoMHf
5. https://www.youtube.com/watch?v=rdXw7Ps9vxc&list=PLHXZ9OQGMqxersk8fUxiUMSIx0DBqsKZS

**COURSE OUTCOMES:**

**Upon completion of the course, the student should be able to:**

1. Construct mathematical arguments using logical connectives, quantifiers and verify the correctness of an argument using symbolic logic, truth tables. (K3)
2. Apply counting principle and mathematical induction to solve combinatorial problems. (K3)
3. Explain the fundamental concepts of algebraic structures such as groups and Boolean algebra. (K3)
4. Illustrate the concepts of graphs. (K3)
5. Apply the concepts of Lattices in the field of computer science. (K3)
6. Apply the concepts of Boolean algebra in logical circuits. (K3)

**CO-PO, MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | - | - | - | - | - | - | - | 2 | 3 |
| CO2 | 3 | - | - | - | - | - | - | - | - | - | - | 2 | 2 |
| CO3 | 3 | - | - | - | - | - | - | - | - | - | - | 2 | 3 |
| CO4 | 3 | - | - | - | - | - | - | - | - | - | - | 3 | 2 |
| CO5 | 3 | - | - | - | - | - | - | - | - | - | - | 2 | 3 |
| CO6 | 3 | - | - | - | - | - | - | - | - | - | - | 3 | 3 |

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# SEMESTER - II

| COURSE CODE: 24BSPH201 | PHYSICS OF ELECTRONIC DEVICES | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 3 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4,7,9,11 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- To acquaint the electrical properties of materials.
- To enlighten the basic principles of semiconductor physics.
- To acquaint the applications of semiconductor devices.
- To introduce the optical properties of materials.
- To educate the properties of magnetic and dielectric materials and their uses.
- To illustrate the properties and applications of nanodevices.

**MODULE - I ELECTRICAL PROPERTIES OF MATERIALS 8**

Classical free electron theory - Expression for electrical conductivity - Thermal conductivity expression - Wiedemann-Franz law - Success and failures - electrons in metals - Fermi- Dirac statistics - Density of energy states - Electron in periodic potential- Energy bands in solids – tight binding approximation - Electron effective mass- concept of hole.

**MODULE - II SEMICONDUCTOR AND TRANSPORT PHYSICS 7**

Semiconductors – Energy band diagram – direct and indirect band gap semiconductors –Intrinsic semiconductor– Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – Carrier transport in Semiconductors:, Mobility ,Drift and Diffusion Current densities.

**MODULE - III SEMICONDUCTOR SWITCHING DEVICES 8**

PN Junction Diode - Construction ,Working and Characteristics - Transistor - NPN, PNP working - Early effect - Current equations - Input and Output Characteristics of CB, CE and CC configurations - JFET and its characteristics - MOSFET and its characteristics - Construction and Working of D-MOSFET - UJT, SCR - CCD and Optocoupler. IoT concept and use in industry.

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**MODULE - IV OPTICAL PROPERTIES OF MATERIALS 7**

Classification of optical materials - optical absorption and emission process in materials - charge carrier generation and recombination - optical absorption loss and gain.– Optoelectronic devices - Solar cells – LED – OLED - Nonlinear optics- Modulators, switching devices Plasmonics (Qualitative)

**MODULE - V MAGNETIC AND DIELECTRIC PROPERTIES OF MATERIALS 8**

Magnetism in materials - Magnetic field and induction - Magnetization - permeability and susceptibility - Types of magnetic materials - microscopic classification of magnetic materials Ferromagnetism - Domain Theory - Hysteresis phenomenon - Dielectric materials – Introduction - Types of Polarization (qualitative) - internal field - Clausius-Mossotti relation – dielectric loss - dielectric breakdown (definitions) - Dielectric constant measurement by Schering bridge method.

**MODULE - VI NANO DEVICES 7**

Quantum Confinement - Quantum structures - Density of states in quantum well, wires, and dots (Quantitative) - Band Gap of Nano materials - Tunnelling - Single electron phenomena - Single electron transistor - Quantum DOT lasers - Conductivity of metallic nano wires - Carbon Nano Tubes (CNT): Structures, properties and applications.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
2. R.F.Pierret. Semiconductor Device Fundamentals. Pearson (Indian Edition), 2006.
3. G.W.Hanson. Fundamentals of Nanoelectronics. Pearson Education (Indian Edition), 2009.
4. Dr.P.Mani. Physics for Electronic Devices, Dhanam Publications, 2024.

**REFERENCES:**

1. Laszlo Solymar, Walsh, Donald, Syms and Richard R.A., Electrical Properties of Materials, Oxford Univ. Press (Indian Edition) 2015.
2. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Education (Indian Edition), 2019.
3. Mark Fox, Optical Properties of Solids, Oxford Univ.Press, 2001.
4. N.Gershenfeld. The Physics of Information Technology. Cambridge University Press, 2011.

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**COURSE OUTCOMES:**

1.. Explore the basic concepts of free electron theory of solids and apply it to determine the conducting properties, carrier concentration and effective mass of an electron in conductors (K3)
2. Analyze the band structures and carrier concentrations of semiconductors, study their variations with temperature, and examine carrier transport mechanisms (K4)
3. Apply the working principles of semiconductor devices and use IoT concepts in practical applications (K3)
4. Illustrate the optical processes in materials and examine the operation of optoelectronic devices (K3)
5. Demonstrate the magnetic and dielectric properties of materials and their applications (K3)
6. Analyze quantum confinement and quantum structures, examine the working principles of quantum devices, and explore the applications of carbon nanotubes (K4)

**CO – PO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 3 | 3 | - | - | - | - | - | - | - | - | - |
| CO3 | 3 | - | - | - | - | - | - | - | - | - | - |
| CO4 | 3 | - | - | - | - | - | - | - | - | - | - |
| CO5 | 3 | - | - | - | - | - | - | - | - | - | - |
| CO6 | 3 | 3 | - | - | - | - | - | - | - | - | - |

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# SEMESTER - II

| COURSE CODE: 24ITPC201 | OBJECT ORIENTED PROGRAMMING USING JAVA | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 3 |
| NPTEL CODE: 106105191 | SYLLABUS VERSION 1.1 | SDG NO. 4, 7, 9, 11 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- To understand the fundamental concepts of object-oriented programming and the Java programming environment.
- To apply Java programming constructs to develop object-oriented applications.
- To illustrate the use of object-oriented features such as interfaces, packages, exception handling, and multithreading.
- To build simple Java applications using collections, file handling, and graphical user interface components.

**MODULE - I INTRODUCTION TO JAVA PROGRAMMING** 8

Object-Oriented Programming Concepts – Features of Java – Java Environment (JDK, JRE, JVM) – Structure of Java Program – Java Tokens – Data Types – Variables – Operators – Control Statements – Arrays – Methods – Command Line Arguments

**MODULE - II CLASSES AND OBJECTS** 8

Classes and Objects – Constructors – Constructor Overloading – this Keyword – Static Members – Methods – Objects as Parameters – Arrays of Objects – Strings – String Buffer – Wrapper Classes – Packages – Access Protection

**MODULE - III INHERITANCE AND POLYMORPHISM** 8

Inheritance – Types of Inheritance – Method Overriding – Dynamic Method Dispatch – super Keyword – final Keyword – Abstract Classes – Interfaces – Polymorphism

**MODULE - IV EXCEPTION HANDLING AND MULTITHREADING** 7

Exception Types – try, catch, finally – throw and throws – User-defined Exceptions – Creating Threads – Thread Life Cycle – Thread Priority – Synchronization

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**MODULE - V COLLECTIONS AND FILE HANDLING** 7

Collection Framework – List – ArrayList – LinkedList – Set – HashSet – Map – HashMap – Iterator – File Class – Byte Streams – Character Streams

**MODULE - VI GUI PROGRAMMING** 7

AWT – Swing Components – Layout Managers – Event Handling – Action Events – Mouse Events – Keyboard Events – Simple GUI Applications

**TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. E. Balagurusamy, "Programming with Java", McGraw Hill Education, 7th Edition, 2023.
2. Herbert Schildt and Danny Coward, "Java: The Complete Reference", McGraw Hill, 13th Edition, 2024

**REFERENCES:**

1. Paul Deitel and Harvey Deitel, Java: How to Program, Early Objects, 12th Edition, Pearson, 2020.
2. Steven Holzner, Java Black Book, New Edition, Dreamtech Press (BPB Publications), 2019.
3. Timothy Budd, "Understanding Object-Oriented Programming with Java", Updated Edition, Pearson Education, 2000

**ONLINE RESOURCES:**

1. https://www.w3schools.com/java/java_oop.asp
2. https://www.edureka.co/blog/object-oriented-programming/
3. https://www.ntu.edu.sg/home/ehchua/programming/java/J3a_OOP Basics.html
4. https://introcs.cs.princeton.edu/java/lectures/
5. https://nptel.ac.in/courses/106105191

**COURSE OUTCOMES:**

**Upon completion of the course, the student should be able to:**

1. Implement Java Programs by applying object-oriented programming principles, Java architectures and language fundamentals. (K3)
2. Develop Java programs using classes, objects, methods, constructors, arrays, and strings. (K3)
3. Employ interfaces, packages, and polymorphism to develop modular Java applications. (K3)

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4. Apply exception handling and multithreading concepts to build reliable Java programs. (K3)
5. Utilize Java collections and file handling techniques for data storage and manipulation. (K3)
6. Construct simple event-driven graphical user interface (GUI) applications using Java AWT and Swing. (K3)

**CO-PO, MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| CO2 | 3 | 3 | - | - | 3 | - | - | - | - | - | - | - | 2 |
| CO3 | 2 | - | 3 | - | 3 | - | - | - | - | - | - | 3 | 2 |
| CO4 | 2 | 3 | - | - | 3 | - | - | - | - | - | - | - | 3 |
| CO5 | 2 | 2 | - | - | 3 | - | - | - | - | - | - | - | 3 |
| CO6 | 2 | - | 3 | - | 3 | - | - | - | 2 | - | - | 2 | - |

# SEMESTER - II

| COURSE CODE: 24COPC201 | FOUNDATIONS OF DATA SCIENCE | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 3 |
| NPTEL CODE: 106106212 | SYLLABUS VERSION 1.1 | SDG NO. 4,9 | | | | |
| PRE-REQUISITE COURSES | C PROGRAMMING | | | | | |

**OBJECTIVES:**

- To collect, clean, manipulate, and analyse data using Python libraries
- To equip students with a strong foundational understanding of data science concepts.
- To perform data operations and derive insights from real-world datasets.
- To gain knowledge on Data Science modules NumPy, SciPy and Matplotlib
- To acquire skills in data preparatory and preprocessing steps

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**MODULE - I DATA SCIENCE FUNDAMENTALS** **7**

Need for data science – Benefits and uses – Facts of data – Data science process – Setting the research goal – Retrieving data – cleansing, integrating, and transforming data – Exploratory data analysis – Build the models – Presenting and building applications.

**MODULE - II PYTHON PROGRAMMING FOR DATA SCIENCE** **9**

Python Programming – Python Interpreter – Language Semantics – Data Types, Variables, Basic Functions and Operators – Flow Control Statements – Data Structures and Sequences: Lists, Tuples, Sets and Dictionaries – Functions: Defining Functions, Passing Arguments and Return Values – Passing Lists to Functions – Classes and Objects – Strings and String Methods – File Handling: Reading and Writing Files – Exception Handling – Python Libraries and Importing Libraries.

**MODULE - III DESCRIBING DATA AND RELATIONSHIPS** **8**

Describing Data – Types of Data – Types of Variables – Measures of Central Tendency: Mean, Median and Mode – Measures of Variability: Range, Variance, Standard Deviation, Degrees of Freedom and Interq uartile Range – Data Presentation using Tables and Graphs – Describing Relationships – Correlation – Scatter Plots – Correlation Coefficient for Quantitative Data – Computational Formula for Correlation Coefficient – Regression Analysis – Regression Line – Least Squares Regression Line – Standard Error of Estimate – Multiple Regression Equations.

**MODULE - IV NUMPY AND PANDAS LIBRARIES FOR DATA WRANGLING** **8**

Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

**MODULE - V DATA VISUALIZATION** **6**

Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting – Geographic Data with Basemap – Visualization with Seaborn.

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**MODULE - VI MACHINE LEARNING** 7

Machine Learning – Applications of Machine Learning in Data Science – Machine Learning in the Data Science Process – Python Tools for Machine Learning – Modelling Process – Feature Engineering and Model Selection – Model Training – Model Validation – Prediction of New Observations – Types of Machine Learning – Supervised Learning – Unsupervised Learning – Semi-Supervised Learning.

**Text Books:**


1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.
2. Martin C. Brown 'Python: The Complete Reference'. 4th edition, Mc-Graw Hill, 2018.
3. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
4. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.


**References:**


1. McKinney, W. (2017). Python for data analysis: Data wrangling with pandas, NumPy, and IPython. O'Reilly Media.
2. Mukhiya, S. K., & Ahmed, U. (2020). Hands-on exploratory data analysis with Python. Packt Publishing.
3. Thereja, R. (2022). Data science and machine learning using Python (1st ed.). Tata McGraw Hill.
4. Ward,M.O.Grinstein, G., & Keim, D. (2015). Interactive data visualization: Foundations, techniques, and applications. A. K. Peters/CRC Press


**E-Resources:**

1. NPTEL course on "Python for Data Science" by Prof. Ragunathan Rengasamy, IIT Madras
2. Swayam MOOC course on "Data Science Using Python" by Prof. Faisal Anwer, Prof. Mohammad Nadeem, Aligarh Muslim University
3. NPTEL course on "Data Analytics with Python", Prof. A. Ramesh, IIT Roorkee.

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Dr.M.PACHHAIAMMAL ALIAS PRIYA
CHAIRMAN, BOS / CE
PROFESSOR AND HEAD / CSE

**Course Outcomes:**

1. Demonstrate the data science process for collecting, cleaning, transforming, exploring, and presenting data. [K3]
2. Develop basic Python programs using programming constructs, data structures, functions and file handling for data science applications. [K3]
3. Calculate statistical measures and use correlation and regression techniques to analyse data relationships. [K3]
4. Perform numerical computations and data manipulation using NumPy and Pandas. [K3]
5. Construct appropriate visualizations using Matplotlib and Seaborn to represent data patterns and relationships. [K3]
6. Implement machine learning procedures for feature engineering, model training, validation, and prediction. [K3]

**CO-PO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| CO2 | 3 | - | - | - | 2 | - | - | - | - | - | - | | 2 |
| CO3 | 3 | - | - | - | - | - | - | - | - | - | - | 3 | 2 |
| CO4 | 2 | - | - | - | 2 | - | - | - | - | - | - | - | 3 |
| CO5 | 3 | - | - | - | 2 | - | - | - | - | - | - | - | 3 |
| CO6 | 3 | - | - | - | 3 | - | - | - | 2 | - | - | 2 | - |

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Dr.M.PACHHAIYAMMAL ALIAS PRIYA
CHAIRMAN, BOS / CCE
PROFESSOR AND HEAD, CCE

# SEMESTER - II

| COURSE CODE: 24HSTA201 | TAMILS AND TECHNOLOGY | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 1 | 0 | 0 | 1 | 1 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- To understand the techniques that help for a better livelihood
- To Identify the methods used for scientific Tamil computing

**அலகு-I நெசவு மற்றும் பானைத் தொழில்நுட்பம்**

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

**UNIT-I WEAVING AND POTTERY (CERAMIC) TECHNOLOGY** 5

Weaving Industry during Sangam Age - Ceramic technology - Black and Red-ware Potteries (BRW) - Graffiti on Potteries.

**அலகு -II சங்ககாலவடிவமைப்புகள்**

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள்ரூசங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு -சங்க காலத்தில் கட்டுமான பொருட்களும்நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள்.

**UNIT-II SANGAM AGE DESIGNS** 5

Designing and Structural construction - House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age- Details of Stage Constructions in Silappathikaram

**அலகு -III பழங்காலகட்டிடத் தொழில்நுட்பம்**

மாமல்லபுரச்சிற்பங்களும், கோவில்களும் - சோழர்காலத்துப்பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத்தலங்கள் - நாயக்கர்காலக்கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டுவீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக்கட்டிடக் கலை.

Recommended in Board of Studies (BoS) Meeting No. 6 held on 31/Aug

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**UNIT-III ANCIENT CONSTRUCTION TECHNOLOGY** 5

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

**அலகு- IV உற்பத்தித் தொழில்நுட்பம்**

கப்பல் கட்டும் கலை -உலோகவியல் -இரும்புத் தொழிற்சாலை இரும்பை உருக்குதல், எஃகு - வரலாற்றுச்சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் சங்கு மணிகள் -எலும்புத்துண்டுகள் - தொல்லியல்சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

**UNIT-IV MANUFACTURING TECHNOLOGY** 5

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

**அலகு - V வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்**

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக்குமுழித்தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காகவடிவமைக்கப்பட்டகிணறுகள்- வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள்- கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

**UNIT-V AGRICULTURE AND IRRIGATION TECHNOLOGY** 5

Dam, Tank, Ponds, Sluice, Significance of KumizhiThoompu of Chola Period> Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries - Pearl - Conch diving -Ancient Knowledge of Ocean - Knowledge Specific Society.

**அலகு-VI அறிவியல்தமிழ்மற்றும்கணித்தமிழ்**

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக்கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

**UNIT-VI SCIENTIFIC TAMIL & TAMIL COMPUTING** 5

Development of Scientific Tamil - Tamil computing - Digitalization of Tamil Books - Development of Tamil Software - Tamil Virtual Academy -Tamil Digital Library - Online Tamil Dictionaries - Sorkuvai Project.

**TOTAL: 30 PERIODS**

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/8/2019

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**TEXT-CUM-REFERENCE BOOKS**

1. தமிழக வரலாறு — மக்களும் பண்பாடும் — கே.கே. பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்)
2. கணினித் தமிழ் — முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி — வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை — ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian> Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - ‚Sangam City Civilization on the banks of river Vaigai... (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation> Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

**OUTCOMES:**

**Upon completion of the course, the learners will be able to:**

1. சங்ககால நெசவு மற்றும் பானைத்தொழில்நுட்பங்களைப் பற்றி அறிந்து கொள்ளுதல்
   To learn about the weaving and pottery (ceramic) technologies during the Sangam Age.(K2)
2. சங்ககாலவடிவமைப்புகள் மற்றும் கட்டுமானக்கலையைப் புரிந்து கொள்ளுதல்
   To understand the designs and structural constructions during the Sangam period.(K2)
3. பண்டைய கால கட்டிடக்கலையின்நுட்பங்கள் மற்றும் கட்டிடவடிவமைப்புகளை ஆராய்தல்.
   To explore the techniques and architectural patterns of ancient Tamil structures.(K2)
4. உற்பத்தி மற்றும் உலோகவியல்தொழில்நுட்பங்களைப் பற்றி அறிதல்.
   To gain knowledge on manufacturing and metallurgical technologies of ancient Tamils.(K3)

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5. வேளாண்மை, நீர்ப்பாசனம் மற்றும் கடல்சார்தொழில்நுட்பங்களைப் பற்றி அறிந்து கொள்ளுதல்.
To understand agricultural> irrigation> and marine technologies of ancient Tamil society.(K3)
6. அறிவியல்தமிழ் மற்றும் கணித்தமிழின்வளர்ச்சியையும் அதன் கணினி பயன்பாடுகளையும் புரிந்து கொள்ளுதல்.
To understand the development of Scientific Tamil and its applications in Tamil computing.(K3)

**CO-PO, PSO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | 1 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | 1 | 2 | 1 |
| CO3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 1 | 2 | 1 |
| CO4 | 3 | 2 | 3 | 3 | - | - | - | - | - | - | 1 | 2 | 2 |
| CO5 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 1 | 2 | 1 |
| CO6 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 1 | 2 | 2 |

# SEMESTER - II

| COURSE CODE: 24HSNC201 | NCC COURSE LEVEL 1 | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 2 | 0 | 0 | 2 | 0 |
| NPTEL CODE: - | SYLLABUS VERSION 1.0 | SDG NO. 4 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**ARMY WING**

**NCC GENERAL** 6

| | | |
|---|---|---|
| NCC 1 | Aims, Objectives & Organization of NCC | 1 |
| NCC 2 | Incentives | 2 |
| NCC 3 | Duties of NCC Cadet | 1 |
| NCC 4 | NCC Camps: Types & Conduct | 2 |

**Recommended in Board of Studies (BoS) Meeting No.** 7 **held on** 20/02/2025

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| | | |
|---|---|---|
| **NATIONAL INTEGRATION AND AWARENESS** | | **4** |
| NI 1 | National Integration: Importance & Necessity | 1 |
| NI 2 | Factors Affecting National Integration | 1 |
| NI 3 | Unity in Diversity & Role of NCC in Nation Building | 1 |
| NI 4 | Threats to National Security | 1 |
| **PERSONALITY DEVELOPMENT** | | **7** |
| PD 1 | Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving | 2 |
| PD 2 | Communication Skills | 3 |
| PD 3 | Group Discussion: Stress & Emotions | 2 |
| **LEADERSHIP** | | **5** |
| L 1 | Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code | 3 |
| L 2 | Case Studies: Shivaji, Jhasi Ki Rani | 2 |
| **SOCIAL SERVICE AND COMMUNITY DEVELOPMENT** | | **8** |
| SS 1 | Basics, Rural Development Programmes, NGOs, Contribution of Youth | 3 |
| SS 4 | Protection of Children and Women Safety | 1 |
| SS 5 | Road / Rail Travel Safety | 1 |
| SS 6 | New Initiatives | 2 |
| SS 7 | Cyber and Mobile Security Awareness | 1 |
| | **TOTAL: 30 PERIODS** | |

**NAVAL WING**

| | | |
|---|---|---|
| **NCC GENERAL** | | **6** |
| NCC 1 | Aims, Objectives & Organization of NCC | 1 |
| NCC 2 | Incentives | 2 |
| NCC 3 | Duties of NCC Cadet | 1 |
| NCC 4 | NCC Camps: Types & Conduct | 2 |
| **NATIONAL INTEGRATION AND AWARENESS** | | **4** |
| NI 1 | National Integration: Importance & Necessity | 1 |
| NI 2 | Factors Affecting National Integration | 1 |
| NI 3 | Unity in Diversity & Role of NCC in Nation Building | 1 |
| NI 4 | Threats to National Security | 1 |

**Recommended in Board of Studies (BoS) Meeting No.** 7 **held on** 20/03/2018

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| | | |
|---|---|---|
| **PERSONALITY DEVELOPMENT** | | **7** |
| PD 1 | Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving | 2 |
| PD 2 | Communication Skills | 3 |
| PD 3 | Group Discussion: Stress & Emotions | 2 |
| **LEADERSHIP** | | **5** |
| L 1 | Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code | 3 |
| L 2 | Case Studies: Shivaji, Jhasi Ki Rani | 2 |
| **SOCIAL SERVICE AND COMMUNITY DEVELOPMENT** | | **8** |
| SS 1 | Basics, Rural Development Programmes, NGOs, Contribution of Youth | 3 |
| SS 4 | Protection of Children and Women Safety | 1 |
| SS 5 | Road / Rail Travel Safety | 1 |
| SS 6 | New Initiatives | 2 |
| SS 7 | Cyber and Mobile Security Awareness | 1 |
| | **TOTAL: 30 PERIODS** | |

**ARMY WING**

| | | |
|---|---|---|
| **NCC GENERAL** | | **6** |
| NCC 1 | Aims, Objectives & Organization of NCC | 1 |
| NCC 2 | Incentives | 2 |
| NCC 3 | Duties of NCC Cadet | 1 |
| NCC 4 | NCC Camps: Types & Conduct | 2 |
| **NATIONAL INTEGRATION AND AWARENESS** | | **4** |
| NI 1 | National Integration: Importance & Necessity | 1 |
| NI 2 | Factors Affecting National Integration | 1 |
| NI 3 | Unity in Diversity & Role of NCC in Nation Building | 1 |
| NI 4 | Threats to National Security | 1 |
| **PERSONALITY DEVELOPMENT** | | **7** |
| PD 1 | Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving | 2 |
| PD 2 | Communication Skills | 3 |
| PD 3 | Group Discussion: Stress & Emotions | 2 |

**Recommended in Board of Studies (BoS) Meeting No.** 7 **held on** 20/03/2024



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| | | |
|---|---|---|
| **LEADERSHIP** | | 5 |
| L 1 | Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code | 3 |
| L 2 | Case Studies: Shivaji, Jhasi Ki Rani | 2 |
| **SOCIAL SERVICE AND COMMUNITY DEVELOPMENT** | | 8 |
| SS 1 | Basics, Rural Development Programmes, NGOs, Contribution of Youth | 3 |
| SS 4 | Protection of Children and Women Safety | 1 |
| SS 5 | Road / Rail Travel Safety | 1 |
| SS 6 | New Initiatives | 2 |
| SS 7 | Cyber and Mobile Security Awareness | 1 |

**TOTAL: 30 PERIODS**

# SEMESTER - II

| COURSE CODE: 24BSPL103 | PHYSICS LABORATORY | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 2 | 2 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4,6,11,12&17 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- Demonstrate the wave nature of light using diffraction and interference properties.
- Study the thermal conductivity of a bad conductor.
- Verify experimentally the elastic properties of materials.

**Sl.No. Name of the Experiment**

1 (a) Determination of wavelength of Laser

(b) Determination of numerical aperture and acceptance angle in an optical fiber.

(c) Determination of particle size using a laser source.

**Recommended in Board of Studies (BoS) Meeting No.** 8 **held on** 17/08/2024

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2 Determination of thermal conductivity of a bad conductor – Lee's Disc method.
3 Determination of Young's modulus by the non-uniform bending method.
4 Determination of the period of oscillation of a given torsional pendulum for a fixed length and find the rigidity modulus of the wire.
5 Find out the thickness of the given wire by the air wedge method.
6 Calculation of lattice cell parameter – X-ray diffraction method.
7 Determination of Planck's constant.
8 Determination of wavelength of mercury spectrum – spectrometer grating.
9 Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
10 Determination of the band gap of a semiconductor.
11 Determination of the Hall coefficient by the Hall effect experiment.
12 Determination of solar cell characteristics.

**TOTAL: 30 PERIODS**

**TEXTBOOK:**

1. Engineering Physics Lab, Dr. G. SenthilKumar, VRB publishers. (2019)
2. Engineering Physics Practical, Dr. P. Mani, Dhanam Publications. (2020)

**OUTCOMES:**

**Upon completion of the course, the student should be able to:**

1. Apply the principles of elasticity and thermal physics to evaluate the various moduli of elasticity and conductivity of a bad conductor. (K3)
2. Explicate the properties of semiconductors by evaluating the band gap, I-V characteristics of solar cells and Hall effect of the materials. (K3)

**CO – PO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | - | - | 2 | - | - | - | - | - | 2 |
| CO2 | 3 | 3 | - | - | 2 | - | - | - | - | - | 2 |

**Recommended in Board of Studies (BoS) Meeting No.** 8 **held on** 15/08/2022



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# SEMESTER - II

| COURSE CODE: 24ITPL201 | OBJECT ORIENTED PROGRAMMING USING JAVA LABORATORY | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 4 | 2 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4 & 9 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- Develop Java programs using object-oriented programming principles and fundamental language constructs.
- Implement Java applications using inheritance, interfaces, exception handling, multithreading, packages, and file processing techniques.
- Apply Java Collection Framework and GUI components to solve real-world programming problems.
- Analyze programming requirements and construct modular Java applications using appropriate development tools and debugging techniques.

| SI.NO | LIST OF EXPERIMENTS |
|---|---|
| 1. | Basic JAVA Programs |
| a. | Write a program to find the sum of individual digits of a positive integer. |
| b. | Write a program to generate the first n terms of the sequence. |
| c. | Write a program to generate all the prime numbers between 1 and n, where n is a value supplied by the user. |
| d. | Write a program to find both the largest and smallest number in a list of integers. |
| e. | Write a program to find factorial of list of number reading input as command |
| 2. | Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary |

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3. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape. Use interface
4. Implement exception handling and creation of user defined exceptions
5. Design a Java interface for ADT Stack. Implement this interface using an array. Provide necessary exception handling in both the implementations.
6. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes
7. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
8. Write a program to implement the concept of importing classes from user defined package and creating packages
9. Write a Java program to create an ArrayList of Student (id,name,dept,age) objects and search for particular Student objects based on id number.
10. Write a Java program to create an ArrayList which will be able to store only char and String but not any other data type.
11. Write a Java program using Queue Collection for Cinema Ticket Sale.
12. Develop an Applet program to accept two numbers from the user and output the sum and difference in the respective text boxes.
13. Write a program that identifies key-up key-down event user entering text in a Applet
14. Write a Java program to design student registration form using Swing controls. The form which having the following fields and button SAVE.
15. Write a program to display the digital watch in Swing.

**TOTAL: 30 PERIODS**

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**Lab Requirements:** Windows operating system, JDK 8, Java IDE

**OUTCOMES:**

**Upon completion of the course, the student will be able to:**

1. Develop Java programs using object-oriented programming concepts, classes, inheritance, abstract classes, and interfaces to solve basic computational problems. (K3)
2. Implement Java applications using exception handling, packages, file handling, interfaces, and multithreading to develop reliable and modular software solutions. (K3)
3. Apply programming requirements and integrate Java Collections, GUI components, and event handling to construct interactive Java applications. (K3)

**CO-PO, PSO MAPPING:**

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

# SEMESTER - II

| COURSE CODE: 24COPL201 | DATA SCIENCE LABORATORY | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 4 | 2 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4,9 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- To understand Python libraries used for data science.
- To perform data handling, cleaning and preprocessing using Python.
- To apply statistical and probability techniques to datasets.
- To perform descriptive analytics, correlation and regression analysis.
- To visualize and interpret data using Python plotting libraries.
- To develop Python-based data analytics applications using real-world data sets.

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**LIST OF EXPERIMENTS**

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.
2. Python basics – variables, operators and data types,Control statements and functions
3. Python lists, tuples, sets and dictionaries
4. File handling and CSV data
5. Programs for reading and writing CSV, Excel and JSON data
6. Working with Numpy arrays and operations
7. Working with Pandas data frames
8. Data filtering, sorting and grouping
9. Handling missing and duplicate data
10. Descriptive statistics using Python
11. Correlation and covariance analysis
12. Data visualization using Matplotlib,Seaborn
13. Exploratory Data Analysis on a real dataset
14. Case Studies(Student performance prediction, Customer segmentation,House price prediction, Healthcare analytics,Sales forecasting,Credit risk analysis)

**LAB REQUIREMENTS:**

**Software**

- Python 3.x (Latest Stable Version)
- Visual Studio Code / PyCharm Community Edition / IDLE
- Python Libraries:
- NumPy
- Pandas
- Matplotlib
- (Optional) SciPy

**OUTCOMES:**

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

1. Apply Python programming concepts and data science libraries such as NumPy, Pandas, SciPy, Statsmodels and Jupyter to read, manipulate and process structured data.(K3)
2. Analyze datasets using data preprocessing, descriptive statistics, correlation, covariance and exploratory data analysis techniques.(K4)

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Dr.M.PACHHAIAMMAL ALIAS PRIYA
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PROFESSOR AND HEAD / CCE

3. Apply Matplotlib and Seaborn to create data visualizations for real-world case studies such as student performance, customer segmentation, healthcare, and sales analytics. (K3)

**CO-PO,PSO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | 3 | - | - | - | 1 | 1 | - |
| CO2 | 3 | 3 | - | - | 3 | - | - | - | 1 | 1 | - |
| CO3 | 3 | - | - | - | 3 | - | - | - | 1 | 1 | - |

# SEMESTER - II

| COURSE CODE: 24ESID201 | IDEA ENGINEERING LABORATORY - II | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 2 | 1 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 1-17 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- Apply rapid ideation, creative thinking, and collaborative problem-solving to generate innovative engineering solutions.
- Create engineering sketches, technical drawings, and CAD models to visualize, communicate, and refine product concepts.
- Utilize design thinking to analyze user needs, build value propositions, and achieve product–market fit.
- Explore innovation management through case studies, technology commercialization, and entrepreneurial ecosystems.
- Navigate Intellectual Property Rights (IPR), patent protection, startup funding, incubation, and government schemes.
- Design sustainable, future-ready solutions using human–AI collaboration, regenerative innovation, and systems thinking aligned with UN SDGs.

**Recommended in Board of Studies (BoS) Meeting No.** 8 **held on** 17/08/2025

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**MODULE - I TECHNIQUES FOR RAPID IDEATION** 5

Introduction to Rapid Ideation and Creative Thinking - Principles and Techniques of Rapid Ideation - The Ideathon Workflow: From Problem to Solution - Brainstorming Methods for Idea Generation - Collaborative and Multidisciplinary Teamwork - Creativity Enhancement Techniques and Innovation Tools - Idea Evaluation and Refinement Through Expert Feedback - Institutional Support for Innovation and Ideation - Developing Feasible Products and Solution Concepts - Hands-on Ideation Activities, Case Studies, and Practical Exercises

**MODULE - II TECHNICAL DRAWING AND VISUALISATION** 5

Introduction to Technical Drawing for Ideation - Role of Technical Drawing in Communicating Innovative Ideas - Fundamentals of Freehand Sketching and 2D Concept Development - Visual Representation of Ideas Using Engineering Sketches - Orthographic Projection Techniques - Isometric and Pictorial Views for Product Visualisation - Spatial Visualisation and Multi-Dimensional Thinking - Introduction to Computer-Aided Design (CAD) for Ideation - Creating and Refining Digital Product Models Using CAD Tools - Transforming Creative Ideas into Practical Engineering Designs - Hands-on Sketching, CAD Exercises, and Mini Design Projects

**MODULE - III VALUE PROPOSITION FIT** 4

Introduction to the Value Proposition - Understanding Customer Needs, Wants, and Pain Points - Customer Segmentation and User Profiling - Identifying Customer Problems and Opportunities - Designing Value Through Quality, Affordability, and Customisation - Defining the Scope of Products and Services - Creating Unique and Personalised Value Propositions - Value Proposition Canvas and Customer–Solution Fit - Evaluating Product–Market Fit and Customer Validation - Refining Value Propositions Through Feedback and Iteration - Case Studies, Activities, and Practical Exercises

**MODULE - IV CASE STUDIES IN SUCCESSFUL IDEA GENERATION** 4

Introduction to Innovation Through Case Studies - Framework for Analysing Innovation Case Studies - Observation and Opportunity Recognition - Creativity and Problem-Solving in Innovation - Technical, Social, Economic, and Environmental Impact Assessment - Innovation and the United Nations Sustainable Development Goals (SDGs) - Lessons Learned from Successful Innovations - Applying Case Study Insights to Real-World Challenges - Building an Innovative and Entrepreneurial Mindset - Reflection, Discussion, and Practical Exercises

**Recommended in Board of Studies (BoS) Meeting No.** 8 **held on** 12/08/2026



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**MODULE - V PROTECTING AND FUNDING THE IDEA** 4

Introduction to Protecting and Funding Innovative Ideas - Importance of Protecting Startup Ideas and Innovations - Fundamentals of Intellectual Property Rights (IPR) - Patents: Concepts, Types, and Patent Filing Process - Trademarks, Copyrights, Trade Secrets, and Non-Disclosure Agreements (NDAs) - Technology Transfer and Intellectual Property Commercialisation - Startup Funding Sources and Stages of Funding - Institutional, State, National, and International Funding Opportunities - Role of Incubators, Accelerators, Angel Investors, and Venture Capital - Government Grants and Innovation Support Programmes - Commercialisation Strategies for Innovative Products and Services - Case Studies, Best Practices, and Practical Exercises

**MODULE - VI FUTURE OF IDEA ENGINEERING** 4

Future of Idea Engineering - Human–AI Co-Creation and Responsible Innovation - Resilience Engineering - Linear, Circular, and Regenerative Innovation - Collective Action, Collaboration, and Global Partnerships - Customer Identification, Buyers vs Users, and Customer Personas - Innovation Case Studies and Sustainable Impact

**26 + 4 (village visit) TOTAL: 30 PERIODS**

**REFERENCES:**


1. https://www.india.gov.in/services
2. https://sdgs.un.org/2030agenda
3. https://www.local2030.org/library/375/Sustainable-Development-Goals-and-Gram-Panchayats-Handbook-for-Elected-Representatives.pdf
4. https://sdgknowledgehub.undp.org.in/tag/lsdg/
5. https://www.tnrd.tn.gov.in/constitutionalprovision.html#1


**WEB REFERENCES**

1. UN Sustainable Development Goals
2. https://srmuniv.digimat.in/nptel/courses/video/109106200/L30.html
3. https://avcce.digimat.in/nptel/courses/video/109106200/L26.html

**OUTCOMES:**

**Upon completion of the course, the student will be able to:**

1. Apply rapid ideation techniques, creative thinking methods, and collaborative approaches to generate innovative engineering solutions for real-world problems.(K2)
2. Develop engineering sketches, technical drawings, and CAD-based models to effectively visualize, communicate, and refine innovative product concepts.(K3)

**Recommended in Board of Studies (BoS) Meeting No.** 8 **held on** 17/oct/25

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3. Analyze customer needs, value propositions, and product–market fit using structured design thinking tools to develop user-centric engineering solutions.(K4)
4. Evaluate innovation case studies, intellectual property rights (IPR), commercialization strategies, and funding opportunities to support technology-based entrepreneurship.(K3)
5. Evaluate IPR protection and funding mechanisms for startup ideas.(K3)
6. Design sustainable and future-ready innovation solutions by integrating human–AI collaboration, regenerative innovation, resilience engineering, and global partnership principles.(K6)

**CO-PO, PSO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | 2 | - | - | - | - | - | - | 3 | 3 |
| CO2 | 3 | - | - | - | 3 | - | - | - | - | - | - | 2 | - |
| CO3 | 2 | - | - | - | 3 | - | - | - | - | - | - | 3 | 2 |
| CO4 | 2 | - | - | - | 3 | - | - | - | - | - | - | 3 | 3 |
| CO5 | 3 | - | - | - | 2 | - | - | 3 | - | - | - | 3 | 2 |
| CO6 | 2 | - | - | - | - | - | 3 | 3 | - | - | - | 3 | 3 |

# SEMESTER - II

| COURSE CODE: 24ENTP201 | DIGITAL DYNAMICS | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 1 | 0 | 1 | 2 | 0 |
| NPTEL CODE: - | SYLLABUS VERSION 1.1 | SDG NO. 4 | | | | |
| PRE-REQUISITE COURSES | - | | | | | |

**OBJECTIVES:**

- Explore online communication
- Master computer skills
- Use virtual platforms
- Understand digital ethics and cyber security
- Observe and follow do's and don'ts

**Recommended in Board of Studies (BoS) Meeting No.** 8 **held on** 31/May

**MODULE - I DIGITAL CULTURE AND SOCIETY** **6**

Adapting to changes
Importance in today's digital landscape
Digital identity and self- presentation
Online communities and forums
Digital divide and consequences
Online collaboration and collective action

**MODULE - II DIGITAL LITERACY AND ACCESS TO TECHNOLOGY** **5**

Computer skills
Social and cultural understanding
Social media campaign and Activism
Netiquettes
Trending Technologies
Digital tools and softwares

**MODULE - III DIGITAL ETHICS** **3**

Digital ethics and moral panics
The art of protecting secrets
Overview of digital tools

**MODULE - IV CYBER SECURITY** **3**

Threats, vulnerability and consequences
Data making and usage practice
Importance of security

**MODULE - V DIGITAL NETWORKING** **7**

Remote work and virtual teams
Authenticity in digital interactions
Engaging content creation
Tools and and techniques for insightful usage
Balancing online and offline interactions
Collaboration for research and innovation

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/8/2023



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**MODULE - VI BUREAU OF INDIAN STANDARDS (BIS): BASIC CONCEPTS,STANDARDS FORMATION PROCESS AND CHALLENGES** 6

**Standardization –Basic Concepts:**

Basic concepts of standardization

Purpose of standardization, marking and certification of articles and processes

Importance of standards to industry, policy makers, trade, sustainability and innovation

**Standards Formulation Process and Challenges:**

Objectives, roles and functions of BIS, Bureau of Indian Standards Act, ISO/ IEC Directives

WTO Good Practices for Standardization

**World of Standards:**

Important Indian and International Standards

**TOTAL: 30 PERIODS**

**REFERENCES:**

1. Communication Skills and Soft Skills – an Integrated Approach. Edited by E. Sureshkumar, P. Sreehari and J. Savithri, Pearson.
2. Silvia. P.J.2007. How to Read a Lot. Washington DC, American Psychological Association.

**WEB REFERENCES:**

1. https://swayam.gov.in/nd1_noc19_hs31/preview
2. https://www.sscnasscom.com/ssc-projects/capacity-building-and-development/training/gbfs/

**OUTCOMES:**

**Upon completion of the course, the student will be able to:**

1. Apply online communication techniques and collaboration skills (K3)
2. Enumerate the principles of digital ethics in online interactions (K2)
3. Understand the importance of Bureau of Indian Standards (BIS). (K2)

**Recommended in Board of Studies (BoS) Meeting No.** 6 **held on** 31/Aug/24



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**CO-PO, PSO MAPPING:**

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

# SEMESTER - II

| COURSE CODE: 24HSTP201 | TAKE CHARGE : COLLEGE READINESS - II | L | T | P | CP | C |
|---|---|---|---|---|---|---|
| | | 1 | 0 | 0 | 1 | 0 |
| NPTEL CODE: | SYLLABUS VERSION 1.1 | SDG NO. 4 , 9 | | | | |
| PRE-REQUISITE COURSES | 24HSTP101 | | | | | |

**OBJECTIVES:**

The objective of this course is to develop students' leadership, teamwork, self-directed learning, career readiness, and financial literacy to prepare them for higher education, employment, and lifelong personal growth.

**MODULE - IV CONTRIBUTION & LEARNING SKILLS**

- Take Charge of Your Contribution
- Take Charge of Your Learning
- Activity on Taking Charge of Your Contribution
- Activity on Taking Charge of Your Learning

**MODULE - V GETTING IN – CAREER & HIGHER EDUCATION READINESS**

- Take Charge of Getting In
- Activity on Taking Charge of Getting In

**MODULE - VI FINANCIAL LITERACY & REFLECTION**

- Take Charge of Your Finances
- Activity on Taking Charge of Your Finances
- Reflections on Take Charge – College Readiness

**Recommended in Board of Studies (BoS) Meeting No. _____ held on _____**

**REFERENCE**

1. Franklin Convey, Take Charge College Readiness, Franklin Convey Education.

This division is well aligned with curriculum design:

- Semester II: Personal growth, academic success, career planning, and financial responsibility (Modules IV–VI).

**COURSE OUTCOMES**

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

4. Participate effectively in leadership, teamwork, and community-oriented activities. (K3)
5. Use self-directed learning strategies to enhance academic performance and lifelong learning skills. (K3)
6. Analyse and plan college, career, and basic financial decisions to achieve personal and professional goals. (K4)

**CO – PO MAPPING:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | 2 | - | - | - | - | - |
| CO2 | 1 | - | - | - | 1 | - | - | - | - | - | - |
| Co3 | - | 2 | - | - | - | 2 | - | - | - | - | - |

**Recommended in Board of Studies (BoS) Meeting No. _____ held on _____**

*Imagine the Future and*

# *Make it happen!*






Together let's build a better world where there is **NO POVERTY** and **ZERO HUNGER.**

We have **GOOD HEALTH AND WELL BEING** **QUALITY EDUCATION** and full **GENDER EQUALITY** everywhere.

There is **CLEAN WATER AND SANITATION** for everyone. **AFFORDABLE AND CLEAN ENERGY**

which will help to create **DECENT WORK AND ECONOMIC GROWTH.** Our prosperity shall be fuelled

by investments in **INDUSTRY, INNOVATION AND INFRASTRUCTURE** that will help us to

**REDUCE INEQUALITIES** by all means. We will live in **SUSTAINABLE CITIES AND COMMUNITIES.**

**RESPONSIBLE CONSUMPTION AND PRODUCTION** will help in healing our planet.

**CLIMATE ACTION** will reduce global warming and we will have abundant,

flourishing **LIFE BELOW WATER**, rich and diverse **LIFE ON LAND.**

We will enjoy **PEACE AND JUSTICE** through **STRONG INSTITUTIONS**

and will build long term **PARTNERSHIPS FOR THE GOALS.**



*For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and* **People like you.**

*Together we can...*

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8/5/26

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