V.S.B. College of Engineering Technical Campus
(An Autonomous Institution)
Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai
NAAC Accredited Institution, NBA Accredited Courses
Coimbatore to Pollachi Road NH -209, Ealur Privu, Kinathukadavu Taluk,
Coimbatore - 642109, Tamilnadu, India. Email:office@vsbcetc.com website : www.vsbcetc.com

**REGULATIONS 2024**

**CHOICE BASED CREDIT SYSTEM**

# B.TECH. ARTIFICIAL INTELLIGENCE & DATA SCIENCE

## I. ABOUT THE DEPARTMENT

**The faculty of AI & DS is the soul of many engineering branches. This field is instrumental in bringing the world to where it is today. Artificial Intelligence and Data Science course was started in our institution in the year 2021. Our department has dedicated, well-qualified and experienced faculty members who are specialists in the areas of Database, Data Mining, Computer Architecture, Operating Systems, Image Processing, Wireless Network, Artificial Neural Networks', Information Security and Programming Languages. They actively involve themselves in research activities in the field of their specialization. They have published a number of papers in Journals and Conferences of National and International repute. The department attributes its success to the creative and innovative outlook of its students also. It encourages students to participate in numerous symposiums and to present papers in them. Students are also made to undergo in-plant training programs, where they hone their technical skill in the realm of computers. etc.**

## II. VISION OF THE DEPARTMENT

**To emerge with technological excellence to nurture talents and instigate research skills with social responsibilities in the domain of Data Science.**

## III. MISSION OF THE DEPARTMENT

**Empower students with knowledge through experiential learning. To create a conducive ambience for learning through exposures in latest cutting-edge technology in collaboration with industries. To provide individual attention and enable character building. Instil lifelong learning and encourage entrepreneurial skills among students**

## IV. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

**Graduates will be able to**

PEO 1**: Information Technology Graduates will have successful careers with high level of technical competency and problem-solving skills to produce innovative solutions for industrial needs.**

PEO 2**: Graduates will have good professionalism, team work, effective communication, leadership qualities and life-long learning for the welfare of mankind.**

PEO 3**: Graduates will be familiar with recent trends in industry for delivering and implementing innovative system in collaboration.**

## I. PROGRAM OUTCOMES (POs)

PO1: Engineering knowledge: **Apply the knowledge of mathematics, science, and basic engineering fundamentals to the solution of complex engineering problems in the major areas of Computer Science and Engineering.**

PO2: Problem analysis: **Identify, formulate, review research literature and analyze complex Computer Science and Engineering problems reaching substantiated conclusions using principles of mathematics, natural sciences and engineering sciences.**

PO3: Design/Development of solutions: **Design solutions for the complex Computer Science and Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and the cultural, societal and environmental considerations.**

PO4: Conduct investigations of complex problems: **Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.**

PO5: Modern tool usage: **Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.**

PO6: The Engineer and society: **Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Computer Science and Engineering practices.**

PO7: Environment and sustainability: **Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge for sustainable development.**

PO8: Ethics: **Apply ethical principles and commit to professional ethics and responsibilities and norms of the professional Computer Science and Engineering practices.**

PO9: Individual and team work: **Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.**

PO10: Communication: **Communicate effectively on complex engineering activities with the engineering community and with society at large, and are able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.**

PO11: Project management and finance: **Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environment.**

PO12: Life-long learning: **Recognize the need for and, have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes.**

## II. PROGRAM SPECIFIC OUTCOMES (PSOs)

**To ensure graduates**

PSO1: **Apply programming skills to develop new software with assured quality.**

PSO2: **Ability to demonstrate specific coding skills to improve employability.**

## B. TECH. ARTIFICIAL INTELLIGENCE & DATA SCIENCE

## CURRICULAM FOR SEMESTERS I TO VIII AND SYLLABI FOR SEMESTERS I AND II

### SEMESTER I

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | INT / EXT | PEROIDS PER WEEK | | | TOTAL CONTACTS PERIOD | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1. | 24IP101 | Induction Programme | - | - | - | - | - | - | 0 |
| **THEORY** | | | | | | | | | |
| 2. | 24HST101 | Professional English - I | HSMC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 3. | 24MAT101 | Matrices and Calculus | BSC | 40 / 60 | 3 | 1 | 0 | 4 | 4 |
| 4. | 24PHT101 | Engineering Physics | BSC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 5. | 24CYT101 | Engineering Chemistry | BSC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 6. | 24GET101 | Problem Solving and Python Programming | ESC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 7. | 24GET102 | தமிழர் மரபு/Heritage of Tamils | HSMC | 40 / 60 | 1 | 0 | 0 | 1 | 1 |
| **PRACTICALS** | | | | | | | | | |
| 8. | 24GEP101 | Problem Solving and Python Programming Laboratory | ESC | 75 / 25 | 0 | 0 | 4 | 4 | 2 |
| 9. | 24BSP101 | Physics and Chemistry Laboratory | BSC | 75 / 25 | 0 | 0 | 4 | 4 | 2 |
| 10. | 24GEP102 | English Laboratory $ | EEC | 75 / 25 | 0 | 0 | 2 | 2 | 1 |
| **TOTAL** | | | | 900 | 16 | 1 | 10 | 27 | 22 |

**$ Skill Based Course**

## SEMESTER II

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | INT / EXT | PEROIDS PER WEEK | | | TOTAL CONTACT S PERIOD | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| **THEORY** | | | | | | | | | |
| 1. | 24HST201 | Professional English II | HSMC | 40 / 60 | 2 | 0 | 0 | 2 | 2 |
| 2. | 24MAT201 | Statistics and Numerical Methods | BSC | 40 / 60 | 3 | 1 | 0 | 4 | 4 |
| 3. | 24PHT201 | Physics for Information Science | BSC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 4. | 24BET202 | Basic Electrical and Electronics Engineering | ESC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 5. | 24GET201 | Engineering Graphics | ESC | 40 / 60 | 2 | 0 | 4 | 6 | 4 |
| 6. | 24AIT201 | Data Structures Design | PCC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 7. | 24GET202 | தமிழர்களும் தொழில்நுட்பமும்/Tamils and Technology | HSMC | 40 / 60 | 1 | 0 | 0 | 1 | 1 |
| 8. | | NCC Credit Course Level 1[#] | - | - | 2 | 0 | 0 | 2 | 2# |
| **PRACTICALS** | | | | | | | | | |
| 9. | 24GEP201 | Engineering Practices Laboratory | ESC | 75 / 25 | 0 | 0 | 4 | 4 | 2 |
| 10. | 24AIP201 | Data Structures Design Laboratory | PCC | 75 / 25 | 0 | 0 | 4 | 4 | 2 |
| 11. | 24GEP202 | Communication Laboratory / Foreign Language[$] | EEC | 75 / 25 | 0 | 0 | 4 | 4 | 2 |
| **TOTAL** | | | | 1000 | 17 | 1 | 16 | 34 | 26 |

**[#] NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will berecorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.**

**[$] Skill Based Course**

## SEMESTER III

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | INT / EXT | PEROIDS PER WEEK | | | TOTAL CONTACTS PERIOD | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| **THEORY** | | | | | | | | | |
| 1. | 24MAT301 | Discrete Mathematics | BSC | 40 / 60 | 3 | 1 | 0 | 4 | 4 |
| 2. | 24AIT301 | Digital Principles and Computer Organization | PCC | 40 / 60 | 3 | 0 | 2 | 5 | 4 |
| 3. | 24AIT302 | Database Design and Management | PCC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 4. | 24AIT303 | Design and Analysis of Algorithms | PCC | 40 / 60 | 3 | 0 | 2 | 5 | 4 |
| 5. | 24AIT304 | Data Exploration and Visualization | PCC | 40 / 60 | 3 | 0 | 2 | 5 | 4 |
| 6. | 24AIT305 | Artificial Intelligence | PCC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| **PRACTICALS** | | | | | | | | | |
| 7. | 24AIP301 | Database Design and Management Laboratory | PCC | 75 / 25 | 0 | 0 | 3 | 3 | 1.5 |
| 8. | 24AIP302 | Artificial Intelligence Laboratory | PCC | 75 / 25 | 0 | 0 | 3 | 3 | 1.5 |
| 9. | 24GEP301 | Professional Development [$] | EEC | 75 / 25 | 0 | 0 | 2 | 2 | 1 |
| **TOTAL** | | | | 900 | 18 | 1 | 14 | 33 | 26 |

**[$]Skill Based Course**

## SEMESTER IV

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | INT / EXT | PEROIDS PER WEEK | | | TOTAL CONTACTS PERIOD | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| **THEORY** | | | | | | | | | |
| 1. | 24AIT401 | Probability and Statistics | BSC | 40 / 60 | 3 | 1 | 0 | 4 | 4 |
| 2. | 24AIT402 | Operating Systems | PCC | 40 / 60 | 3 | 0 | 2 | 5 | 4 |
| 3. | 24AIT403 | Fundamentals of Data Science and Analytics | PCC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 4. | 24AIT404 | Machine Learning | PCC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 5. | 24AIT405 | Computer Networks | PCC | 40 / 60 | 3 | 0 | 2 | 5 | 4 |
| 6. | 24GET401 | Environmental Sciences and Sustainability | BSC | 40 / 60 | 2 | 0 | 0 | 2 | 2 |
| 7. | | NCC Credit Course Level 2[#] | | | 3 | 0 | 0 | 3 | 3# |
| **PRACTICALS** | | | | | | | | | |
| 8. | 24AIP401 | Machine Learning Laboratory | PCC | 75 / 25 | 0 | 0 | 4 | 4 | 2 |
| 9. | 24AIP402 | Data Science and Analytics Laboratory | PCC | 75 / 25 | 0 | 0 | 4 | 4 | 2 |
| **TOTAL** | | | | 800 | 17 | 1 | 12 | 30 | 24 |

**[#] NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recordedin the Mark Sheet, however the same shall not be considered for the computation of CGPA.**

## SEMESTER V

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | INT / EXT | PEROIDS PER WEEK | | | TOTAL CONTACTS PERIOD | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| **THEORY** | | | | | | | | | |
| 1. | 24AIT501 | Deep Learning | PCC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 2. | 24AIT502 | Data and Information Security | PCC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 3. | 24AIT503 | Distributed Computing | PCC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 4. | | Big Data Analytics | PCC | | 2 | 0 | 2 | 4 | 3 |
| 5. | | Professional Elective I | PEC | 40 / 60 | - | - | - | - | 3 |
| 6. | | Professional Elective II | PEC | 40 / 60 | - | - | - | - | 3 |
| 7. | | Mandatory Course-I[&] | MC | - | 3 | 0 | 0 | 3 | 0 |
| **PRACTICAL** | | | | | | | | | |
| 8. | | Deep Learning Laboratory | PCC | | 0 | 0 | 4 | 4 | 2 |
| 9. | | Summer Internship | EEC | | 0 | 0 | 0 | 0 | 2 |
| **TOTAL** | | | | 600 | - | - | - | - | 22 |

**& Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under Mandatory Course-I)**

## SEMESTER VI

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | INT / EXT | PEROIDS PER WEEK | | | TOTAL CONTACTS PERIOD | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| **THEORY** | | | | | | | | | |
| 1. | 24AIP601 | Embedded Systems and IoT | PCC | 40 / 60 | 3 | 0 | 2 | 5 | 4 |
| 2. | | Open Elective – I* | OEC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 3. | | Professional Elective III | PEC | 40 / 60 | - | - | - | - | 3 |
| 4. | | Professional Elective IV | PEC | 40 / 60 | - | - | - | - | 3 |
| 5. | | Professional Elective V | PEC | 40 / 60 | - | - | - | - | 3 |
| 6. | | Professional Elective VI | PEC | 40 / 60 | - | - | - | - | 3 |
| 7. | | Mandatory Course-II & | MC | | 3 | 0 | 0 | 3 | 0 |
| 8. | | NCC Credit Course Level 3# | | | 3 | 0 | 0 | 3 | |
| **TOTAL** | | | | 700 | - | - | - | - | 19 |

***Open Elective – I Shall be chosen from the list of open electives offered by other Programmes**
**& Mandatory Course-II is a Non-credit Course (Student shall select one course from the list given underMandatory Course-II)**
**# NCC Credit Course level 3 is offered for NCC students only. The grades earned by the students will berecorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA**

**SEMESTER VII / VIII***

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | INT / EXT | PEROIDS PER WEEK | | | TOTAL CONTACTS PERIOD | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| **THEORY** | | | | | | | | | |
| 1. | 24GET701 | Human Values and Ethics | HSMC | 40 / 60 | 2 | 0 | 0 | 2 | 2 |
| 2. | | Elective - Management[#] | HSMC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 3. | | Open Elective – II** | OEC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 4. | | Open Elective – III** | OEC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| 5. | | Open Elective – IV** | OEC | 40 / 60 | 3 | 0 | 0 | 3 | 3 |
| **TOTAL** | | | | 900 | 14 | 0 | 0 | 14 | 14 |

***If students undergo internship in Semester VII, then the courses offered during semester VII will beoffered during semester VIII.**
**** Open Elective II - IV (Shall be chosen from the list of open electives offered by other Programme).**
**[#] Elective - Management shall be chosen from the Elective Management courses.**

## SEMESTER VIII /VII*

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | INT / EXT | PEROIDS PER WEEK | | | TOTAL CONTACT S PERIOD | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| PRACTICALS | | | | | | | | | |
| 1. | 24AIP801 | Project Work / Internship | EEC | 75 / 25 | 0 | 0 | 20 | 20 | 10 |
| TOTAL | | | | 100 | 0 | 0 | 20 | 20 | 10 |

***If students undergo internship in Semester VII, then the courses offered during semester VII will beoffered during semester VIII.**

**TOTAL CREDITS: 163**

## ELECTIVE – MANAGEMENT COURSES

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24GET01 | Principles of Management | HSMC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 2 | 24GET02 | Total Quality Management | HSMC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 3 | 24GET03 | Engineering Economics and Financial Accounting | HSMC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 4 | 24GET04 | Human Resource Management | HSMC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 5 | 24GET05 | Knowledge Management | HSMC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 6 | 24GET06 | Industrial Management | HSMC | 40/60 | 3 | 0 | 0 | 3 | 3 |

## MANDATORY COURSES I

| S. No | COURSE CODE | COURSE TITLE | CATE GORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1. | 24MXT01 | Introduction to Women and Gender Studies | MC | 40/60 | 3 | 0 | 0 | 3 | 0 |
| 2. | 24MXT02 | Elements of Literature | MC | 40/60 | 3 | 0 | 0 | 3 | 0 |
| 3. | 24MXT03 | Film Appreciation | MC | 40/60 | 3 | 0 | 0 | 3 | 0 |
| 4. | 24MXT04 | Disaster Management | MC | 40/60 | 3 | 0 | 0 | 3 | 0 |

## MANDATORY COURSES II

| S.No | COURSE CODE | COURSE TITLE | CATE GORY | Int/Ext | PERIODSPER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1. | 24MXT05 | Well Being with traditional Practices (Yoga, Ayurveda and Siddha) | MC | 40/60 | 3 | 0 | 0 | 3 | 0 |
| 2. | 24MXT06 | History of Science and Technology in India | MC | 40/60 | 3 | 0 | 0 | 3 | 0 |
| 3. | 24MXT07 | Political and Economic Thought for a Humane Society | MC | 40/60 | 3 | 0 | 0 | 3 | 0 |
| 4. | 24MXT08 | State, Nation Building and Politics in India | MC | 40/60 | 3 | 0 | 0 | 3 | 0 |
| 5. | 24MXT09 | Industrial Safety | MC | 40/60 | 3 | 0 | 0 | 3 | 0 |

## PROFESSIONAL ELECTIVE COURSES: VERTICALS

| Vertical I Data Science | Vertical II Full Stack Development for AI&DS | Vertical III Cloud Computing and Data Centre Technologies | Vertical IV Cyber Security and Data Privacy | Vertical V Creative Media | Vertical VI Emerging Technologies | Vertical VII Artificial Intelligence and Machine Learning |
|---|---|---|---|---|---|---|
| Exploratory Data Analysis | Cloud Computing | Cloud Computing | Ethical Hacking | Augmented Reality/Virtual Reality | Augmented Reality/Virtual Reality | Knowledge Engineering |
| Recommender Systems | App Development | Virtualization | Digital and Mobile Forensics | Multimedia and Animation | Robotic Process Automation | Soft Computing |
| Neural Networks and Deep Learning | Cloud Services Management | Cloud Services Management | Social Network Security | Video Creation and Editing | Neural Networks and Deep Learning | Neural Networks and Deep Learning |
| Text and Speech Analysis | UI and UX Design | Data Warehousing | Modern Cryptography | UI and UX Design | Cyber security | Text and Speech Analysis |
| Business Analytics | Software Testing and Automation | Storage Technologies | Engineering Secure software systems | Digital marketing | Quantum Computing | Optimization Techniques |
| Image and video analytics | Web Application Security | Software Defined Networks | Crypto currency and Block chain Technologies | Visual Effects | Crypto currency and Block chain Technologies | Game Theory |
| Computer Vision | Dev-ops | Stream Processing | Network Security | Game Development | Game Development | Cognitive Science |
| Big Data Analytics | Principles of Programming Languages | Security and Privacy in Cloud | Security and Privacy in Cloud | Multimedia Data Compression and Storage | 3D Printing and Design | Ethics And AI |

**Registration of Professional Elective Courses from Verticals:**

Professional Elective Courses will be registered in Semesters V and VI. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI. The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E/B.Tech (Honours) or Minor degree also. For more details on B.E./B.Tech (Honours) or Minor degree refer to the Regulations 2021, Clause 4.10.

## PROFESSIONAL ELECTIVE COURSES
## VERTICALS

### VERTICAL 1: VERTICALS FOR AIDS I

| S. No | COURSE CODE | COURSE TITLE | CATE GORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24AIET01 | Knowledge Engineering | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 2 | 24AIET02 | Recommender Systems | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 3 | 24AIET03 | Soft Computing | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 4 | 24AIET04 | Text and Speech Analysis | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 5 | 24AIET05 | Business Analytics | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 6 | 24AIET06 | Image and Video Analytics | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 7 | 24AIET07 | Computer Vision | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 8 | 24AIET08 | Big Data Analytics | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |

### VERTICAL 2: FULL STACK DEVELOPMENT FOR IT

| S. No | COURSE CODE | COURSE TITLE | CATE GORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24AIET09 | Cloud Computing | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 2 | 24AIET10 | App Development | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 3 | 24AIET11 | Cloud Services Management | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 4 | 24AIET12 | UI and UX Design | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 5 | 24AIET13 | Software Testing and Automation | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 6 | 24AIET14 | Web Application Security | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 7 | 24AIET15 | DevOps | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 8 | 24AIET16 | Principles of Programming Languages | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |

## VERTICAL 3: CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES

| S. No | COURSE CODE | COURSE TITLE | CATE GORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24AIET17 | Cloud Computing | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 2 | 24AIET18 | Virtualization | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 3 | 24AIET19 | Cloud Services Management | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 4 | 24AIET20 | Data Warehousing | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 5 | 24AIET21 | Storage Technologies | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 6 | 24AIET22 | Software Defined Networks | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 7 | 24AIET24 | Stream Processing | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 8 | 24AIET24 | Security and Privacy in Cloud | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |

## VERTICAL 4: CYBER SECURITY AND DATA PRIVACY

| S. No | COURSE CODE | COURSE TITLE | CATE GORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24AIET25 | Ethical Hacking | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 2 | 24AIET26 | Digital and Mobile Forensics | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 3 | 24AIET27 | Social Network Security | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 4 | 24AIET28 | Modern Cryptography | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 5 | 24AIET29 | Engineering Secure Software Systems | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 6 | 24AIET30 | Crypto currency and Block chain Technologies | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 7 | 24AIET31 | Network Security | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 8 | 24AIET32 | Security and Privacy in Cloud | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |

## VERTICAL 5: CREATIVE MEDIA

| .S. No | COURSE CODE | COURSE TITLE | CATE GORY | Int/Ext | PERIODS PERWEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24AIET33 | Augmented Reality/Virtual Reality | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 2 | 24AIET34 | Multimedia and Animation | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 3 | 24AIET35 | Video Creation and Editing | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 4 | 24AIET36 | UI and UX Design | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 5 | 24AIET37 | Digital marketing | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 6 | 24AIET38 | Multimedia Data Compression and Storage | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 7 | 24AIET39 | Game Development | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 8 | 24AIET40 | Visual Effects | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |

## VERTICAL 6: EMERGING TECHNOLOGIES

| S. No | COURSE CODE | COURSE TITLE | CATE GORY | Int/Ext | PERIODS PERWEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24AIET41 | Augmented Reality/Virtual Reality | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 2 | 24AIET42 | Robotic Process Automation | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 3 | 24AIET43 | Neural Networks and Deep Learning | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 4 | 24AIET44 | Cyber security | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 5 | 24AIET45 | Quantum Computing | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 6 | 24AIET46 | Cryptocurrency and Block chain Technologies | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 7 | 24AIET47 | Game Development | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 8 | 24AIET48 | 3D Printing and Design | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |

## VERTICAL 7: VERTICALS FOR AIDS II

| S. No | COURSE CODE | COURSE TITLE | CATE GORY | Int/Ext | PERIODS PERWEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24AIET49 | Bio-Inspired Optimization Techniques | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 2 | 24AIET50 | App Development | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 3 | 24AIET51 | Health Care Analytics | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 4 | 24AIET52 | Cyber Security | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 5 | 24AIET53 | Optimization Techniques | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 6 | 24AIET54 | Game Theory | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 7 | 24AIET55 | Cognitive Science | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 8 | 24AIET56 | Ethics and AI | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |

## OPEN ELECTIVES

**(Students shall choose the open elective courses, such that the course contents are not similar to anyother course contents/title under other course categories).**

## OPEN ELECTIVES – I

| S. No | COURSE CODE | COURSE TITLE | CATE GORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24OAS351 | Space Science | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 2 | 24OAS352 | Introduction to Industrial Engineering | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 3 | 24OAS353 | Climate Change and its Impact | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 4 | 24OAS354 | Environment and Social Impact Assessment | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 5 | 24OAS355 | Renewable Energy System | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 6 | 24OAS356 | Introduction to Industrial Instrumentation and Control | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 7 | 24OAS357 | Graph Theory | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 8 | 24OAS358 | Space Science | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |

## OPEN ELECTIVES – II

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24OAS359 | Resource Management Techniques | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 2 | 24OAS360 | Fintech Regulation | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 3 | 24OAS361 | Holistic Nutrition | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 4 | 24OAS362 | IT in Agricultural System | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 5 | 24OAS363 | Introduction to Control Engineering | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 6 | 24OAS364 | Pharmaceutical Nanotechnology | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 7 | 24OAS365 | Aviation Management | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 8 | 24OAS366 | Resource Management Techniques | PEC | 40/60 | 2 | 0 | 2 | 4 | 3 |

## OPEN ELECTIVES – III

| S. No | COURSE CODE | COURSE TITLE | CATAGORY | Int/Ext | PERIODS PERWEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24OAS367 | English for Competitive Examinations | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 2 | 24OAS368 | NGOs and Sustainable Development | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 3 | 24OAS369 | Democracy and Good Governance | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 4 | 24OAS370 | Renewable Energy Technologies | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 5 | 24OAS371 | Applied Design Thinking | OEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 6 | 24OAS372 | Reverse Engineering | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 7 | 24OAS374 | Sustainable Manufacturing | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 8 | 24OAS374 | Electric and Hybrid Vehicle | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 9 | 24OAS375 | Space Engineering | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 10 | 24OAS376 | Industrial Management | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 11 | 24OAS377 | Quality Engineering | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 12 | 24OAS378 | Fire Safety Engineering | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 13 | 24OAS379 | Introduction to non-destructive testing | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 14 | 24OAS380 | Mechatronics | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 24OAS381 | Foundation of Robotics | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 16 | 24OAS382 | Fundamentals of Aeronautical engineering | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 17 | 24OAS383 | Remote Sensing Concepts | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 18 | 24OAS384 | Urban Agriculture | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 19 | 24OAS385 | Drinking Water Supply and Treatment | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 20 | 24OAS386 | Electric Vehicle technology | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 21 | 24OAS387 | Introduction to PLC Programming | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 22 | 24OAS388 | Nano Technology | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 24 | 24OAS389 | Functional Materials | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 24 | 24OAS390 | Biomedical Instrumentation | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 25 | 24OAS391 | Traditional Indian Foods | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 26 | 24OAS392 | Introduction to food processing | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 27 | 24OAS393 | IPR for Pharma Industry | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 28 | 24OAS394 | Basics of Textile Finishing | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 29 | 24OAS395 | Industrial Engineering for Garment Industry | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 30 | 24OAS396 | Basics of Textile Manufacture | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 31 | 24OAS397 | Introduction to Petroleum Refining and Petrochemicals | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 32 | 24OAS398 | Energy Conservation and Management | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 33 | 24OAS399 | Basics of Plastics Processing | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 34 | 24OAS390 | Signals and Systems | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 35 | 24OAS391 | Fundamentals of Electronic Devices and Circuits | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 36 | 24OAS392 | Foundation Skills in integrated product Development | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 37 | 24OAS393 | Assistive Technology | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 38 | 24OAS394 | Operations Research | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 39 | 24OAS395 | Algebra and Number Theory | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 40 | 24OAS396 | Linear Algebra | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 41 | 24OAS397 | Lean Concepts, Tools And Practices | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |

## OPEN ELECTIVES – IV

| S. No | COURSE CODE | COURSE TITLE | CATE GORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24OAS398 | Project Report Writing | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 2 | 24OAS399 | Advanced Numerical Methods | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 3 | 24OAS400 | Random Processes | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 4 | 24OAS401 | Queuing and Reliability Modelling | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 5 | 24OAS402 | Production and Operations Management for Entrepreneurs | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 6 | 24OAS403 | Multivariate Data Analysis | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 7 | 24OAS404 | Additive Manufacturing | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 8 | 24OAS405 | New Product Development | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 9 | 24OAS406 | Industrial Design & Rapid Prototyping Techniques | OEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 10 | 24OAS407 | Micro and Precision Engineering | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 11 | 24OAS408 | Cost Management of Engineering Projects | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 12 | 24OAS409 | Batteries and Management system | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 13 | 24OAS410 | Sensors and Actuators | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 14 | 24OAS411 | Space Vehicles | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 15 | 24OAS412 | Management Science | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 16 | 24OAS413 | Production Planning and Control | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 17 | 24OAS414 | Operations Management | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 18 | 24OAS415 | Industrial Hygiene | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 19 | 24OAS416 | Chemical Process Safety | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 20 | 24OAS417 | Electrical, Electronic and Magneticmaterials | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 21 | 24OAS418 | Nano materials and applications | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 22 | 24OAS419 | Hydraulics and Pneumatics | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 24 | 24OAS420 | Sensors | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 24 | 24OAS421 | Foundation of Automation | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 25 | 24OAS422 | Concepts in Mobile Robotics | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 26 | 24OAS423 | Marine Propulsion | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 27 | 24OAS424 | Marine Merchant Vehicles | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 28 | 24OAS425 | Elements of Marine Engineering | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 29 | 24OAS426 | Drone Technologies | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 30 | 24OAS427 | Geographical Information System | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 31 | 24OAS428 | Agriculture Entrepreneurship Development | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 32 | 24OAS430 | Biodiversity Conservation | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 33 | 24OAS431 | Introduction to control systems | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 34 | 24OAS432 | Introduction to Industrial Automation Systems | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 35 | 24OAS433 | Energy Technology | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 36 | 24OAS434 | Surface Science | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 37 | 24OAS435 | Environment and Agriculture | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 38 | 24OAS436 | Fundamentals of Food Engineering | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 39 | 24OAS437 | Food safety and Quality Regulations | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 40 | 24OAS438 | Nutraceuticals | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 41 | 24OAS439 | Basics of Dyeing and Printing | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 42 | 24OAS440 | Fibre Science | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 43 | 24OAS441 | Garment Manufacturing Technology | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 44 | 24OAS442 | Industrial safety | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 45 | 24OAS443 | Unit Operations in Petro Chemical Industries | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 46 | 24OAS444 | Plastic Materials for Engineers | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 47 | 24OAS445 | Properties and Testing of Plastics | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 48 | 24OAS446 | VLSI Design | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 49 | 24OAS447 | Industrial IoT and Industry 4.0 | OEC | 40/60 | 2 | 0 | 2 | 4 | 3 |
| 50 | 24OAS448 | Wearable devices | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 51 | 24OAS449 | Medical Informatics | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 52 | 24OAS450 | Basics of Integrated Water Resources Management | OEC | 40/60 | 3 | 0 | 0 | 3 | 3 |

## SUMMARY

| Name of the Programme: B.Tech. Artificial Intelligence and Data Science | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **S.No** | **Subject Area** | **Credits per Semester** | | | | | | | | **Total Credits** |
| | | **I** | **II** | **III** | **IV** | **V** | **VI** | **VII/VIII** | **VIII/VII** | |
| **1** | **HSMC** | **4** | **3** | | | | | **5** | | **12** |
| **2** | **BSC** | **12** | **7** | **4** | **6** | | | | | **29** |
| **3** | **ESC** | **5** | **9** | | | | | | | **14** |
| **4** | **PCC** | | **5** | **21** | **18** | **14** | **4** | | | **62** |
| **5** | **PEC** | | | | | **6** | **12** | | | **18** |
| **6** | **OEC** | | | | | | **3** | **9** | | **12** |
| **7** | **EEC** | **1** | **2** | **1** | | **2** | | | **10** | **16** |
| **8** | **Non-Credit /(Mandatory)** | | | | | √ | √ | | | |
| **Total** | | **22** | **26** | **26** | **24** | **22** | **19** | **14** | **10** | **163** |

**TOTAL CREDITS: 163**

**ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL**

**A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B . Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also. Complete details are available in clause 4.10 (Amendments) of Regulations 2021.**

## VERTICALS FOR MINOR DEGREE
## (In addition to all the verticals of other programmes)

| **Vertical I Fintech and Block Chain** | **Vertical II Entrepreneurship** | **Vertical III Public Administration** | **Vertical IV Business Data Analytics** | **Vertical V Environment and Sustainability** |
|---|---|---|---|---|
| Financial Management | Foundations of Entrepreneurship | Principles of Public Administration | Statistics for Management | Sustainable infrastructure Development |
| Fundamentals of Investment | Team Building & Leadership Management for Business | Constitution of India | Datamining for Business Intelligence | Sustainable Agriculture and Environmental Management |
| Banking, Financial Services and Insurance | Creativity & Innovation in Entrepreneurship | Public Personnel Administration | Human Resource Analytics | Sustainable Bio Materials |
| Introduction to Blockchain and its Applications | Principles of Marketing Management for Business | Administrative Theories | Marketing and Social Media Web Analytics | Materials for Energy Sustainability |
| Fintech Personal Finance and | Human Resource Management for Entrepreneurs | Indian Administrative System | Operation and Supply Chain Analytics | Green Technology |
| Introduction to Fintech | Financing New Business Ventures | Public Policy Administration | Financial Analytics | Environmental Quality Monitoring and Analysis |
| - | - | - | - | Integrated Energy Planning for Sustainable Development |
| - | - | - | - | Energy Efficiency for Sustainable Development |

**(choice of courses for Minor degree is to be made from any one vertical of other programmes or from anyone of the following verticals)**

## VERTICAL 1: FINTECH AND BLOCK CHAIN

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24CMG331 | Financial Management | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 2 | 24CMG332 | Fundamentals of Investment | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 3 | 24CMG333 | Banking, Financial Services and Insurance | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 4 | 24CMG334 | Introduction to Blockchain and its Applications | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 5 | 24CMG335 | Fintech Personal Finance and Payments | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 6 | 24CMG336 | Introduction to Fintech | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |

## VERTICAL 2: ENTREPRENEURSHIP

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24CMG337 | Foundations of Entrepreneurship | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 2 | 24CMG338 | Team Building & Leadership Management for Business | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 3 | 24CMG339 | Creativity & Innovation in Entrepreneurship | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 4 | 24CMG340 | Principles of Marketing Management For Business | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 5 | 24CMG341 | Human Resource Management for Entrepreneurs | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 6 | 24CMG342 | Financing New Business Ventures | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |

## VERTICAL 3: PUBLIC ADMINISTRATION

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24CMG343 | Principles of Public Administration | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 2 | 24CMG344 | Constitution of India | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 3 | 24CMG345 | Public Personnel Administration | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 4 | 24CMG346 | Administrative Theories | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 5 | 24CMG347 | Indian Administrative System | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 6 | 24CMG348 | Public Policy Administration | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |

## VERTICAL 4: BUSINESS DATA ANALYTICS

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24CMG349 | Statistics for Management | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 2 | 24CMG350 | Datamining For Business Intelligence | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 3 | 24CMG351 | Human Resource Analytics | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 4 | 24CMG352 | Marketing And Social Media Web Analytics | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 5 | 24CMG353 | Operation And Supply Chain Analytics | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 6 | 24CMG354 | Financial Analytics | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |

## VERTICAL 5: ENVIRONMENT AND SUSTAINABILITY

| S. No | COURSE CODE | COURSE TITLE | CATEGORY | Int/Ext | PERIODS PER WEEK | | | TOTAL CONTACT PERIODS | CREDITS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | |
| 1 | 24CES331 | Sustainable infrastructure Development | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 2 | 24CES332 | Sustainable Agriculture and Environmental | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Management | | | | | | | |
| 3. | 24CES333 | Sustainable Bio Materials | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 4. | 24CES334 | Materials for Energy Sustainability | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 5. | 24CES335 | Green Technology | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 6. | 24CES336 | Environmental Quality Monitoring and Analysis | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 7. | 24CES337 | Integrated Energy Planning for Sustainable Development | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |
| 8. | 24CES338 | Energy Efficiency for Sustainable Development | PEC | 40/60 | 3 | 0 | 0 | 3 | 3 |

**24IP101** **INDUCTION PROGRAMME**

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have a broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skillsand underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character."

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

**(i)** Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

**(ii)** Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

**(iii)** Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, make decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do's and don'ts, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

**(i)** Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

**(ii)** Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

**(iii)** Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

**(iv)** Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the underprivileged.

**(v)** Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

**(vi)** Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering / Technology / Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to buildingsimple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

References:

Guide to Induction program from AICTE

| 24HST101 | PROFESSIONAL ENGLISH - I | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

- To improve the communicative competence of learners
- To learn to use basic grammatic structures in suitable contexts
- To acquire lexical competence and use them appropriately in a sentence and understandtheir meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners' ability to read and write complex texts, summaries, articles, blogs,definitions, essays and user manuals.

**UNIT I INTRODUCTION TO EFFECTIVE COMMUNICATION 1**

What is effective communication? (Explain using activities) Why is communication critical for excellence during study, research and work? What are the seven C's of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?

**INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 8**

Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense ( simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

**UNIT II NARRATION AND SUMMATION 9**

Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.

**UNIT III DESCRIPTION OF A PROCESS / PRODUCT 9**

Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of

comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

**UNIT IV CLASSIFICATION AND RECOMMENDATIONS 9**

Reading – Newspaper articles; Journal reports –and Non Verbal Communcation ( tables, pie charts etc,. ). Writing – Note-making / Note-taking (*Study skills to be taught, not tested); Writingrecommendations; Transferring information from non verbal ( chart , graph etc, to verbal mode) Grammar – Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed/ Semi fixed expressions.

**UNIT V EXPRESSION 9**

Reading – Reading editorials; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions – Content vs Function words.

**TOTAL : 45 PERIODS**

**LEARNING OUTCOMES :**

At the end of the course, learners will be able

**CO1:**To use appropriate words in a professional context

**CO2:**To gain understanding of basic grammatic structures and use them in right context. CO3:To read and infer the denotative and connotative meanings of technical texts

**CO4:**To write definitions, descriptions, narrations and essays on various topics

**TEXT BOOKS:**


1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department ofEnglish, Anna University, (2020 edition).
2. English for Science & Technology Cambridge University Press, 2021.Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr.KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.


**REFERENCES:**


1. Technical Communication – Principles and Practices By Meenakshi Raman &SangeetaSharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book on Technical English By Lakshmi Narayanan, Scitech Publications(India) Pvt. Ltd.
3. English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw Hill Education, ISBN : 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, R S Salaria, Khanna PublishingHouse.

5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, NewDelhi,2003.

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1. https://onlinecourses.swayam2.ac.in/cec24_lg08/preview
2. https://archive.nptel.ac.in/courses/109/106/109106129/
3. https://onlinecourses.nptel.ac.in/noc20_hs56/preview
4. https://onlinecourses.nptel.ac.in/noc21_hs16/preview
5. https://www.udemy.com/course/learn-business-english/

**ONLINE RESOURCES:**

1. https://www.ebooksfree4u.com/2018/11/technical-communication-by-meenakshi.html
2. https://www.msajce-edu.in/academics/sh/LectureNote/HS3151-LN.pdf
3. https://www.poriyaan.in/paper/professional-english-i-1/
4. slhd.nsw.gov.au/learningtocommunicate/pdf/LtC_ParentHandbook.pdf
5. https://www.manage.gov.in/studymaterial/EC.pdf

**CO's-PO's & PSO's MAPPING**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 1 | 3 | - | 3 | - | - | - |
| 2 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 1 | 3 | - | 3 | - | - | - |
| 3 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | - | - | - |
| 4 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | - | - | - |
| 5 | 2 | 3 | 3 | 3 | - | 3 | 3 | 3 | 2 | 3 | - | 3 | - | - | - |
| AVg. | 1.6 | 2.2 | 1.8 | 2.2 | 1.5 | 3 | 3 | 3 | 1.6 | 3 | 3 | 3 | - | - | - |

**1 - low, 2 - medium, 3 - high, '-"- no correlation**

| 24MAT101 | MATRICES AND CALCULUS | L | T | P | C |
|---|---|---|---|---|---|
| | | 4 | 0 | 0 | 4 |

**COURSE OBJECTIVES:**

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To understand various techniques of multiple integrals.

**UNIT I MATRICES** **9+3**

Eigen values and Eigenvectors of a real matrix – Characteristic equation - Properties of Eigen values and Eigenvectors – Cayley – Hamilton Theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical from by orthogonal transformation – Nature of quadratic forms.

**UNIT II DIFFERENTIAL CALCULUS** **9+3**

Derivatives – Differentiation rules (Sum, Product, Quotient, Chain rules) – Implicit differentiation – Logarithmic differentiation – Maxima and Minima of functions of one variables.

**UNIT III FUNCTIONS OF SEVERAL VARIABLES** **9+3**

Partial differentiation– Total derivative - Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables–Applications: Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

**UNIT IV INTEGRATION** **9+3**

The Definite and Indefinite integral – Integration techniques - Substitution methods-Integration by parts –Reduction formula- Trigonometric substitutions- Integration of rational and Irrational functions (Partial fraction method)-Improper Integrals.

**UNIT V MULTIPLE INTEGRALS** **9+3**

Double integrals– Double integrals in polar coordinates– Change of order of integration - Triple integrals – Volume of solids – Change of variable in double and triple integrals.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

At the end of the course, learners will be able

- Use the matrix algebra methods for solving practical problems.
- Apply differential calculus tools in solving various application problems.
- Able to use differential calculus ideas on several variable functions.
- Apply different methods of integration in solving practical problems.
- Apply various techniques in multiple integrals.

**TEXT BOOKS:**

1. Kreyszig E, "Advanced Engineering Mathematics" John Wiley and 10th Edition, NewDelhi,

2016.
2. Grewal B. S, "Higher Engineering Mathematics, New Delhi, 44th Edition, 2018.
3. James Stewart, "Calculus: Early Transcendentals", Cengage Learning 8th Edition, NewDelhi, 2015.

**REFERENCES:**

1. Jain R. K and Iyengar S.R.K, "Advanced Engineering Mathematics", Narasa Publications, New Delhi, 5th Edition, 2016.
2. Narayanan S, and Manicavachagampillai T. K, "Calculus:Volume I and II", S. Viswnathan Publishers Pvt. Ltd., Chennai, 2009.
3. Ramana B. V, "Higher Engineering Mathematics", McGral Hill Eduvation Pvt. Ltd.,New Delhi, 2016.

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**2.** https://archive.nptel.ac.in/courses/111/106/111106146/3**.**
**3.**https://archive.nptel.ac.in/courses/111/108/111108157/
**4.** https://archive.nptel.ac.in/courses/111/104/111104092/
**5.** https://archive.nptel.ac.in/courses/111/105/111105160/

**ONLINE RESOURCES:**

**1.https://books.google.co.in/books/about/Engineering_Mathematics_I_Matrices_and_C.html?id=**
**2.** https://easyengineering.net/ma3151-matrices-and-calculus-notes/#google_vignette
**3.** https://learnengineering.in/ma3151-matrices-and-calculus/
**4.https://menso88.weebly.com/uploads/1/7/5/8/17586891/textbook_og_engineering_matematics.**
**5.** https://www.scribd.com/document/595384513/MA3151-Matrices-and-Calculus-Lecture-

## CO's-PO's & PSO's MAPPING

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | - | - | - |
| CO2 | 3 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | - | - | - |
| CO3 | 3 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | - | - | - |
| CO4 | 3 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | - | - | - |
| CO5 | 3 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | - | - | - |
| Avg | 3 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | - | - | - |

**1 - low, 2 - medium, 3 - high, '-"- no correlation**

| 24PHT101 | ENGINEERING PHYSICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

- To make the students effectively achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

**UNIT I MECHANICS 9**

Multi-particle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of the system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M .I –moment of inertia of continuous bodies –M.I of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum double pendulum –Introduction to nonlinear oscillations.

**UNIT II ELECTROMAGNETIC WAVES 9**

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 waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium- vacuum interface for normal incidence.

**UNIT III OSCILLATIONS, OPTICS AND LASERS 9**

Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave - soundwaves - Doppler effect. Reflection and refraction of light waves - total internal reflection - interference –Michelson interferometer –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, $CO_2$ laser, semiconductor laser –Basic applications of lasers in industry.

**UNIT IV BASIC QUANTUM MECHANICS 9**

Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes-Normalization, probabilities and the correspondence principle.

**UNIT V APPLIED QUANTUM MECHANICS 9**

The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

After completion of this course, the students should be able to

**CO1**:Understand the importance of mechanics.

**CO2**:Express their knowledge in electromagnetic waves.

**CO3**:Demonstrate a strong foundational knowledge in oscillations, optics and lasers.

**CO4**:Understand the importance of quantum physics.

**CO5**:Comprehend and apply quantum mechanical principles towards the formation of energybands.

**TEXT BOOKS:**


1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (IndianEdition), 2017.
2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.

**Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw-Hill (Indian Edition), 2017**


**REFERENCES:**


1. Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016
2. Bali. N., Goyal. M. and Watkins. C., " Advanced Engineering Mathematics ", FirewallMedia (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
3. Jain . R.K. and Iyengar. S.R.K., " Advanced Engineering Mathematics ", NarosaPublications, New Delhi, 5th Edition, 2016.
4. Narayanan. S. and Manicavachagom Pillai. T. K., "Calculus" Volume I and II,
5. Viswanathan Publishers Pvt. Ltd., Chennai, 2009Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd,New Delhi, 2016.
6. Srimantha Pal and Bhunia. S.C, "Engineering Mathematics" Oxford University Press, 2015.
7. Thomas. G. B., Hass. J, and Weir. M.D, " Thomas Calculus ", 14th Edition, Pearson India,2018.


**WEB REFERENCES:**

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2. https://archive.nptel.ac.in/courses/122/103/122103011/
3. https://archive.nptel.ac.in/courses/122/107/122107035/

4. **https://archive.nptel.ac.in/courses/122/103/122103011/**
5. https://archive.nptel.ac.in/courses/115/106/115106133/

**ONLINE RESOURCES:**

1. https://www.mbit.edu.in/wp-content/uploads/2020/05/FULLBOOKPHYSICS.pdf
2. https://physicsrvce.files.wordpress.com/2022/03/unit-4-laser-and-of.pdf
3. http://www.gpcet.ac.in/wp-content/uploads/2018/09/UNIT-1-EP-PDF.pdf
4. https://www.ks.uiuc.edu/Services/Class/PHYS480/qm_PDF/QM_Book.pdf
5. **https://books.google.co.in/books?id=61WJDAAAQBAJ&printsec=copyright#v=onepage &q&f=false**

## CO's-PO's & PSO's MAPPING

| CO | PO | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 3 | 2 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - |
| 2 | 3 | 3 | 2 | 1 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| 3 | 3 | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 1 | - | - | - |
| 4 | 3 | 3 | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - | - | |
| 5 | 3 | 3 | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| AV | 3 | 3 | 1.6 | 1.2 | 1.8 | 1 | - | - | - | - | - | 1 | - | - | - |

**1 - low, 2 - medium, 3 - high, '-"- no correlation**

| 24CYT101 | ENGINEERING CHEMISTRY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

- To inculcate sound understanding of water quality parameters and water treatmenttechniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties andcombustion characteristics.
- To familiarize the students with the operating principles, working processes andapplications of energy conversion and storage devices.

**UNIT I WATER AND ITS TREATMENT 9**

Water: Sources and impurities, Water quality parameters: Definition and significance of-color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming & foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment - Ion exchange demineralization and zeolite process.

**UNIT II NANOCHEMISTRY 9**

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

**UNIT III PHASE RULE AND COMPOSITES 9**

Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process. Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix

composites and Polymer matrix composites. Hybrid composites - definition and examples.

**UNIT IV FUELS AND COMBUSTION 9**

Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil- cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. $CO_2$ emission and carbon footprint.

**UNIT V ENERGY SOURCES AND STORAGE DEVICES 9**

Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion- battery; Electric vehicles - working principles; Fuel cells: $H_2$-$O_2$ fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course, the students will be able:

**CO1**:To infer the quality of water from quality parameter data and propose suitable treatmentmethodologies to treat water.

**CO2**:To identify and apply basic concepts of nanoscience and nanotechnology in designing thesynthesis of nanomaterials for engineering and technology applications.

**CO3**:To apply the knowledge of phase rule and composites for material selection requirements.

**CO4:**To recommend suitable fuels for engineering processes and applications.

**CO5:**To recognize different forms of energy resources and apply them for suitable applications inenergy sectors.

**TEXT BOOKS:**


1. P. C. Jain and Monica Jain, “Engineering Chemistry”, 17th Edition, Dhanpat Rai PublishingCompany (P) Ltd, New Delhi, 2018.
2. Sivasankar B., “Engineering Chemistry”, Tata McGraw-Hill Publishing Company Ltd, NewDelhi, 2008.
3. S.S. Dara, “A Text book of Engineering Chemistry”, S. Chand Publishing, 12th Edition,2018

**REFERENCES:**


1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi,2014.
4. ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.


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2. https://onlinecourses.nptel.ac.in/noc21_cy49/preview
3. https://archive.nptel.ac.in/courses/122/106/122106028/
4. https://nptel.ac.in/courses/104101130
5. https://www.classcentral.com/course/youtube-core-science-engineering-chemistry-1-47682

**ONLINE RESOURCES:**

1. https://www.academia.edu/37796622/Engineering_Chemistry_by_Jain_and_Jain
2. https://vtu.ac.in/wp-content/uploads/2023/05/Sealed-E-version-Engg-Chemistry-Handbook-for-I-II-Semester-22-Sheme.pdf
3. https://soaneemrana.org/onewebmedia/CHEMISTRY%20THEORY.pdf
4. https://www.srividyaengg.ac.in/coursematerial/Iyear/111144.pdf
5. https://www.studocu.com/in/document/nirma-university-of-science-and-technology/engineering-chemistry/engineering-chemistry-notes-e-book-for-1st-year-engg-

## CO's-PO's & PSO's MAPPING

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 2 | 2 | 1 | - | 1 | 1 | - | - | - | - | 1 | - | - | - |
| 2 | 2 | - | - | 1 | - | 2 | 2 | - | - | - | - | - | - | - | - |
| 3 | 3 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4 | 3 | 1 | 1 | - | - | 1 | 2 | - | - | - | - | - | - | - | - |
| 5 | 3 | 1 | 2 | 1 | - | 2 | 2 | - | - | - | - | 2 | - | - | - |
| CO | 2.8 | 1.3 | 1.6 | 1 | - | 1.5 | 1.8 | - |  | - | - | 1.5 | - | - | - |

**1 - low, 2 - medium, 3 - high, '-"- no correlation**

| 24GET101 | PROBLEM SOLVING AND PYTHON PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

**UNIT- I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9**

Fundamentals of Computing – Identification of Computational Problems - Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, and guess an integer number in a range, Towers of Hanoi.

**UNIT- II DATA TYPES, EXPRESSIONS, STATEMENTS 9**

Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

**UNIT- III CONTROL FLOW, FUNCTIONS, STRINGS 9**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else),chained conditional (if-elif-else);Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, GCD, exponentiation, sum an array of numbers, linear search, binary search.

**UNIT -IV LISTS, TUPLES, DICTIONARIES 9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

**UNIT V FILES, MODULES, PACKAGES 9**

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

Upon completion of the course, students will be able to

**CO1:** Develop algorithmic solutions to simple computational problems.

**CO2:** Develop and execute simple Python programs.

**CO3:** Write simple Python programs using conditionals and loops for solving problems.

**CO4:** Decompose a Python program into functions.

**CO5:** Represent compound data using Python lists, tuples, dictionaries etc.

**CO6:** Read and write data from/to files in Python programs.

**TEXT BOOKS:**


1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.


**REFERENCES:**


1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.


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2. https://onlinecourses.nptel.ac.in/noc23_cs53/preview
3. https://archive.nptel.ac.in/courses/106/105/106105171/
4. https://www.shiksha.com/online-courses/introduction-to-programming-in-c-course-
5. https://onlinecourses.nptel.ac.in/noc23_cs93/preview

**ONLINE RESOURCES:**

1. https://www.cimat.mx/ciencia_para_jovenes/bachillerato/libros/%5BKernighan-
2. https://www.vssut.ac.in/lecture_notes/lecture1424354156.pdf
3. https://progforperf.github.io/Expert_C_Programming.pdf
4. http://pdvpmtasgaon.edu.in/uploads/dptcomputer/Let%20us%20c%20-
5. https://www.researchgate.net/publication/320371751

## CO's-PO's & PSO's MAPPING

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | 2 | 3 | 3 | - |
| 2 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | 2 | 3 | - | - |
| 3 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | - | 3 | - | - |
| 4 | 2 | 2 | - | 2 | 2 | - | - | - | - | - | 1 | - | 3 | - | - |
| 5 | 1 | 2 | - | - | 1 | - | - | - | - | - | 1 | - | 2 | - | - |
| 6 | 2 | 2 | - | - | 2 | - | - | - | - | - | 1 | - | 2 | - | |
| AVg. | 2 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | 2 | 3 | 3 | - |

**1 - low, 2 - medium, 3 - high, '-' - no correlation**

**24GET102 HERITAGE OF TAMILS L T P C**

**1 0 0 1**

**UNIT I LANGUAGE AND LITERATURE 3**

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

**UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART SCULPTURE 3**

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.

**UNIT III FOLK AND MARTIAL ARTS 3**

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

**UNIT IV THINAI CONCEPT OF TAMILS 3**

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.

**UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3**

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 : 15 PERIODS**

**GE3152** **தமிழர் மரபு** **L T P C**
**1 0 0 1**

**அலகு I** **மொழி மற்றும் இலக்கியம்**: **3**

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – 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.

**அலகு II** **மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை –**

**சிற்பக் கலை**: **3**

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.

**அலகு III** **நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்**: **3**

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

**அலகு IV** **தமிழர்களின் திணைக் கோட்பாடுகள்**: **3**

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

**அலகு V** **இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு**: **3**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

**TOTAL : 15 PERIODS**

**TEXT-CUM-REFERENCE BOOKS**

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும்
   கல்வியியல் 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 C ivilization 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) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

| 24GEP101 | PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 1 | 0 | 0 | 1 |

**COURSE OBJECTIVES:**

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

**EXPERIMENTS:**

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

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

CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Implement programs in Python using conditionals and loops for solving problems.
CO4: Deploy functions to decompose a Python program.
CO5: Process compound data using Python data structures.
CO6: Utilize Python packages in developing software applications.

**TEXT BOOKS:**

1. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016.
2. Karl Beecher, “Computational Thinking: A Beginner's Guide to Problem Solving and Programming”, 1st Edition, BCS Learning & Development Limited, 2017.

**REFERENCES:**

1. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, “Computational Thinking: A Primer for Programmers and Data Scientists”, 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data”, Third Edition, MIT Press, 2021.
4. Eric Matthes, “Python Crash Course, A Hands - on Project Based Introduction to Programming”, 2nd Edition, No Starch Press, 2019.
5. https://www.python.org/ Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018

**WEB RESOURCES:**

1. https://onlinecourses.nptel.ac.in/noc22_cs101/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs40/preview
3. https://onlinecourses.swayam2.ac.in/cec21_cs05/preview
4. https://www.mygreatlearning.com/academy/learn-for-free/courses/c-for-beginners1
5. https://www.guvi.in/courses/programming/c-programming-for-beginners/

**ONLINE RESOURCES:**

1. https://karadev.net/uroci/filespdf/files/a%20book%20on%20c.pdf
2. c-programming-step-by-step-beginners-to-experts-edition_compress.pdf
3. https://people.engr.tamu.edu/slupoli/notes/C/supplements/UMBCTraining/IntermediateC_Course.pdf
4. https://magpi.raspberrypi.com/books/essentials-c-v1
5. https://www.e-booksdirectory.com/details.php?ebook=10892

## CO’s-PO’s & PSO’s MAPPING

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | 2 | 3 | 3 | - |
| 2 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | 2 | 3 | - | - |
| 3 | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | - | 3 | - | - |
| 4 | 2 | 2 | - | 2 | 2 | - | - | - | - | - | 1 | - | 3 | - | - |
| 5 | 1 | 2 | - | - | 1 | - | - | - | - | - | 1 | - | 2 | - | - |
| 6 | 2 | 2 | - | - | 2 | - | - | - | - | - | 1 | - | 2 | - | |
| AVg. | 2 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | 2 | 3 | 3 | - |

**1 - low, 2 - medium, 3 - high, ‘-' - no correlation**

| 24BSP101 | PHYSICS AND CHEMISTRY LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**PHYSICS LABORATORY: (Any Seven Experiments)**

**COURSE OBJECTIVES:**

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concisemanner.
- To learn problem solving skills related to physics principles and interpretation ofexperimental data.
- To determine error in experimental measurements and techniques used to minimize such**error.**
- To make the student as an active participant in each part of all lab exercises.

**LIST OF EXPERIMENTS:**

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia ofregular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young's modulus.
4. Uniform bending – Determination of Young's modulus.
5. Laser- Determination of the wavelength of the laser using grating.
6. Air wedge - Determination of thickness of a thin sheet/wire.
    a) Optical fibre -Determination of Numerical Aperture and acceptance angle.
    b) Compact disc- Determination of width of the groove using laser.
7. Ultrasonic interferometer – determination of the velocity of sound and compressibility of
8. liquids.
9. Post office box -Determination of Band gap of a semiconductor.
10. Michelson Interferometer.
11. Melde's string experiment.

**TOTAL: 30 PERIODS**

**COURSE OUTCOMES:**

Upon completion of the course, the students should be able to

- Understand the functioning of various physics laboratory equipment.
- Use graphical models to analyze laboratory data.
- Use mathematical models as a medium for quantitative reasoning and describing physicalreality.
- Access, process and analyze scientific information.
- Solve problems individually and collaboratively.

## CHEMISTRY LABORATORY

## COURSE OBJECTIVES:

- To impart practical skills in the estimation of water quality parameters by volumetry and gravimetry.
- To familiarize the students with the estimation of impurities in aqueous solutions throughelectro analytical techniques such as, pH metry, potentiometry and conductometry.
- To demonstrate the analysis of metals by UV-Visible spectroscopic and flamephotometric methods.

## LIST OF EXPERIMENTS:

1. Determination of total, temporary & permanent hardness of water by EDTA method
2. Determination of chloride content of water sample by Argento metric method
3. Determination of types and amount of alkalinity in waters ample
4. Determination of DO content of water sample by Winkler's method
5. Determination of strength of acids in a mixture of acids using conductivity meter
6. Conductometric titration of barium chloride against sodium (precipitation titration).
7. Estimation of iron content of the given solution using potentiometerOpen

Ended Experiments

1. Determination of strength of given hydrochloric acid using pH meter.
2. Conductometric titration of Strong acid against Strong base

**TOTAL: 30 PERIODS**

### CO's-PO's & PSO's MAPPING

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 2 | 3 | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| 2 | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| 3 | 3 | 2 | 3 | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| 4 | 3 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| 5 | 3 | 2 | 3 | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| AVG | 3 | 2.4 | 2.6 | 1 | 1 | - | - | - | - | - | - | - | - | - | - |

**1 - low, 2 - medium, 3 - high, '-"- no correlation**

## COURSE OUTCOMES:

At the end of the course, the students will be able:

- To independently estimate the water quality parameters, such as, acidity, alkalinity,hardness, DO, TDS, chloride and copper contents by appropriate wet chemical analyses.
- To quantitatively analyse the impurities in aqueous solution by electro analyticaltechniques.
- To determine the amount of metal ions in aqueous samples by spectroscopic techniques.

**TEXT BOOKS:**

1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, "Vogel's Textbook of Quantitative Chemical Analysis", Pearson Education, 2009.
2. V.K. Ahluwalia, Sunitha Dhingra and Adarsh Gulati, "College Practical Chemistry", Universities Press (India) Pvt. Ltd., 2018

**WEB RESOURCES:**

1. https://archive.nptel.ac.in/courses/122/103/122103010/
2. https://archive.nptel.ac.in/courses/122/103/122103011/
3. https://archive.nptel.ac.in/courses/122/107/122107035/
4. https://nptel.ac.in/courses/104101130
5. https://www.classcentral.com/course/youtube-core-science-engineering-chemistry-1-

**ONLINE RESOURCES:**

1. https://www.academia.edu/9476156/Vogels_TEXTBOOK_OF_QUANTITATIVE_CHEMICAL_ANALYSIS_5th_ed_G_H_Jeffery
2. https://www.osmania.ac.in/Syllabus_2019/UG/Fac%20of%20Science%202years/CHEMISTRY.pdfhttps://magpi.raspberrypi.com/books/essentials-c-v1

**CO's-PO's & PSO's MAPPING**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | - | 1 | - | - | 2 | 2 | - | - | - | - | 2 | - | - | - |
| 2 | 3 | 1 | 2 | - | - | 1 | 2 | - | - | - | - | 1 | - | - | - |
| 3 | 3 | 2 | 1 | 1 | - | - | 1 | - | - | - | - | - | - | - | - |
| 4 | 2 | 1 | 2 | - | - | 2 | 2 | - | - | - | - | - | - | - | - |
| 5 | 2 | 1 | 2 | - | 1 | 2 | 2 | - | - | - | - | 1 | - | - | - |
| Avg. | 2.6 | 1.3 | 1.6 | 1 | 1 | 1.4 | 1.8 | - | - | - | - | 1.3 | - | - | - |

**1 - low, 2 - medium, 3 - high, '-"- no correlation**

| 24GEP102 | ENGLISH LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 |

**COURSE OBJECTIVES :**

- To improve the communicative competence of learners
- To help learners use language effectively in academic /work contexts
- To develop various listening strategies to comprehend various types of audio materials likelectures, discussions, videos etc.
- To build on students' English language skills by engaging them in listening, speaking andgrammar learning activities that are relevant to authentic contexts.
- To use language efficiently in expressing their opinions via various media.

**UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 6**

Listening for general information-specific details- conversation: Introduction to classmates - Audio /video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; - politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions( filling out a bank application for example).

**UNIT II NARRATION AND SUMMATION 6**

Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events-Talking aboutcurrent and temporary situations & permanent and regular situations* - describing experiences andfeelings- engaging in small talk- describing requirements and abilities.

**UNIT III DESCRIPTION OF A PROCESS / PRODUCT 6**

Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities(large & small)- talking about precautions.

**UNIT IV CLASSIFICATION AND RECOMMENDATIONS 6**

Listening – Listening to TED Talks; Listening to lectures - and educational videos.Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation-

**UNIT V EXPRESSION 6**

Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic-giving opinions-understanding a website-describing processes

**TOTAL : 30 PERIODS**

**LEARNING OUTCOMES:**

At the end of the course, learners will be able

**CO1:**To listen to and comprehend general as well as complex academic information

**CO2:**To listen to and understand different points of view in a discussion

**CO3:**To speak fluently and accurately in formal and informal communicative contexts

**CO4:**To describe products and processes and explain their uses and purposes clearly and accurately

**CO5:**To express their opinions effectively in both formal and informal discussions

**TEXT BOOKS:**


1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford UniversityPress, Oxford: 2011.
2. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press,Oxford: 2010


**REFERENCE BOOKS:**


1. Bhatnagar, Nitin and Mamta Bhatnagar, http://www.ir.juit.ac.in:8080/jspui/bitstream/123456789/5563/1/Communication%20Skills%20for%20Engineers-C.%20Muralikrishna%20-%20Pearson.pdf New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford UniversityPress: Oxford, 2014.

3. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014

**ONLINE RESOURCES;**

1. https://www.scribd.com/document/526389054/BOOK-Q-Skill-for-Success-4-Listening-and-Speaking
2. https://www.scribd.com/document/377019701/richards-jack-c-bohlke-david-speak-now-2-student-s-book
3. http://www.ir.juit.ac.in:8080/jspui/bitstream/123456789/5563/1/Communication%20Skills%20for%20Engineers-C.%20Muralikrishna%20-%20Pearson.pdf
4. https://www.scribd.com/document/529071930/Speak-Now-4-Student-s-Book
5. https://ia804601.us.archive.org/17/items/ilhem_201504/%5BGillian_Porter_Ladousse%5D_Speaking_Personally__Qu_text.pdf

**CO's-PO's & PSO's MAPPING**

| CO | PO | | | | | | | | | | | | PSO | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| 1 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - |
| 2 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - |
| 3 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - |
| 4 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - |
| 5 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - |
| AVg. | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - |

**- medium, 3 - high, '-"- no correlation**

| 24HST201 | PROFESSIONAL ENGLISH - II | L T P C<br>2 0 0 2 |
|---|---|---|

**COURSE OBJECTIVES :**

- To engage learners in meaningful language activities to improve their reading and writing skills
- To learn various reading strategies and apply in comprehending documents in professional context.
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

**UNIT I MAKING COMPARISONS 6**

Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases

**UNIT II EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING 6**

Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint, Writing - Writing responses to complaints. Grammar - Active Passive Voice transformations, Infinitive and Gerunds

**UNIT III PROBLEM SOLVING 6**

Reading - Case Studies, excerpts from literary texts, news reports etc. Writing – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay. Grammar – Error correction; If conditional sentences

**UNIT IV REPORTING OF EVENTS AND RESEARCH 6**

Reading –Newspaper articles; Writing – Recommendations, Transcoding, Accident Report, Survey Report Grammar – Reported Speech, Modals Vocabulary – Conjunctions- use of prepositions

**UNIT V THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY 6**

Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses.

**TOTAL : 30 PERIODS**

**COURSE OUTCOMES:**

At the end of the course, learners will be able

**CO1:**To compare and contrast products and ideas in technical texts.

**CO2:**To identify and report cause and effects in events, industrial processes through technical texts

**CO3:**To analyse problems in order to arrive at feasible solutions and communicate them in the written format.

**CO4:**To present their ideas and opinions in a planned and logical manner

**CO5:**To draft effective resumes in the context of job search.

**TEXT BOOKS :**

1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2. English for Science & Technology Cambridge University Press 2021.
3. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

**REFERENCES:**


1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.
3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.


**WEB RESOURCES:**

1. https://www.mygreatlearning.com/academy/learn-for-free/courses/smart-english-basics-for-professionals
2. https://www.udemy.com/topic/english-grammar/free/
3. https://learn.saylor.org/course/index.php?categoryid=29&utm_source=google&utm_medium=keyword&utm_campaign=google_keyword_ad_esl&gad_source=1&gclid=EAIaIQobChMIhuOVq6CRhQMVJatmAh1SlgRAEAMYASAAEgK9uPD_BwE
4. https://learn.saylor.org/course/view.php?id=440
5. https://learn.saylor.org/course/view.php?id=481

**ONLINE RESOURCES:**

1. https://www.scribd.com/document/586171781/Professional-English-II
2. https://archive.org/details/englishforengine0000unse/page/n7/mode/2up
3. https://www.slideshare.net/SmitPatel888407/communication-skills-meenakshi-raman-sangeeta-sharma
4. https://www.scribd.com/document/463389417/VAAR-012
5. https://uwetat.files.wordpress.com/2014/08/improve-your-writing.pdf

**CO's-PO's & PSO's MAPPING**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | PO1 | PO1 | PSO | PSO | PSO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | - | - | - |
| **2** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | - | - | - |
| **3** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | - | - | - |
| **4** | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | - | - | - |
| **5** | - | - | - | - | - | - | - | - | **3** | **3** | **3** | **3** | - | - | - |
| **AVg.** | **3** | **3** | **3** | **3** | **2.75** | **3** | **3** | **3** | **2.2** | **3** | **3** | **3** | - | - | - |

**2 - medium, 3 - high, '-' - no correlation**

**Note:** The average value of this course to be used for program articulation matrix.

| 24MAT201 | STATISTICS AND NUMERICAL METHODS | L T P C<br>3 1 0 4 |
|---|---|---|

**COURSE OBJECTIVES:**

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

**UNIT I TESTING OF HYPOTHESIS 9 + 3**

Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

**UNIT II DESIGN OF EXPERIMENTS 9 + 3**

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - $2^2$ factorial design.

**UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9 + 3**

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

**UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9 +3**

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

**UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9 +3**

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

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

**CO1:**Apply the concept of testing of hypothesis for small and large samples in real life problems.
**CO2:**Apply the basic concepts of classifications of design of experiments in the field of agriculture.
**CO3:**Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems. **CO4:**Understandthe knowledge of various techniques and methods for solving first and second order ordinary differential equations.
**CO5:**Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

**TEXT BOOKS:**

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

**REFERENCES:**

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
6. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.

**CO's-PO's & PSO's MAPPING**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | - | - | - |
| **CO2** | 3 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | - | - | - |
| **CO3** | 3 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | - | - | - |
| **CO4** | 3 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | - | - | - |
| **CO5** | 3 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | - | - | - |
| **Avg** | 3 | 3 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | - | - | - |

**1 - low, 2 - medium, 3 - high, '-' - no correlation**

**WEB REFERENCES:**

1. **https://onlinecourses.nptel.ac.in/noc23_ma30/preview**
2. **https://archive.nptel.ac.in/courses/111/105/111105164/**
3. **https://onlinecourses.nptel.ac.in/noc21_ae02/preview**
4. **https://onlinecourses.nptel.ac.in/noc20_ge05/preview**
5. **https://www.shiksha.com/online-courses/matlab-programming-for-numerical-computation-**

**ONLINE RESOURCES:**

1. **http://www.mi.sanu.ac.rs/~gvm/Teze/Numerical%20methods%20In%20Computational%20**
2. **https://www.mdpi.com/books/reprint/7666-computational-methods-and-applications-for-**
3. **https://web.pdx.edu/~crkl/readings/quandt83.pdf**
4. **http://eprints.covenantuniversity.edu.ng/12569/1/Emetere2019_Chapter_IntroductionToCom**
5. **https://www.scribd.com/document/513474165/Computational-Techniques-Lecture-notes-**

| 24PHT201 | PHYSICS FOR INFORMATION SCIENCE | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

- To make the students understand the importance in studying electrical properties of materials.
- To enable the students to gain knowledge in semiconductor physics
- To instill knowledge on magnetic properties of materials.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications
- To inculcate an idea of significance of nano structures, quantum confinement, ensuing nano device applications and quantum computing.

**UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9**

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

**UNIT II SEMICONDUCTOR PHYSICS 9**

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration – Carrier transport in Semiconductor: random motion, drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode.

**UNIT III MAGNETIC PROPERTIES OF MATERIALS 9**

Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility - Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Ferromagnetism: origin and exchange interaction-saturation magnetization and Curie temperature – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses-– Magnetic principle in computer data storage – Magnetic hard disc (GMR sensor).

**UNIT IV OPTICAL PROPERTIES OF MATERIALS 9**

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – solar cell - LED – Organic LED – Laser diodes – Optical data storage techniques.

**UNIT V NANODEVICES AND QUANTUM COMPUTING 9**

Introduction - quantum confinement – quantum structures: quantum wells, wires and dots –– band gap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade - resonant-tunneling diode – single electron transistor – quantum cellular automata - Quantum system for information processing - quantum states – classical bits – quantum bits or qubits –CNOT gate - multiple qubits – Bloch sphere – quantum gates – advantage of quantum computing over classical computing.

**TOTAL :45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course, the students should be able to

**CO1:**gain knowledge on classical and quantum electron theories, and energy band structures

**CO2:**acquire knowledge on basics of semiconductor physics and its applications in various devices

**CO3:**get knowledge on magnetic properties of materials and their applications in data storage,

**CO4:**have the necessary understanding on the functioning of optical materials for optoelectronics

**CO5:**understand the basics of quantum structures and their applications and basics of quantum computing

**TEXT BOOKS:**


1. Jasprit Singh, “Semiconductor Devices: Basic Principles”, Wiley (Indian Edition), 2007.
2. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw-Hill Education (Indian Edition), 2020.
3. Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020.


**REFERENCES:**


1. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
2. Y.B.Band and Y.Avishai, Quantum Mechanics with Applications to Nanotechnology and
3. Information Science, Academic Press, 2013.
4. V.V.Mitin, V.A. Kochelap and M.A.Stroscio, Introduction to Nanoelectronics, Cambridge Univ.Press, 2008.
5. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson Education (Indian Edition) 2009.
6. B.Rogers, J.Adams and S.Pennathur, Nanotechnology: Understanding Small Systems, CRC Press, 2014.

**WEB REFERENCES:**

1. https://archive.nptel.ac.in/courses/115/103/115103108/
2. https://www.youtube.com/watch?v=Ioap-8GEVdQ
3. https://www.youtube.com/playlist?list=PLx8lp704LAvhYOn-h2dHZCWbLTqXMeiH7
4. https://www.coursera.org/learn/quantum-physics
5. https://www.coursera.org/learn/semiconductor-process-1

**ONLINE RESOURCES:**

1. https://www.optima.ufam.edu.br/SemPhys/Downloads/Neamen.pdf
2. https://www.scribd.com/document/70908178/Semiconductor-Devices-Basic-Principles-Jasprit-Singh
3. http://www.icet.ac.in/Uploads/Downloads/Module%20III%20-%20Quantum%20Mechanicsand%20Nanotechnology.pdf
4. https://ocw.mit.edu/courses/6-701-introduction-to-nanoelectronics-spring-2010/6a95133986a8698a55448d60c7834d15_MIT6_701S10_textbook.pdf
5. https://www.scribd.com/doc/92486213/Hanson-fundamentals-of-Nanoelectronics-Copy

**CO's-PO's & PSO's MAPPING**

| CO's | PO's | | | | | | | | | | | | PSO's | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| 1 | 3 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2 | 3 | 1 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| 3 | 3 | - | - | 1 | 2 | 1 | 1 | - | - | - | - | - | - | - | - |
| 4 | 3 | - | 2 | 1 | 3 | - | 1 | - | - | - | - | - | - | - | - |
| 5 | 3 | 2 | 2 | 2 | 2 | 1 | 2 | - | - | - | - | 2 | - | - | - |
| AVG | 3 | 1.3 | 2 | 1.3 | 2.3 | 1 | 1.3 | - | - | - | - | 2 | - | - | - |

**1-Low,2-Medium,3-High,"-"-no correlation**
**Note: the average value of this course to be used for program articulation matrix.**

**24BET202 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

- To introduce the basics of electric circuits and analysis
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To educate on the fundamental concepts of digital electronics
- To introduce the functional elements and working of measuring instruments

**UNIT I ELECTRICAL CIRCUITS 9**

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state)

Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only)

**UNIT II ELECTRICAL MACHINES 9**

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.

**UNIT III ANALOG ELECTRONICS 9**

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar JunctionTransistor-Biasing, JFET, SCR, MOSFET,IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters

**UNIT IV DIGITAL ELECTRONICS 9**

Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps (Simple Problems only).

**UNIT V MEASUREMENTS AND INSTRUMENTATION 9**

Functional elements of an instrument, Standards and calibration, Operating Principle, types - Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

After completing this course, the students will be able to

**CO1**: Compute the electric circuit parameters for simple problems
**CO2**: Explain the working principle and applications of electrical machines
**CO3**: Analyze the characteristics of analog electronic devices
**CO4**: Explain the basic concepts of digital electronics
**CO5:** Explain the operating principles of measuring instruments

**TEXT BOOKS:**


1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020
2. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.
3. Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2008
4. James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.
5. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.

**REFERENCES**:


1. Kothari DP and I.J Nagrath, “Basic Electrical Engineering”, Fourth Edition, McGraw Hill
2. Education, 2019.
3. Thomas L. Floyd, ‘Digital Fundamentals’, 11th Edition, Pearson Education, 2017.
4. Albert Malvino, David Bates, ‘Electronic Principles, McGraw Hill Education; 7th edition, 2017.
5. Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits”, Schaum’ Outline Series, McGraw Hill, 2002.
6. H.S. Kalsi, ‘Electronic Instrumentation’, Tata McGraw-Hill, New Delhi, 2010


**WEB REFERENCES:**

1. https://archive.nptel.ac.in/courses/108/105/108105112/
2. https://archive.nptel.ac.in/courses/108/101/108101091/
3. https://www.classcentral.com/course/youtube-electrical-basic-electrical-technology-47680
4. https://www.youtube.com/results?search_query=digital+electronics+NPTEL
5. https://www.youtube.com/playlist?list=PLbRMhDVUMnge4gDT0vBWjCb3Lz0HnYKkX

**ONLINE RESOURCES:**

1. https://www.griet.ac.in/nodes/BEEE.pdf
2. http://www.pcefet.com/common/library/books/39/173_BasicElectricalEngineeringbyV.K.MehtaandRohitMehta.pdf
3. https://www.academia.edu/34107910/BEEE
4. https://in.pinterest.com/pin/pdf-be3251-basic-electrical-and-electronics-engineering-beee books-lecture--590393832423198787/
1. https://www.scribd.com/document/340956975/Beee

**CO’s-PO’s & PSO’s MAPPING**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 2 | 1 | - | - | - | - | 1 | - | - | - | 2 | - | - | 1 |
| 2 | 2 | 2 | 1 | - | - | - | - | 1 | - | - | - | 2 | - | - | 1 |
| 3 | 2 | 1 | 1 | - | - | - | - | 1 | - | - | - | 2 | - | - | 1 |
| 4 | 2 | 2 | 1 | - | - | - | - | 1 | - | - | - | 2 | - | - | 1 |
| 5 | 2 | 2 | 1 | - | - | - | - | 1 | - | - | - | 2 | - | - | 1 |
| CO | 2 | 1.8 | 1 | - | - | - | - | 1 | - | - | - | 2 | - | - | 1 |

**1 - low, 2 - medium, 3 - high, ‘-' - no correlation**

**24GET201** **ENGINEERING GRAPHICS** **L T P C**

**2 0 4 4**

**COURSE OBJECTIVES:**

**The main learning objective of this course is to prepare the students for:**

- Drawing engineering curves.
- Drawing a freehand sketch of simple objects.
- Drawing orthographic projection of solids and section of solids.

- Drawing development of solids
- Drawing isometric and perspective projections of simple solids.

**CONCEPTS AND CONVENTIONS (Not forExamination)**

Importance of graphics in engineering applications — Use of drafting instruments — BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

**UNIT 1 PLANE CURVES 6+12**

asic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

**UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

**UNIT III PROJECTION OF SOLIDS AND FREEHAND SKETCHING 6+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects.

Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

**UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6 +12**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones.

Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

**UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12**

Principles of isometric projection — isometric scale — isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids - Prisms, pyramids and cylinders by visual ray method.

Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination)

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES**:

On successful completion of this course, the student will be able to

**CO1:** Use BIS conventions and specifications for engineering drawing.

**CO2:** Construct the conic curves, involutes and cycloid.

**CO3:** Solve practical problems involving projection of lines.

**CO4:** Draw the orthographic, isometric and perspective projections of simple solids.

**CO5:** Draw the development of simple solids.

**TEXT BOOK:**


1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Natarajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015


**REFERENCES**:


1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
3. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.
6. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.


Publication of Bureau of Indian Standards:

1. IS 10711 — 2001: Technical products Documentation — Size and layout of drawing sheets.
2. IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation — Lettering.
3. IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.
4. IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit a solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

**CO's-PO's & PSO's MAPPING**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 1 | 2 | - | 2 | - | - | - | - | 3 | - | 2 | 2 | 2 | - |
| 2 | 3 | 1 | 2 | - | 2 | - | - | - | - | 3 | - | 2 | 2 | 2 | - |
| 3 | 3 | 1 | 2 | - | 2 | - | - | - | - | 3 | - | 2 | 2 | 2 | - |
| 4 | 3 | 1 | 2 | - | 2 | - | - | - | - | 3 | - | 2 | 2 | 2 | - |
| 5 | 3 | 1 | 2 | - | 2 | - | - | - | - | 3 | - | 2 | 2 | 2 | - |
| CO | 3 | 1 | 2 | - | 2 | - | - | - | - | 3 | - | 2 | 2 | 2 | - |

**1 - low, 2 - medium, 3 - high, '-' - no correlation**

**WEB REFERENCES:**

1. https://archive.nptel.ac.in/courses/112/102/112102304/
2. https://nptel.ac.in/courses/112103019
3. https://nptel.ac.in/courses/112/105/112105294/
4. https://www.classcentral.com/course/swayam-engineering-graphics-and-design-43589
5. https://nptel.ac.in/courses/112/103/112103019/

**ONLINE RESOURCES:**

1. https://www.slideshare.net/alurikumaraswamya/engineering-graphics-80165287
2. https://easyengineering.net/ge8152-engineering-graphics/
3. https://www.academia.edu/7867472/ENGINEERING_GRAPHICS
4. https://www.cousincrewclothing.com/forum/general-discussions/kv-natarajan-engineering-graphics-pdf-free-download
5. https://edurev.in/p/68354/Introduction-to-Engineering-Graphics

**24AIT201 DATA STRUCTURES DESIGN L T P C**
**3 0 0 3**

**COURSE OBJECTIVES:**

- To understand the concepts of ADTs
- To design linear data structures – lists, stacks, and queues
- To understand sorting, searching and hashing algorithms
- To apply Tree and Graph structures
- To apply Graph structures

**UNIT I ABSTRACT DATA TYPES 9**

Abstract Data Types (ADTs) – ADTs and classes – introduction to OOP – classes in Python – inheritance – namespaces – shallow and deep copying Introduction to analysis of algorithms – asymptotic notations – recursion – analyzing recursive algorithms

**UNIT II LINEAR STRUCTURES 9**

List ADT – array-based implementations – linked list implementations – singly linked lists – circularly linked lists – doubly linked lists – applications of lists – Stack ADT – Queue ADT – double ended queues

**UNIT III SORTING AND SEARCHING 9**

Bubble sort – selection sort – insertion sort – merge sort – quick sort – linear search – binary search – hashing – hash functions – collision handling – load factors, rehashing, and efficiency

**UNIT IV TREE STRUCTURES 9**

Tree ADT – Binary Tree ADT – tree traversals – binary search trees – AVL trees – heaps – multiway search trees

**UNIT V GRAPH STRUCTURES 9**

Graph ADT – representations of graph – graph traversals – DAG – topological ordering – shortest paths – minimum spanning trees

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

At the end of the course, the student should be able to:
CO1: explain abstract data types

CO2: design, implement, and analyse linear data structures, such as lists, queues, and stacks,

according to the needs of different applications

CO3: design, implement, and analyse efficient tree structures to meet requirements such as

searching, indexing, and sorting

CO4: model problems as tree structures

CO5: implement efficient graph algorithms to solve them

**TEXT BOOKS:**

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, “Data Structures and Algorithms in Python” (An Indian Adaptation), Wiley, 2021.
2. Lee, Kent D., Hubbard, Steve, “Data Structures and Algorithms with Python” Springer Edition 2015.
3. Narasimha Karumanchi, “Data Structures and Algorithmic Thinking with Python” Careermonk, 2015.

**REFERENCES:**

1. Rance D. Necaise, “Data Structures and Algorithms Using Python”, John Wiley & Sons, 2011.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, “Introduction to Algorithms", Third Edition, PHI Learning, 2010.
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Fourth Edition, Pearson Education, 2014
4. Aho, Hopcroft, and Ullman, “Data Structures and Algorithms”, Pearson Education India, 2002.

**WEB REFERENCES:**

1. https://onlinecourses.nptel.ac.in/noc22_cs26/preview
2. https://www.youtube.com/watch?v=HUGHVu88uB0&list=PLhBd9eXZZqGL4cleKwPLgMge6bSmw8WpT&index=3
3. https://www.youtube.com/watch?v=d7iGniWrRng
4. https://www.youtube.com/watch?v=9oTV7fDEaCY
5. https://www.youtube.com/watch?v=bvWVs0tJUOY

**ONLINE RESOURCES:**

1. https://terrorgum.com/tfox/books/datastructuresandprogramdesignusingpython.pdf
2. https://nibmehub.com/opacservice/pdf/read/Data%20Structures%20and%20Algorithms%20in 20Python.pdf
3. https://github.com/manishbisht/CompetitiveProgramming/blob/master/Resources/books/Michael%20T.%20Goodrich%2C%20Roberto%20Tamassia%2C%20Michael%20H.%20Goldwasser-Data%20Structures%20and%20Algorithms%20in%20Python-Wiley%20(2013).pdf

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**UNIT I WEAVING AND CERAMIC TECHNOLOGY** **3**

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

**UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY** **3**

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 - 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.

**UNIT III MANUFACTURING TECHNOLOGY** **3**

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 beats - Archeological evidences - Gem stone types described in Silappathikaram.

**UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY** **3**

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

**UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3**

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 : 15 PERIODS**

**TEXT-CUM-REFERENCE BOOKS**


1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் 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 C ivilization 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) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

**GE3252** **தமிழரும் தொழில்நுட்பமும்** **L T P C**
**1 0 0 1**

**அலகு I** **நெசவு மற்றும் பானைத் தொழில்நுட்பம்**: **3**

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

**அலகு II** **வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்**: **3**

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

**அலகு III** **உற்பத்தித் தொழில் நுட்பம்**: **3**

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

**அலகு IV** **வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்**: **3**

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

**அலகு V** **அறிவியல் தமிழ் மற்றும் கணித்தமிழ்**: **3**

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

**TOTAL : 15 PERIODS**

**TEXT-CUM-REFERENCE BOOKS**


1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் 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 C ivilization 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) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

| NX3251 | NCC Credit Course Level 1*<br>(ARMY WING)<br>NCC Credit Course Level - I | L<br>2 | T<br>0 | P<br>0 | C<br>2 |
|---|---|---|---|---|---|
| **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 |
| **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**

| NX3252 | NCC Credit Course Level 1* (NAVAL WING) | | | | |
|---|---|---|---|---|---|
| | NCC Credit Course Level - I | L | T | P | C |
| | | 2 | 0 | 0 | 2 |

| | | |
|---|---|---|
| **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 |
| **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**

| NX3253 | NCC Credit Course Level 1* (AIR FORCE WING) | | | | |
|---|---|---|---|---|---|
| | NCC Credit Course Level - I | **L** | **T** | **P** | **C** |
| | | **2** | **0** | **0** | **2** |

| | | |
|---|---|---|
| **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 |
| **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**

| 24GEP201 | ENGINEERING PRACTICES LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 2 |

**COURSE OBJECTIVES:**

The main learning objective of this course is to provide hands on training to the students in:

- Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common house hold wood work.
- Wiring various electrical joints in common household electrical wire work.
- Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanicalassembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

**GROUP – A(CIVIL & ELECTRICAL)**

**PART I CIVIL ENGINEERING PRACTICES 15**

**PLUMBING WORK:**

a. Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers,elbows and other components which are commonly used in household.
b. Preparing plumbing line sketches.
c. Laying pipe connection to the suction side of a pump
d. Laying pipe connection to the delivery side of a pump.
e. Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

**WOOD WORK:**

a. Sawing,
b. Planning and
**c.** Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.**Wood**

**Work Study:**

a. Studying joints in door panels and wooden furniture
b. Studying common industrial trusses using models.

**PART II ELECTRICAL ENGINEERING PRACTICES 15**

a. Introduction to switches, fuses, indicators and lamps - Basic switch board wiring withlamp, fan and three pin socket
b. Staircase wiring
c. Fluorescent Lamp wiring with introduction to CFL and LED types.
d. Energy meter wiring and related calculations/ calibration
e. Study of Iron Box wiring and assembly
f. Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
g. Study of emergency lamp wiring/Water heater

**GROUP – B(MECHANICAL AND ELECTRONICS)**

**PART III MECHANICAL ENGINEERING PRACTICES 15**

**WELDING WORK:**

a. Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.

**b.** Practicing gas welding. **BASIC**

**MACHINING WORK:**

a. (simple)Turning.

b. (simple)Drilling.

**c.** (simple)Tapping**.**

**ASSEMBLY WORK:**

a. Assembling a centrifugal pump.

b. Assembling a household mixer.

**c.** Assembling an airconditioner.

**SHEET METAL WORK:**

**Making of a square tray**

**FOUNDRY WORK:**

a. Demonstrating basic foundry operations.

**PART IV ELECTRONIC ENGINEERING PRACTICES 15**

**SOLDERING WORK:**

a. Soldering simple electronic circuits and checking continuity. ELECTRONIC

**ASSEMBLY AND TESTING WORK:**

**a. Assembling and testing electronic components on a small PCB.ELECTRONIC**

**EQUIPMENT STUDY:**

**a. Study an elements of smart phone..**

**b. Assembly and dismantle of LED TV.**

**c. Assembly and dismantle of computer/ laptop**

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

Upon completion of this course, the students will be able to:

- Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common householdwood work.
- Wire various electrical joints in common household electrical wire work.
- Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assemblyof common household equipments; Make a tray out of metal sheet using sheet metalwork.
- Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

**TEXT BOOKS:**

1. Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition,O’Reilly Publishers, 2016.

**REFERENCES:**


1. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, “Computational Thinking: A Primer for Programmers and Data Scientists”, 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data”, Third Edition, MIT Press, 2021
4. Eric Matthes, “Python Crash Course, A Hands - on Project Based Introduction to Programming”, 2nd Edition, No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018.


**24AIP201 DATA STRUCTURES DESIGN LABORATORY**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 4 | 2 |

**COURSE OBJECTIVES:**

- To implement ADTs in Python
- To design and implement linear data structures – lists, stacks, and queues
- To implement sorting, searching and hashing algorithms
- To solve problems using tree and graph structures

**LIST OF EXPERIMENTS:**

Note: The lab instructor is expected to design problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed.

1. Implement simple ADTs as Python classes
2. Implement recursive algorithms in Python
3. Implement List ADT using Python arrays
4. Linked list implementations of List
5. Implementation of Stack and Queue ADTs
6. Applications of List, Stack and Queue ADTs
7. Implementation of sorting and searching algorithms
8. Implementation of Hash tables
9. Tree representation and traversal algorithms
10. Implementation of Binary Search Trees
11. Implementation of Heaps
12. Graph representation and Traversal algorithms
13. Implementation of single source shortest path algorithm
14. Implementation of minimum spanning tree algorithms

**COURSE OUTCOMES:**

At the end of the course, the student should be able to:
CO1: implement ADTs as Python classes
CO2: design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications
CO3: design, implement, and analyse efficient tree structures to meet requirements such as searching, indexing, and sorting

CO4: model problems as graph problems
CO5: implement efficient graph algorithms to solve them

**TOTAL:60 PERIODS**

**TEXT BOOKS:**

1.Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, “Data Structures and Algorithms in Python” (An Indian Adaptation), Wiley, 2021.

2.Lee, Kent D., Hubbard , Steve, “Data Structures and Algorithms with Python” Springer Edition 2015.
3. Narasimha Karumanchi, “Data Structures and Algorithmic Thinking with Python” Careermonk, 2015.

**REFERENCES:**

1. Rance D. Necaise, “Data Structures and Algorithms Using Python”, John Wiley & Sons, 2011.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, “Introduction to Algorithms", Third Edition, PHI Learning, 2010.
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Fourth Edition, Pearson Education, 2014
4. Aho, Hopcroft, and Ullman, “Data Structures and Algorithms”, Pearson Education India, 2002.

**WEB REFERENCES:**

1. **https://onlinecourses.nptel.ac.in/noc24_cs57/preview**
2. **https://onlinecourses.swayam2.ac.in/cec24_cs03/preview**
3. **https://www.youtube.com/watch?v=c235EsGFcZs**
4. **https://www.youtube.com/watch?v=i-gjacxrQqY**
5. **https://www.youtube.com/channel/UCaMIU19xncd_rJPvsFNQLIQ/videos**

**ONLINE RESOURCES:**

1. **https://topperworld.in/python-handwritten-notes-2/**
2. **https://www.bu.edu/lernet/artemis/years/2011/slides/python.pdf**
3. **https://www.stat.berkeley.edu/~spector/python.pdf**
4. **https://cfm.ehu.es/ricardo/docs/python/Learning_Python.pdf**
5. **https://static.realpython.com/python-basics-sample-chapters.pdf**

| 24GEP202 | COMMUNICATION LABORATORY | L T P C<br>0 0 4 2 |
|---|---|---|

**COURSE OBJECTIVES**

- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
- To analyse concepts and problems and make effective presentations explaining them clearly and precisely.
- To be able to communicate effectively through formal and informal writing.
- To be able to use appropriate language structures to write emails, reports and essays
- To give instructions and recommendations that are clear and relevant to the context

**UNIT I** **12**

Speaking-Role Play Exercises Based on Workplace Contexts, - talking about competition- discussing progress toward goals-talking about experiences- talking about events in life- discussing past events-Writing: writing emails ( formal & semi-formal).

**UNIT II** **12**

Speaking: discussing news stories-talking about frequency-talking about travel problems-discussing travel procedures- talking about travel problems- making arrangements-describing arrangements-discussing plans and decisions- discussing purposes and reasons- understanding common technology terms-Writing: - writing different types of emails.

**UNIT III** **12**

Speaking: discussing predictions-describing the climate-discussing forecasts and scenarios- talking about purchasing-discussing advantages and disadvantages- making comparisons- discussing likes and dislikes- discussing feelings about experiences-discussing imaginary scenarios Writing: short essays and reports-formal/semi-formal letters.

**UNIT IV** **12**

Speaking: discussing the natural environment-describing systems-describing position and movement-explaining rules-( example- discussing rental arrangements)- understanding technical instructions-Writing: writing instructions-writing a short article.

**UNIT V** **12**

Speaking: describing things relatively-describing clothing-discussing safety issues (making recommendations) talking about electrical devices-describing controlling actions- Writing:
job application( Cover letter + Curriculum vitae)-writing recommendations.

**TOTAL: 60 PERIODS**

**LEARNING OUTCOMES**

**CO1:**Speak effectively in group discussions held in a formal/semi formal contexts.
**CO2:**Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions
**CO3:**Write emails, letters and effective job applications.
**CO4:**Write critical reports to convey data and information with clarity and precision
**CO5:**Give appropriate instructions and recommendations for safe execution of tasks

**Assessment Pattern**

- One online / app based assessment to test speaking and writing skills
- Proficiency certification is given on successful completion of speaking and writing.

**CO's-PO's & PSO's MAPPING**

| CO | PO | PO | PO | PO | PO | PO | PO | PO | PO | PO1 | PO1 | PO1 | PSO | PSO | PSO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 2 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - |
| **2** | 2 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - |
| **3** | 2 | 2 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - |
| **4** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - |
| **5** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - |
| **AV** | **2.4** | **2.8** | **3** | **3** | **1.8** | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **-** | **-** | **-** |

**1 - low, 2 - medium, 3 - high, '-' - no correlation**

**Note:** The average value of this course to be used for program articulation matrix.