**FACULTY OF ENGINEERING**

**Scheme of Instructions& Examinations**

**for**

**Four-Year Degree Programme of**

**Bachelor of Engineering (B.E.)**

**in**

**ELECTRONICS AND COMMUNICATION ENGINEERING**

(Accredited by NBA)

(With effect from the Academic Year 2023–24)



**STANLEY COLLEGE OF ENGINEERING AND TECHNOLOGY FOR WOMEN (AUTONOMOUS)**

**(Affiliated to Osmania University)**

**(Accredited by NAAC with "A" Grade)**

**ABIDS, HYDERABAD-500001,Telangana**

|  |  |
| --- | --- |
| **Abbreviation** | **Meaning** |
| HSM | Humanities, Social Sciences and Management |
| BSC | Basic Sciences including Mathematics, Physics and Chemistry |
| ESC | Engineering Sciences including Workshop, Drawing, Basic Electrical / Electronics |
| PC | Professional Core Courses |
| PE | Professional Elective Courses |
| OE | Open Elective Courses |
| PW | Project Work |
| MC | Mandatory Courses |
| AC | Audit Courses |
| PY | Philosophy |
| EC | Electronics and Communication Engineering. |
| CE | Civil Engineering, |
| MP | Mechanical / Production Engineering |
| IT | Information Technology |
| CS | Computer Science Engineering |
| EE | Electrical and Electronics Engineering |
| CM | Computer Engineering |
| AD | Artificial Intelligence and Data Science |
| L | Lecture |
| T | Tutorial |
| P | Practical |
| G | Grade |
| D | Drawing |
| CIE | Continuous Internal Evaluation |
| SEE | Semester End Evaluation |
|  | Each contact hour is a clock hour |
|  | The duration of the Practical class is two hours; however, it can be extended wherever necessary, to enable the student to complete the experiment. |

|  |  |
| --- | --- |
| **Keywords** | **Definition** |
| HSM | Courses offered in the area of humanities and social sciences like communication & managerial skills. |
| BSC | Courses of foundational nature in the areas of Mathematics, Physics, Chemistry, Biology etc. |
| ESC | Courses belonging to the basic evolutionary aspects of a Particular Engineering from all other branches of Engineering. |
| PC | Courses that are fundamental and compulsory constituents of the respective engineering discipline. |
| PE | Courses those are discipline-specific to stream line the graduates to different emerging fields as per their choice. |
| OE | Courses of interdisciplinary nature offered to all the students of various programmes across the Institute. |
| PW | To make a perfect, Hands-on experienced Professionals. |
| MC | Compulsory non-credit courses that a student need to study to become a responsible citizen, as per supreme court guidelines. |
| AC | Audit courses can help the student to get awareness of different issues which enhance their skill sets to improve their employability. |

## SCHEME OF INSTRUCTIONS& EXAMINATIONS

**(ELECTRONICS AND COMMUNICATION ENGINEERING)**

1. **Induction Program**

|  |  |
| --- | --- |
| SMC900XX Induction Program (Mandatory) | 3-week duration |
| I Induction program for students to be offered right  at the start of the first year | * Physical Activity * Creative Arts * Universal Human Values * Literary * Proficiency Modules * Lectures by Eminent People * Visits to local Areas * Familiarization to Dept./Branch & Innovations |

**B.E. I- Semester**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Title** | | **Scheme of**  **Instruction per Week** | | | | **Scheme of**  **Examination** | | | **Credits** |
| **L** | **T** | **P** | **Contact Hrs.** | **CIE** | **SEE** | **SEE Duration in Hrs.** |
| **Theory Course** | | | | | | | | | | | |
| **Three-Week Induction Program** | | | | | | | | | | | |
|  | SBS0101MT | | Mathematics-I | 3 | 1 | - | 4 | 40 | 60 | 3 | 4 |
|  | SBS0901PH | | Engineering Physics | 3 | 1 | - | 4 | 40 | 60 | 3 | 4 |
|  | SES0101CS | | Programming in C | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
|  | SES0101EE | | Basic Electrical Engineering | 3 | 1 | - | 4 | 40 | 60 | 3 | 4 |
| **Practical/Laboratory Course** | | | | | | | | | | | |
|  | SHS0911EG | English Lab | | - |  | 2 | 2 | 40 | 60 | 3 | 1 |
|  | SBS0911PH | Engineering Physics Lab | | - | - | 2 | 2 | 40 | 60 | 3 | 1 |
|  | SES0912ME | Engineering Workshop | | - | - | 4 | 4 | 40 | 60 | 3 | 2 |
|  | SES0911EE | Basic Electrical Engineering Lab | | - | - | 2 | 2 | 40 | 60 | 3 | 1 |
|  | SES0111CS | Programming in C Lab | | - | - | 4 | 4 | 40 | 60 | 3 | 2 |
|  | SHS0111EC | Design Thinking | | - | - | 2 | 2 | 40 | 60 | 3 | 1 |
| **Total** | | | | **12** | **3** | **16** | **31** | **400** | **600** | **30** | **23** |

**B.E. II- Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Title** | **Scheme of**  **Instruction per Week** | | | | **Scheme of**  **Examination** | | | **Credits** |
| **L** | **T** | **P** | **Contact Hrs.** | **CIE** | **SEE** | **SEE**  **Duration in Hrs.** |
| **Theory Course** | | | | | | | | | | |
|  | SHS0901EG | English | 2 | - | - | 2 | 40 | 60 | 3 | 2 |
|  | SHS0902EG | Universal Human Values | 2 | - | - | 2 | 40 | 60 | 3 | 2 |
|  | SBS0902CH | Engineering Chemistry | 3 | 1 | - | 4 | 40 | 60 | 3 | 4 |
|  | SBS0201MT | Mathematics-II | 3 | 1 | - | 4 | 40 | 60 | 3 | 4 |
|  | SES0201CS | Data Structures | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| **Practical/Laboratory Course** | | | | | | | | | | |
|  | SBS0911CH | Chemistry Lab | - | - | 2 | 2 | 40 | 60 | 3 | 1 |
|  | SES0911ME | Engineering Graphics Lab | - | - | 4 | 4 | 40 | 60 | 3 | 2 |
|  | SES0211CS | Data Structures Lab | - | - | 2 | 2 | 40 | 60 | 3 | 1 |
|  | SPW0221EC | IDEA Lab | - | - | 2 | 2 | 40 | 60 | 3 | 1 |
| **Total** | | | **13** | **2** | **10** | **25** | **360** | **540** | **27** | **20** |

**B.E. III- Semester**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Title** | **Scheme of**  **Instruction per Week** | | | | **Scheme of**  **Examination** | | | | **Credits** |
| **L** | **T** | **P** | **Contact Hrs.** | **CIE** | **SEE** | **SEE Duration in Hrs.** | |
| **Theory Course** | | | | | | | | | | | |
|  | SBS0301EC | Probability Theory and Stochastic Process | 3 | 1 | - | 4 | 40 | 60 | 3 | 4 | |
|  | SPC0302EC | Electronic Devices | 3 | - | - | 3 | 40 | 60 | 3 | 3 | |
|  | SPC0304EC | Digital System Design | 3 | - | - | 3 | 40 | 60 | 3 | 3 | |
|  | SPC0303EC | Signals & Systems | 3 | - | - | 3 | 40 | 60 | 3 | 3 | |
|  | SOE190XXX | Open Elective-I | 3 | - | - | 3 | 40 | 60 | 3 | 3 | |
|  | SMC0901CH | Environmental Sciences | 2 | - | - | 2 | 50 | - | - | 0 | |
| **Practical/Laboratory Course** | | | | | | | | | | | |
|  | SPC0312EC | Electronic Devices Lab | - | - | 2 | 2 | 40 | 60 | 3 | 1 | |
|  | SPC0314EC | Digital System Design Lab | - | - | 2 | 2 | 40 | 60 | 3 | 1 | |
|  | SOE191XXX | Open Elective-I Lab | - | - | 2 | 2 | 40 | 60 | 3 | 1 | |
| **Total** | | | **17** | **1** | **6** | **24** | **370** | **480** | **24** | **19** | |

**B.E. IV- Semester**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Title** | **Scheme of**  **Instruction per Week** | | | | | | | **Scheme of**  **Examination** | | | | | | | | **Credits** | |
|
| **L** | | **T** | **P** | | | **Contact Hrs.** | **CIE** | | **SEE** | |  | **SEE Duration in Hrs.** | | |
| **Theory Course** | | | | | | | | | | | | | | | | | | | |
|  | SHS0901BM | Managerial Economics and Financial Accountancy | 3 | - | | - | 3 | | |  | 40 | 60 | 3 | | | | 3 | | |
|  | SPC0401EC | Analog Electronic Circuits | 3 | - | | - | 3 | | |  | 40 | 60 | 3 | | | | 3 | | |
|  | SPC0402EC | Pulse and Linear Integrated Circuits | 3 | 1 | | - | 4 | | |  | 40 | 60 | 3 | | | | 4 | | |
|  | SPC0403EC | Electromagnetic Theory and Transmission Lines | 3 | 1 | | - | 4 | | |  | 40 | 60 | 3 | | | | 4 | | |
|  | SOE290XXX | Open Elective-II | 3 | - | | - | 3 | | |  | 40 | 60 | 3 | | | | 3 | | |
|  | SMC901HS | Indian Constitution | 2 | - | | - | 2 | | |  | 40 | 60 | 3 | | | | 0 | | |
| **Practical/Laboratory Course** | | | | | | | | | | | | | | | | | | | |
|  | SHS0912EG | Advanced Communication Skills Lab | - | - | | 2 | 2 | | |  | 40 | 60 | 3 | | | | 1 | | |
|  | SPC0411EC | Analog Electronic Circuits Lab | - | - | | 2 | 2 | | |  | 40 | 60 | 3 | | | | 1 | | |
|  | SPC0412EC | Pulse and Linear Integrated Circuits | - | - | | 2 | 2 | | |  | 40 | 60 | 3 | | | | 1 | | |
|  | SOE291XXX | Open Elective-II Lab | - | - | | 2 | 2 | | |  | 40 | 60 | 3 | | | | 1 | | |
|  | | | | | | | | | | | | | | | | | | | |
|  | SPW0421EC | Internship- I | The students have to undergo an Internship of 4 week duration after IV- Semester SEE | | | | | | | 50 | | - | - | | | - | 1 | |
| **Total** | | | **17** | **2** | | **8** | | **27** | |  | **450** | **600** | **30** | | | | **22** | | |

**B.E. V- Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Title** | **Scheme of**  **Instruction per Week** | | | | **Scheme of**  **Examination** | | | **Credits** |
| **L** | **T** | **P** | **Contact Hrs.** | **CIE** | **SEE** | **SEE Duration in Hrs.** |
| **Theory Course** | | | | | | | | | | |
|  | SPC0501EC | Digital Signal Processing | 3 | 1 | - | 4 | 40 | 60 | 3 | 4 |
|  | SPC0502EC | Antennas and Wave Propagation | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
|  | SPC0503EC | Analog Communication | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
|  | SPE190XEC | Professional Elective-I | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
|  | SOE390XXX | Open Elective-III | 3 | - | - | 3 | 40 | 60 | 3 | 3 |
| **Practical/Laboratory Course** | | | | | | | | | | |
|  | SPC0511EC | Digital Signal Processing Lab | - | - | 2 | 2 | 40 | 60 | 3 | 1 |
|  | SPC0512EC | Antenna Lab | - | - | 2 | 2 | 40 | 60 | 3 | 1 |
|  | SPE191XEC | Professional Elective-I Lab | - | - | 2 | 2 | 40 | 60 | 3 | 1 |
|  | SPW0521EC | Mini Project and Industrial Visit | - | - | 2 | 2 | 50 | - | - | 2 |
| **Total** | | | **15** | **1** | **8** | **24** | **370** | **480** | **24** | **21** |

**B.E. VI- Semester**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Title** | **Scheme of Instruction**  **per Week** | | | | **Scheme of**  **Examination** | | | | **Credits** |
| **L** | **T** | **P** | **Contact Hrs.** | **CIE** | **SEE** | **SEE**  **Duration in Hrs.** | |
| **Theory Course** | | | | | | | | | | | |
|  | SHS0902BM | Entrepreneurship and Startups | 3 | 1 | - | 4 | 40 | 60 | 3 | 4 | |
|  | SPC0601EC | Computer Organization and Microprocessors | 3 | - | - | 3 | 40 | 60 | 3 | 3 | |
|  | SPC0602EC | Digital Communication | 3 | - | - | 3 | 40 | 60 | 3 | 3 | |
|  | SPC0603EC | Automatic Control Systems | 3 | - | - | 3 | 40 | 60 | 3 | 3 | |
|  | SPE290XEC | Professional Elective –II | 3 | - | - | 3 | 40 | 60 | 3 | 3 | |
| **Practical/Laboratory Course** | | | | | | | | | | | |
|  | SPC0611EC | Microprocessors Lab | - | - | 2 | 2 | 40 | 60 | 3 | 1 | |
|  | SPC0612EC | Communication Engineering Lab | - | - | 2 | 2 | 40 | 60 | 3 | 1 | |
|  | SPEXXXEC | Professional Elective –II Lab | - | - | 2 | 2 | 40 | 60 | 3 | 1 | |
|  | SPW0621EC | Technical Seminar | - | - | - | - | 50 | - | - | 1 | |
|  | | | | | | | | | | | |  |
|  | SPW0621EC | Internship- II | The students have to undergo an Internship of 4 week duration after VI- Semester SEE | | | | 50 | - | - | **1** | |  | |
| **Total** | | | **15** | **1** | **6** | **22** | **420** | **480** | **24** | **21** | |

**B.E. VII- Semester**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Title** | | | **Scheme of**  **Instruction per Week** | | | | **Scheme of**  **Examination** | | | **Credits** |
| **L** | **T** | **P** | **Contact Hrs.** | **CIE** | **SEE** | **SEE Duration in Hrs.** |
| **Theory Course** | | | | | | | | | | | | |
|  | SPC0701EC | Microwave Techniques | | 3 | | - | - | 3 | 40 | 60 | 3 | 3 |
|  | SPC0702EC | Embedded Systems | | 3 | | - | - | 3 | 40 | 60 | 3 | 3 |
|  | SPC0703EC | Data Communications and Computer Networks | | 3 | | - | - | 3 | 40 | 60 | 3 | 3 |
|  | SPC0704EC | Radar Engineering | | 3 | | - | - | 3 | 40 | 60 | 3 | 3 |
|  | SPE390XEC | Professional Elective –III | | 3 | | - | - | 3 | 40 | 60 | 3 | 3 |
| **Practical/Laboratory Course** | | | | | | | | | | | | |
|  | SPC0711EC | Microwave Engineering Lab | - | | | - | 2 | 2 | 40 | 60 | 3 | 1 |
|  | SPC0712EC | Embedded Systems Lab | - | | | - | 2 | 2 | 40 | 60 | 3 | 1 |
|  | SPC0713EC | Data Communications and Computer Networks Lab | - | | | - | 2 | 2 | 40 | 60 | 3 | 1 |
|  | SPW0721EC | Project Work (Phase–I) | - | | | - | 6 | 6 | 40 | - | - | 2 |
| **Total** | | | **15** | | | **0** | **12** | **27** | **360** | **480** | **24** | **20** |

**B.E. VIII- Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Code** | **Course Title** | **Scheme of**  **Instruction per Week** | | | | **Scheme of**  **Examination** | | | **Credits** |
| **L** | **T** | **P** | **Contact Hrs.** | **CIE** | **SEE** | **SEE Duration in Hrs.** |
| **Theory Course** | | | | | | | | | | |
|  | SPE490XEC | PE-IV | 2 | - | - | 2 | 40 | 60 | 3 | 2 |
|  | SPW0821EC | Project Work (Phase-II) | - | - | 16 | 16 | 40 | 120 | - | 12 |
| **Total** | | | **2** | **0** | **16** | **18** | **80** | **180** | **3** | **14** |

**List of Project Works (PW)**

|  |  |  |  |
| --- | --- | --- | --- |
| **S No** | **Course Code** | **Semester** | **Name of the Course** |
| 1 | SPW211EC | II | IDEA Lab |
| 2 | SPW412EC | IV | Internship - I |
| 3 | SPW513EC | V | Mini Project& Industrial Visit |
| 4 | SPW614EC | VI | Technical Seminar |
| 5 | SPW615EC | VI | Internship - II |
| 6 | SPW716EC | VII | Project Work (Phase-I) |
| 7 | SPW818EC | VIII | Project Work (Phase-II) |

**List of Mandatory Course (MC)**

|  |  |  |
| --- | --- | --- |
| **S.No.** | **Course Code** | **Mandatory Course -Subject Name** |
| 1 | SHS916EC | Design Thinking |
| 2 | SMC900XX | Induction Program |
| 3 | SAC903CH | Environmental Science |
| 4 | SMC901HS | Indian Constitution |

**Professional Elective-I**

|  |  |
| --- | --- |
| **Course Code** | **Course Name** |
| SPE1901EC | Real Time Operating Systems |
| SPE1902 EC | Mixed Signal Circuits & Systems |
| SPE1903 EC | Advanced Digital Signal Processing |
| SPE1904 EC | Fiber Optic Communication |
| SPE1905 EC | Information Theory Coding |

**Professional Elective-II**

|  |  |
| --- | --- |
| **Course Code** | **Course Name** |
| SPE2901EC | Sensor Technology |
| SPE2902EC | VLSI Design |
| SPE2903 EC | Array Signal Processing |
| SPE2904 EC | Wireless Sensor Networks |
| SPE2905 EC | Soft Computing Techniques |

**Professional Elective-III**

|  |  |
| --- | --- |
| **Course Code** | **Course Name** |
| SPE3901 EC | Electronic Measurements & Instrumentation |
| SPE3902 EC | Low Power VLSI Design |
| SPE3903 EC | Image and Video Processing |
| SPE3904 EC | Mobile Communication and Networks |
| SPE3905 EC | Computer Vision & Pattern Recognition |

**Professional Elective-IV**

|  |  |
| --- | --- |
| **Course Code** | **Course Name** |
| SPE4901EC | IOT and Applications |
| SPE4902 EC | Design For Testability |
| SPE4903 EC | Biomedical Signal Processing |
| SPE4904 EC | Satellite Communication |
| SPE4905 EC | Deep learning |

**Open Elective-I**

|  |  |  |
| --- | --- | --- |
| **Course Code** | **Course Name** | **Offered to** |
| S0E1901CS | OOPs Using Java | EEE, ECE |
| S0E1902CS | Open Source Technologies | IT |
| S0E1901EC**\*** | Signal Analysis And Transformation Techniques | CSE |
| S0E1902EC**\*** | Signals And Systems | AIDS |
| S0E1901IT | Operating Systems | ECE |
| S0E1901EE | Reliability Engineering | IT |
| S0E1901BM | Entrepreneurship | CSE |
| S0E1902BM | Operations Research | AIDS |
| S0E1901EG | Soft Skills & Interpersonal Skills | CSE |
| S0E1902EG | Effective Technical Communication In English | AIDS |
| S0E1901MT | Operations Research | AIDS |

**Note:** **\*** Denotes Course offered to other departments

**Open Elective-II**

|  |  |  |
| --- | --- | --- |
| **Course Code** | **Course Name** | **Offered to** |
| S0E2901CS | Software Engineering | EEE |
| S0E1902CS | Data Science Using R | ECE |
| S0E2901EC**\*** | Internet Of Things | CSE |
| S0E2902EC**\*** | FUNDAMNETALS OF Iot | EEE |
| S0E2903EC**\*** | Digital Signal Processing | CME |
| S0E2904EC**\*** | Embedded Systems And Its Applications | AIDS |
| S0E2901IT | Cyber Security | EEE,ECE |
| S0E2902OTH | Intellectual Property Rights | IT |
| S0E2901AD | Database Management Systems | ECE |
| S0E2901BM | Human Resource Management | CME |
| S0E2902BM | Management Science | CSE |
| S0E2903BM | Advanced Entrepreneurship | AIDS |
| S0E2904BM | Quantitative Analysis For Business Decisions | IT |
| S0E2901EG | Technical Writing For Research | CME |
| S0E2901MT | Quantitative Analysis For Business Decisions | IT |

**Note:** **\*** Denotes Course offered to other departments

**Open Elective-III**

|  |  |  |
| --- | --- | --- |
| **Course Code** | **Course Name** | **Offered to** |
| S0E3901CS | Database Management Systems | EEE |
| S0E3901EC**\*** | Embedded Systems | CSE |
| S0E3902EC**\*** | Power Management For IoT Devices | CME |
| S0E3903EC**\*** | Internet Of Things | AIDS |
| S0E3901IT | Software Engineering | ECE |
| S0E3902OTH | Intellectual Property Rights | ECE |
| S0E3901AD | Data Science Using R | EEE |
| S0E3901EE | Energy Conservation And Management | IT |
| S0E3901BM | Basics Of Entrepreneurship | IT |
| S0E3902BM | Human Resource Management | CSE |
| S0E3903BM | Management Information System | CME |
| S0E3904BM | Supply Chain Management | AIDS |
| S0E3901EG | Technical Writing For Research | AIDS |

**Note:** **\*** Denotes Course offered to other departments

**Open Elective-IV**

|  |  |  |
| --- | --- | --- |
| **Course Code** | **Course Name** | **Offered to** |
| S0E4901EE | Basics of Power Electronics | ECE |
| S0E4901BM | Entrepreneurship | ECE |

SEMESTER-I

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Course Code | Course Title | | | | | | Core /  Elective |
| SBS0101MT | **Mathematics-I**  **(Common to All)** | | | | | | **Core** |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| L | T | D | P |
| - | 3 | 1 | - | - | **40** | **60** | 4 |
| **Course Objectives**   1. To introduce the concepts of mean value theorems and curvature. 2. To introduce the concept of multiple integrals. 3. To study vector differential and vector integral calculus.   **Course Outcomes**   1. Identify the nature of sequences and series. 2. Analyze the consequences of the mean value Theorems for differentiable functions and Evaluate the Curvature. 3. Analyze the properties of functions of two variables. 4. Evaluate double and triple integrals in engineering problems. 5. Solve problems based on vector differentiation and integration | | | | | | | |

**Unit-I**

**Sequence and series:** Sequences –General properties of series, Convergence and Divergence of sequence. Series of positive terms, Comparison test, tests of convergence D’Alembert’s Ratio test, Cauchy’s nth root test, Raabe’s test, Logarithmic test, Alternating series, Series of positive and negative terms, Absolute convergence, and Conditional convergence.

**Unit-II**

**Differential Calculus:** Rolle’s, Lagrange’s, Cauchy’s Mean value theorems (without proofs), Taylor’s series, Curvature, Radius of curvature, Circle of Curvature, Envelope of family of curves, Evolutes.

**Unit-III**

**Multivariable Calculus (Differentiation):** Functions of two variables, Limits and continuity, Partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions (Chain rule), Jacobian, Higher order partial derivatives, Taylor’s series of functions of two variables, Maximum and minimum of values of functions of two variables, Method of Lagrange Multipliers.

**Unit-IV**

**Multiple Integrals:** Double and Triple integrals (Cartesian), Change of order of integration (Cartesian coordinates), Change of variables in double and triple integrals, Jacobian. Beta and Gamma Functions, Relation between Gamma and Beta Functions.

**Unit-V**

**Vector Calculus:** Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field, Line, Surface and Volume integrals, Green’s theorem in a plane, Gauss’s divergence theorem, Stoke’s theorem (without proofs) and their verification with respect to Cartesian, applications.

# **TEXT/REFERENCE/ADDITIONALBOOKS:**

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 43dEdition, 2014.
2. B.V. Ramana, Higher Engineering Mathematics, 23reprint, 2015.
3. N. Bali, M. Goyal, A text book of Engineering Mathematics, Laxmi Publications,2010.
4. G.B. Thomas, Maurice Weir and Joel Hass, Thomas' Calculus, Peterson, 12th Edition, 2010

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CourseCode | CourseTitle | | | | | | Core/  Elective |
| **SBS0901PH** | **ENGINEERING PHYSICS** | | | | | | **Core** |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| L | T | D | P |
| - | 3 | 1 | - | - | **40** | **60** | 4 |
| Course Objectives: The objective of this course is to make the student   1. Understand basics of wave nature of light and to analyze various phenomena like interference and diffraction exhibited by light. 2. Know the construction of lasers and optical fibers and apply their basic principles to various laser systems and optical fibers. 3. Acquire the knowledge of different types of crystal systems, to analyze the crystal parameters and to classify the defects present in the crystal. 4. Learn the difference between classical and quantum mechanics and identify the role of quantum mechanics and to know the significance of Maxwell’s equations in engineering applications. 5. Familiarize with basics of Electromagnetic Laws and Electromagnetic Wave theory   Course Outcomes: After completion of the course, the student will be able to   1. Demonstrate the wave nature of light and distinguish between interference and diffraction phenomena. 2. Understand the lasing action in lasers, propagation of light in optical fibers and compile their applications in different fields. 3. Distinguish crystals based on their structures and understand the effects of defects on the properties of materials. 4. Apply and solve various engineering problems from concepts of dual nature of particles and can explain the importance of electromagnetic waves. 5. Understand the basic laws of Electromagnetic theory to further use the knowledge for engineering applications. | | | | | | | |

Unit-I: (10 periods)

Interference: Superposition of waves, Coherent and non coherent sources, Interference of light by division of wave front and by division of amplitude, Young’s double slit experiment, Newton’s rings experiment.

Diffraction: Introduction, Distinction between Fresnel’s and Fraunhoffer diffraction, Fraunhoffer diffraction at single slit, Diffraction grating (N-slits).

Unit-II: (10 periods)

Lasers: Characteristics of Lasers, Basic concepts of transitions - absorption, spontaneous and stimulated emissions, Einstein’s theory for matter and radiation interaction ( A & B coefficients), Concepts of meta stable states, population inversion and pumping, Components of lasers, Types of lasers, Ruby laser, He-Ne laser, Semiconductor laser, Applications of laser.

Fiber optics: Optical fiber as a wave guide, Parts of an optical fibre, Basic principle – total internal reflection, Concept of Numerical Aperture(NA) and acceptance angle, Types of optical fibres – Step Index and Graded Index fibres, Fibre drawing process (Double crucible method), Applications of optical fibres.

Unit-III: (10 periods)

Crystallography: Introduction, Crystalline and amorphous solids, Space lattice, Basis, Bravais lattice, Unit cell, Types of crystal systems, lattice planes, Miller Indices, Interplanar distance for cubic system (expression), X-ray diffraction, Braggs law, Powder X-ray diffraction, Classification of defects, Point defects, Concentration of Schottky and Frenkel defects in ionic crystals, Line and Plane defects.

Unit-IV: (10 periods)

Introduction to Quantum Mechanics: Introduction, de-Broglie concept – wave nature of particles (de-Broglie wavelength), properties of wave function and its physical significance, Time independent and Time dependent Schrodinger wave equations, Particle in a 1-D box.

Electrostatics: Introduction – Coulomb’s law and field Intensity – Electric field due to continuous charge distributions – Electric flux density – Gauss law – Maxwell’s equation – Electric potential – Polarization in dielectrics – Dielectric constant and strength.

Unit-V: (10 periods)

Magnetostatics: Introduction – Boitsavart’s law – Ampere’s Law - Maxwell’s equation – Magnetic flux density (Maxwell’s equation) – Maxwell’s equations for static fields.

Electro Magnetic Theory: Introduction – Faraday’s law – Displacement current – Lenz’s law – Electromagnetic waves: Introduction – Maxwell’s equations in differential and integral forms - Equation of plane wave in free space – Poynting theorem.

Text Books:

1. R .K .Gaur and S.L.Gupta, Engineering Physics, DhanpatRai Publications,2011

2. B.K.Pandey and S.Chaturvedi, Engineering physics, Cengage Publications, 2012

3. M.N. Avadhanulu, P.G. Kshirsagar and T.V.S Murthy, A Text book of Engineering Physics,

S Chand, 2018.

4. M. Armugam Materials Science, Anuradha Publications, 2015

5. P.K. Palaniswamy, engineering Physics, Scitech publications, 2012.

6. Matthew N. O. Sadiku, Principles of Electromagnetics, 4th Edition, Oxford University Press.

Recommended Books:

1. [AjoyGhatak](https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Ajoy+Ghatak&search-alias=stripbooks) , Optics, **7th Edition,**Mc.Graw Hill, India.
2. [AjoyGhatak](https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Ajoy+Ghatak&search-alias=stripbooks) and K Thyagarajan, Fiber optics and Lasers, Infinity Press.
3. GerdKeiser,OpticalFibre Communications, 3rd Edition, McGraw Hill International Editions.
4. [Charles Kittel](https://www.amazon.in/Charles-Kittel/e/B001H6OICC/ref=dp_byline_cont_book_1),Introduction to Solid State Physics, Wiley India Edition.
5. Feynman P Richard,The Feynman Lectures on Physics, 2nd Edition, Addison-Wesley.
6. David J Griffiths, Introduction to Electrodynamics, Cambridge India.

Web links:

1. [www.ece.gatech.edu/sites/default/files/documents/stepup/2017/interference\_and\_diffra](https://www.ece.gatech.edu/sites/default/files/documents/stepup/2017/interference_and_diffraction.pdf)

[ction.pdf](https://www.ece.gatech.edu/sites/default/files/documents/stepup/2017/interference_and_diffraction.pdf)

1. [pgslogan.weebly.com/uploads/2/4/7/0/24706722/unit-i.pdf](http://pgslogan.weebly.com/uploads/2/4/7/0/24706722/unit-i.pdf)
2. [nptel.ac.in/content/storage2/courses/112108150/pdf/Lecture\_Notes/MLN\_03.pdf](https://nptel.ac.in/content/storage2/courses/112108150/pdf/Lecture_Notes/MLN_03.pdf)
3. [study.com/academy/topic/introduction-to-electrostatics.html](https://study.com/academy/topic/introduction-to-electrostatics.html)
4. [www.tcd.ie/Physics/research/groups/magnetism/files/lectures/5006/5006-2.pdf](https://www.tcd.ie/Physics/research/groups/magnetism/files/lectures/5006/5006-2.pdf)

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| **Course Code** | | **Course Title** | | | | | | **Core / Elective** |
| **SES0101CS** | **PROGRAMMING FOR PROBLEM SOLVING** | | | | | | | **Core** |
|  | **Contact Hours per Week** | | | | | **CIE** | **SEE** | **Credits** |
| Prerequisite | L T D P | | | | |  |  |  |
| - | 3 | | - | - |  | 40 | 60 | 3 |

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| **Course Objectives:**   1. Understand programming skills using the fundamentals and basics of C Language. 2. Improve problem solving skills using arrays, strings, and functions. 3. Understand the dynamics of memory by pointers and study files creation process with access permissions.   **Course Outcomes: At the end of the course, Students should be able to:**   1. Describe the concept of computer system, analyze a given problem, develop an   algorithm, fundamental programming constructs, identify data representation formats  And describe operators and their precedence, associativity.  2. Understand branching and loop statements  3. Describe the concept of homogeneous derives data types, strings and functions.  4. Understand pointers, heterogeneous data types.  5. Describe the concept of file system. |

**UNIT - I INTRODUCTION**

**Introduction to Programming :** Computer system, components of a computer system, computing environments, computer languages, creating and running programs, algorithms, flowcharts; Introduction to C language: Computer languages, History of C, basic structure of C programs, process of compiling and running a C program, C tokens, keywords, identifiers, constants, strings, special symbols, variables, data types; Operators and expressions. **Conditional Control structures:** Decision statements; Simple if, if-else, else if ladder, Nested if and Case Statement-switch statement;

**UNIT - II ITERATIVE CONTROL STRUCTURES AND ARRAYS**

**Iterative Control structures:** Loop control statements: while, for and do while loops. Jump statements, break, and continue, goto statements.

**Arrays :** Concepts, one dimensional arrays, declaration and initialization of one dimensional arrays, two dimensional arrays, initialization and accessing, multi-dimensional arrays; Strings(character arrays): Arrays of characters, variable length character strings, inputting character strings, character library functions, string handling functions.

**UNIT – III FUNCTIONS, STRUCTURES AND UNIONS**

**Functions**: Need for user defined functions, function declaration, function prototype, category of functions, inter function communication, function calls, parameter passing mechanisms, recursion, passing arrays to functions, passing strings to functions, storage classes, preprocessor directive.

**Structures**: Structure definition, initialization, accessing structures, nested structures, arrays of structures, structures and functions, unions, bit fields, typedef, enumerations.

**UNIT – IV POINTERS AND DYNAMIC MEMORY ALLOCATION Pointers**: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, pointers and arrays, pointers as functions arguments, functions returning pointers, passing structures through pointers, self-referential structures.

**Dynamic memory allocation:** Basic concepts, library functions.

**UNIT - V FILE HANDLING, SEARCHING AND SORTING Files: Streams**, basic file operations, file types, file opening modes, input and output operations with files, special functions for working with files, file positioning functions, command line arguments.

**Searching and Sorting**: linear search, binary search, bubble sort.

**Text Books:**

1. Somasekhara, “Problem Solving with C ”, PHI.
2. Byron Gottfried, “Programming with C”, Schaum’s Outlines Series, McGrawHillEducation, 3rd Edition, 2017.
3. E. Balagurusamy, “Programming in ANSI C”, McGraw Hill Education, 6th Edition, 2012.

**Reference Books :**

1. W. Kernighan Brian, Dennis M. Ritchie, “The C Programming Language”, PHILearning, 2nd Edition, 1988.
2. YashavantKanetkar, “Exploring C”, BPB Publishers, 2nd Edition, 2003. 3. Schildt Herbert, “C: The Complete Reference”, Tata McGraw Hill Education, 4thEdition, 2014.
3. R. S. Bichkar, “Programming with C”, Universities Press, 2nd Edition, 2012.
4. Dey Pradeep, Manas Ghosh, “Computer Fundamentals and Programming in C”, Oxford University Press, 2nd Edition, 2006.
5. Stephen G. Kochan, “Programming in C”, Addison-Wesley Professional, 4th Edition, 2014.

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| Course Code | Course Title | | | | | | Core/Elective |
| **SES0101EE** | **Basic Electrical Engineering** | | | | | | Core |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| L | T | D | P |
| - | 3 | - | - | - | 40 | 60 | 3 |
| **Course Objectives:**   * Define basic concepts of DC and AC circuit behavior. * Formulate the circuit analysis theorems and methods. * Develop and solve mathematical representations for RL, RC & RLC circuits. * Analyze the principle and behavior of two-port networks & their parameters. * Design concepts of complex frequency, resonance, and passive filter design.   **Course Outcomes:**   1. Solve the DC circuits and analyze how they are used in real time applications. 2. Synthesize mathematical response of RL, RC and RLC networks for transient and sinusoidal excitation 3. Express given two port networks in terms of Parameter Model. 4. Demonstrate Resonance and complex frequency phenomenon in circuits. 5. Design different types of filters using passive elements. | | | | | | | |

**UNIT I**

**Experimental Laws and Simple Circuits**: Current, Voltage & Power, Types of Circuits & Circuit Elements, Dependent and Independent current and voltage sources, Ohm’s law, Kirchhoff’s laws, Voltage & Current Division, Star and Delta transformations.

DC circuit analysis: Nodal and Mesh Analysis, Source transformations, Thevenin’s and Norton’s theorems, Superposition theorem, Maximum power transfer theorem,Reciprocity Theorem, Compensation Theorem, Millman’s Theorem, Duality and Dual networks.

**UNIT II**

**Transient Circuits& Sinusoidal Analysis**: Formulation of Integro-differential equations – RL, RC and RLC circuits –Transient and steady state responses, Zero Input Response (ZIR), Zero State Response (ZSR), Complete response,Sinusoidal Steady State Response, Phasor Diagrams, Calculation of power in ac circuits: average power, apparent power, complex power, vector representation.

**UNIT III**

**Two Port Networks**: Z, Y, h, g and ABCD parameters, Equivalence of two port networks, T-π transformation, Interconnection of two ports, Brune’s Test, Driving Point and Transfer Functions.

**Passive Filters**: Constant k-Filters-Low Pass, High Pass Design, Band Pass, Band Elimination Filter, m-derived Low Pass and High Pass Filter Design.

**UNIT IV**

**Transformers:**Principle of operation and construction of single phase transformers (core and shell types), EMF equation, losses, efficiency and voltage regulation.

**Synchronous Generators:** Principle of operation, Types and constructional features, EMF equation.

**UNIT-V:**

**DC Machines**:Working principle of DC machine as a generator and a motor; Types and constructional features; EMF equation of generator, relation between EMF induced and terminal voltage enumerating the brush drop and drop due to armature reaction.

**DC motor:**Working principle; Back EMF and its significance, torque equation; Types of D.C. motors, characteristics and applications; Necessity of a starter for DC motor.

**Suggested Readings:**

1. Hayt Jr. W.H. Kemmerly J.E. and Steven M. Durbin, *Engineering Circuit Analysis*, 8th ed., McGraw Hill Education (India) Private Limited, 2013.
2. Aatre, V.K., *Network Theory and Filter Design*, 2nd ed., New Age International Pvt. Ltd., 1986.
3. Jagan NC and Laxminarayana C, *Network Analysis*, 3rd ed., BSP Publications, 2014.
4. A SudhakarShyammohan, Circuit Networks: Analysis Synthesis, 4th Edition, Tata McGraw-Hill, 2010.
5. Robert L Boylstead, introductory Circuit Analysis, Pearson, 2018.

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| **Course Code** | **Course Title** | | | | | | **Core / Elective** |
| SHS0911EG | **ENGLISH LAB**  **(Common to all Branches)** | | | | | | **Core** |
| Prerequisite | Contact Hours per week | | | | CIE | SEE | Credit |
| L | T | D | P |
| - | **-** | - | - | **2** | **40** | **60** | **1** |
| **Course Objectives:**  To enhance the listening and speaking skills of students by   * Giving them sufficient practice in listening with comprehension and training them in the use of correct pronunciation, stress, and intonation * Sensitizing them to the use of verbal and non-verbal communication and encouraging them to learn the art of conversation to suit formal and informal situations. * Preparing them to make presentations and facilitating them to speak without inhibitions in order to improve their speaking skills.   **Course Outcomes:**  On successful completion of the course, students will be able to:   1. Improve pronunciation skills by learning the phonemic system, word stress, rhythm and intonation of English phonetics (UNDERSTAND, REMEMBER APPLY) 2. Communicate effectively and appropriately using appropriate verbal and non verbal communication by participating in a situational context like role plays (ANALYZE, CREATE) 3. Develop their listening comprehension skills and perform effectively in competitive exams (CREATE, APPLY) 4. Face mock interviews confidently and demonstrate their verbal and soft skills (APPLY, CREATE) 5. Enhance participation skills and be able to explain and defend their opinions by participating in Group Discussions and Debates (UNDERSTAND, APPLY, CREATE) | | | | | | | |

**SYLLABUS:**

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| **UNIT** | **DETAILS** |
| **I** | * Icebreaking activity - JAM * Picture Perception * Listening for Comprehension (Competitive exams – IELTS, TOEFL, PTE) |
| **II** | * Phonetics (Vowels, Diphthongs and Consonant Sounds) * Stress and Intonation * British and American English: Vocabulary and Pronunciation |
| **III** | **Conversation Skills**:   * Introducing oneself to others * Asking for and giving information * Making requests and responding to them appropriately * Giving instructions and responding to them appropriately |
| **IV** | **Group Activity**:   * Group Discussion- Features and parts of a good GD * Debate * Role play |
| **V** | **Presentation Skills:**   * Planning * Preparing * Practicing * Presenting |

**Suggested Reading**

Board of Editors. Language and Life: A Skills Approach. Orient Black Swan, 2018.

Balasubramanian, T. A Textbook of English Phonetics for Indian Students. Macmillan, 1981.

CIEFL. Exercises in Spoken English. Parts. I-III. Oxford University Press.

Pillai, Radhakrishna G. Spoken English For You - Level II. 8th Edition. Emerald Publishers, 2014.

Sethi, J and PV Dhamija. A Course in Phonetics and Spoken English. 2nd Edition.

Prentice Hall India Learning Private Limited, 1999.

Kumar, T Vijay, K Durga Bhavani and YL Srinivas. English in Use: A Textbook for College Students. 2nd Edition. Macmillan Education India Private Limited, 2020

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| Course Code | Course Title | | | | | | Core/Elective |
| **SBS0911PH** | **ENGINEERING PHYSICS LAB** | | | | | | Core |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| L | T | D | P |
| - | - | - | - | 2 | 40 | 60 | 1 |
| **Course Objectives**: The objective of this course is to make the student   * Apply the theoretical knowledge in doing practical experiments and acquire skills to handle instruments. * Understand the behavior of semiconductors and opto-electronic devices. * Analyze errors in experimental data. * Plot graphs between different physical parameters.   **Course Outcomes:**  After completion of the course, the student will be able to   * Relate theoretical knowledge to practical concepts by conducting experiments and can take measurements independently. * Know the working of different devices like solar cell, photocell, thermistor and learn their applications in day to day life. * Summarize the experimental findings appropriately in laboratory records. * Compute and compare experimental results, draw graphs, estimate and interpret results. | | | | | | | |

**LIST OF EXPERIMENTS**

1. Determination of Radius of curvature of a plano convex lens by forming Newton’s rings.
2. Determination of wave length of sodium light by using diffraction grating.
3. Determination of the width of single slit by diffraction.
4. Determination of wavelength of laser using diffraction grating.
5. Determination of Numerical Aperture (NA) and Acceptance angle of an optical fiber.
6. To determine the power loss per meter of the cable and power loss due to i) Bending ii) coupling of an optical fibre.
7. To find the value of Planck’s constant by using photo cell.
8. To find the dielectric constant of a given material.
9. To draw the I-V characteristics of solar cell and to calculate fill factor
10. To draw the I-V characteristics of P-N junction diode and to evaluate series resistance in forward and reverse bias conditions.

Note: A minimum of eight experiments to be done in one semester.

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| **Course Code** | **Course Title** | | | | | | **Core/Elective** |
| **SES0912ME** | **ENGINEERING WORKSHOP** | | | | | | **Core** |
| **Prerequisite** | **Course hours per week** | | | | **CIE** | **SEE** | **Credits** |
| **L** | **T** | **D** | **P** |
| **-** | **-** | **-** | **-** | **4** | **40** | **60** | **2** |
| **Course Objectives:**  |  | | --- | | 1. Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances | | 1. To provide hands on experience about use of different engineering materials, tools, equipment and processes those are common in the engineering field. | | 1. To gain basic knowledge on various manufacturing processes used for the production of various engineering products. | | 1. To gain hands on exposure on computer hardware and working knowledge on computers and software. | | 1. Adopt safety practices while working with various tools. |  **Course Outcomes:**  |  | | --- | | 1. Identify and demonstrate the usage of different tools to be used in various manufacturing trades with safety measures. | | 1. Apply the skills developed to undertake the jobs connected to various engineering workshop trades including fitting, carpentry, sheet metal, house wiring, welding, and foundry. | | 1. Demonstrate the knowledge of various machine tools and their operations such as machining, injection moulding, casing and 3D printing and basic electronics lab instruments. | | 1. Illustrate the advanced machining processes like CNC, rapid prototyping. | | 1. Apply the basic knowledge of computers to assemble and dissemble various components of computer and able to install various operating systems such as windows or Linux. | | | | | | | | |

# **LIST OF EXPERIMENTS:**

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| A.TRADE FOR EXERCISES:CARPENTRY: Sawing and Grooving, T-lap joint and dove-tail joint.FITTING: Square fitting, half round fitting, V-fitting.HOUSE WIRING: Series wiring and parallel wiring by one way switch, two way switching for stair case light, tube light connections.SHEET METAL WORKING: Open Scoop, Funnel, Rectangle tray and a cone.WELDING: lap joint, single V-butt joint, T-joint, L-joint, corner joint.PLUMBING: preparation of nipple and fitting to elbow, tee, union and coupling tap connection and shower connection.3D printing:To print Square, Pyramid, Cube shapes.B.TRADES FOR DEMONSTRAYION AND EXPOSURE:Machines (lathe and drilling)Injection Moulding.Mould making and casting.Basic electronics lab instruments.C.PRESENTATIONS AND VIDEOS LECTURES:Manufacturing methods.Glass cutting.CNC lathe.Note: Atleast two exercises from each trade. |

# TEXT/REFERENCE/ADDITIONALBOOKS:

1. Venugopal,K,”Workshop Manual”, Anuradha Publicstions,Kumbakonam,TN,2012.
2. K.C.John, “Mechanical Workshop” 2nd Edn., PHI, 2010.
3. Hajra Choudary, “Elements of Workshop Technology” Vol.1, Asian Publishers,Edu., 1993.
4. G.S.Sawhney, “Mechanical Experiments and Workshop Practice”, I.K.International Publishing house, New Delhi,2009.

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| Course Code | Course Title | | | | | | Core/Elective |
| **SES0111EE** | **Basic Electrical Engineering Lab** | | | | | | Core |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| L | T | D | P |
| - | - | - | - | 2 | 40 | 60 | 1 |
| **Course Objectives**:   * Familiarize with the basic electronic components. * Identify and make use of different electronic equipment and meters used in Electronics Laboratories. * Interpret network theorems and the instrumentation through experimentation. * Calculate and analyze parameters in transient and two port network circuits. * Design and establish passive filter circuit through simulation models.   **Course Outcomes:**   * Identify the basic electronic components and design circuits through experimentation and simulation models. * Verify various parameters of the circuits by applying theorems. * Analyze and perform response of RL, RC and RLC networks for transient and sinusoidal excitation. * Calculate and interpret Resonance and complex frequency in circuits. * Design different types of filters using passive elements. | | | | | | | |

1. Study of all types of discrete Active & Passive devices, Display devices, Integrated components, Electromechanical components, Electromagnetic components. Study and use of different meters (volt/ammeter, AVO/Multi meter) for the measurement of electrical parameters.
2. Measurement of RLC components using LCR Meter.
3. Verification of KVL and KCL.
4. Design and Verification of Superposition and Tellegan’s theorem
5. Design and Verification of Thevenin’s and Maximum Power Transfer Theorem.
6. Sinusoidal steady state response of RL, RC circuits- impedance, phase difference, current, voltage and power factor calculations.
7. Measurement of two-port network parameters: Z, Y, ABCD, h and g.
8. Determination of Frequency Response of a Two-Port Network.
9. Design and Study of Passive Filters- Constant K- Low Pass, High Pass.
10. To find the efficiency of a single phase Transformer by Direct loading.
11. To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using O.C. and S.C. tests.
12. To obtain efficiency of a dc shunt machine using Swinburn’s test.

***Note: Minimum ten experiments should be conducted.***

**Suggested Readings:**

1. David Bell A., *Laboratory Manual for Electronic Devices and Circuits,* Prentice Hall of India, 2001.

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| **Course Code** | | **Course Title** | | | | | | **Core / Elective** |
| **SES0111CS** | **PROGRAMMING FOR PROBLEM SOLVING LABORATORY** | | | | | | | **Core** |
|  | **Contact Hours per Week** | | | | | **CIE** | **SEE** | **Credits** |
| Prerequisite | L T D P | | | | |  |  |  |
| - | - | | - | - | 4 | 40 | 60 | 2 |
| **Course Objectives :**  **The course should enable the students to :**  1. Formulate problems and implement algorithms using C programming language.  2. Develop programs using decision structures, loops and functions.  3. Learn memory allocation techniques using pointers and use structured programming approaches for solving computing problems in the real world.  **Course Outcomes :**  1.Understand the concept of basics of C, data types and variables.  2. Understand the concept of operators, precedence of operators, conditional statements and looping statements.  3. Explore the concept of strings, functions, recursive functions and differences between call by value and call by reference.  4. Explore the concept of storage classes, preprocessor directives, pointes and files.  5. Understand the concept of file handling functions, searching and sorting methods and real time applications of C. | | | | | | | | |

**LIST OF EXPERIMENTS**

**Concept: Basic I/O,Operators**

1. Write a C program to check and print a given number is even or odd using ternary operator.
2. Write a C program to calculate area and circumference of a circle.
3. Write a C program to solve given expression

**Concept: Basic I/O,conditionalexecution,loops, Jump Statement**

1. Write a C program to accept student roll, marks, calculate total, average and print grade of student.
2. Write a C program to print Fibonacci series
3. Write a C program to check and print Armstrong Number
4. Write a C program to check and print Prime No.
5. Write a C program to add sum of only positive integers using continue statement.

**Concept: Basic I/O,Conditionalexecution,loops, Arrays(integer 1D,2D)**

1. Write a C program to print sum of integers of a 1D array.
2. Write a C program to perform matrix addition for a 2D array.
3. Write a C program to perform matrix multiplication of a 2D array.

**Concept: Sub Programs:User Defined Functions,Recursion**

1. Write a C program to perform different prototypes of user defined function.
2. Write a C program to perform factorial of given number using functions.
3. Write a C program to perform factorial of given number using recursive functions.

**Concept: Strings**

1. Write a C program to determine if the given string is a palindrome or not
2. Write a C program to apply inbuilt string functions

**Concept: Structures and Unions:**

1. Write a C program to apply Nested structures and array of structures.
2. Write a program to demonstrate structure and union.

**Concept: Pointers**

1. Write a C program to access 1D Array and 2D array using Pointers
2. Write a C program to concatenate two strings using pointers.
3. Write a C program to find the length of string using pointers.

**Concept: Files, Searching, Sorting**

1. Write a C program to display the contents of a file.
2. Write a C program to copy the contents of one file to another.
3. Write a C program apply binary search.
4. Write a C program apply bubble sorting.

**Text Books:**

1. Somasekhara, “Problem Solving with C ”, PHI.
2. Byron Gottfried, “Programming with C”, Schaum's Outlines Series, McGraw Hill Education, 3rd Edition, 2017.
3. E. Balagurusamy, “Programming in ANSI C”, McGraw Hill Education, 6th Edition, 2012.

**Reference Books :**

1. B. A. Forouzan, R. F. Gillberg, “C Programming and Data Structures”, Cengage Learning, India, 3rd Edition, 2014.
2. W. Kernighan Brian, Dennis M. Ritchie, “The C Programming Language”, PHI Learning, 2nd Edition, 1988.
3. YashavantKanetkar, “Exploring C”, BPB Publishers, 2nd Edition, 2003.
4. Schildt Herbert, “C: The Complete Reference”, Tata McGraw Hill Education, 4th Edition, 2014.
5. R. S. Bichkar, “Programming with C”, Universities Press, 2nd Edition, 2012.
6. Dey Pradeep, Manas Ghosh, “Computer Fundamentals and Programming in C”, Oxford University Press, 2nd Edition, 2006.
7. Stephen G. Kochan, “Programming in C”, Addison-Wesley Professional, 4th Edition, 2014.

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| **Course Code** | **Course Title** | | | | | | **Core/Elective** |
|  | **Design Thinking** | | | | | |  |
| **Prerequisite** | **Contact Hours per Week** | | | | **CIE** | **SEE** | **CREDITS** |
|  | L | T | D | P |
| 0 | 0 | - | 2 |  |  | 1 |
| **COURSE OBJECTIVE(S):**  The objective of this Course is to provide the new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products which useful for a student in preparing for an engineering career. | | | | | | | |
| **Course Outcomes :**  Student will able to  1. Compare and classify the various learning styles and memory techniques and Apply them in their engineering education  2. Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products  3. Develop new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products  4. Propose real-time innovative engineering product designs and Choose appropriate frameworks, strategies, techniques during prototype development  5. Perceive individual differences and its impact on everyday decisions and further Create a better customer experience. | | | | | | | |

**Unit 1: Components of Decision Making System**

Understanding the Learning Process, Kolb’s Learning Styles, Assessing and Interpreting.

**Remembering Memory:** Understanding the Memory process, Problems in retention, Memory enhancement techniques.

**Emotions: Experience & Expression:** Understanding Emotions: Experience & Expression, Assessing Empathy, Application with Peers.

**Activity: Create Charts for learning process, learning styles,interpretation.**

**Unit 2: Basics of Design Thinking (HCD- Human Centric Design)**

Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – **Empathize, Define, Ideate, Prototype, Test.**

**Design Thinking & Customer Centricity :** Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design.

**Activity**: Steps in chart creation

1. Empathize.
2. Group Discussion.
3. Taking Real Time Example(Washing Machine, Refrigerator etc.)
4. Specify parameters for design.

**Unit 3: Creativity and Bug Fixing, Prototyping and Testing**

Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving.

**Prototyping & Testing** : What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, Sample Example, Test Group Marketing.

**Activity**: Block Diagram and Flow Chart for each Module.

Simulation

**Unit 4: Tools of Design thinking**

Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space - Empathy for design – Collaboration in distributed Design.

**Activity**: Tools and Testing

**Unit 5:Future Emerging Trends**

Artificial Intelligence, Augmented Reality and Virtual Reality, Quantum Computing and IoT & Consumer Appliances

**Activity:** Draw Charts in any one application domain (Health care, Defence etc.)

**Text/Reference Books:**

1. E.Balaguruswamy(2022), Developing Thinking Skills( The way to success), Khanna Book Publishing Company.
2. John.R.Karsnitz, Stephen O’Brien and John P. Hutchinson, “Engineering Design”, Cengage learning (International edition) Second Edition, 2013.
3. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).

Semester-II

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| **Course Code** | **Course Title** | | | | | | **Core / Elective** |
| SHS0901EG | **ENGLISH**  **(Common to all Branches)** | | | | | | **Core** |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| L | T | D | P |
| - | **2** | - | - | - | **40** | **60** | **2** |
| **Course Objectives**  To enhance the English language abilities of Engineering students, especially in reading and writing, by   1. Using authentic material for language learning, exposing them to a variety of content-rich texts and strengthening their grammar and vocabulary. 2. Improving their reading comprehension skills and honing their existing writing skills. 3. Encouraging them to think creatively and critically.   **Course Outcomes**  On successful completion of the course, the student will be able to:   1. Demonstrate competence in language by using appropriate vocabulary and grammar 2. Evaluate themselves for their decision making and critical thinking skills and motivate to understand their goals and dreams through reading fiction and non-fiction 3. Improve their technical and creative writing skills by learning the different types of writings. 4. Learn to read effectively to comprehend the nuances of simple and complex texts 5. Use inclusive language and demonstrate empathy and treat all people with respect, dignity, and impartiality. | | | | | | | |

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| **UNIT** | **DETAILS** |
| **I** | **Reading**: The Kitemaker – Ruskin Bond  **Vocabulary**: Word formation - part I - Prefixes, Suffixes, Root words  **Grammar**: Articles, Prepositions, Punctuations.  **Writing**: Guided Writing (Expanding the outline / Writing from verbal cues), Paragraph writing |
| **II** | **Reading**: Punishment in Kindergarten- Kamala Das  **Vocabulary**: Word formation – part II Compounding and Blending,  **Grammar**: Connectives, Tense and Concord  **Writing**: Formal Letter Writing, Basics of E-mail |
|  | **Reading**: Grammar of Anarchy(Excerpt)- BR Ambedkar  **Vocabulary**: Synonyms, Antonyms, One-word substitutes  **Grammar**: Narration (Direct - Indirect speech)  **Writing**: Precis Writing |
| **IV** | **Reading**: The Flower- Alfred Tennyson  **Vocabulary**: Words often confused, Phrasal Verbs, Prepositional Phrases  **Grammar**: Voice  **Writing**: Information Transfer-Verbal to Non-verbal & Non-verbal to Verbal |
| **V** | **Reading**: Reading Comprehension  **Vocabulary**: Inclusive Language, Euphemisms  **Grammar**: Degrees of Comparison  **Writing**: Types of Writing: Persuasive Writing, Argumentative Writing |

**Suggested Reading**

Board of Editors. Language and Life: A Skills Approach. Orient BlackSwan, 2018.

Sudharshana, NP and C Savitha. English for Engineers. Cambridge University Press, 2018.

Kumar, Sanjay and Pushp Lata. English Language and Communication Skills for Engineers. Oxford University Press, 2018.

Practical English Usage by Michael Swan, Oxford University Press 4th edition 2017.

Kumar, T Vijay, K Durga Bhavani and YL Srinivas. English in Use: A Textbook for College Students. 2nd Edition. Macmillan Education India Private Limited.

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| **Course Code** | **Course Title** | | | | | | **Core / Elective** |
| SHS0902EG | **Universal Human Values**  **(Common to all Branches)** | | | | | | **Core** |
| Prerequisite | Contact Hours per week | | | | CIE | SEE | Credit |
| L | T | D | P |
| - | **2** | - | - | **-** | 40 | **60** | **2** |
| **Course Objectives:**  1. To develop a critical ability to distinguish between essence and form, or between what is of value  and what is superficial to life.  2. To move from discrimination to commitment. It is to create an ability to act on any discrimination  in a given situation.  3. It encourage students to discover what they consider valuable, after learning the course, they  should be able to discriminate between valuable and superficial in real situation in their life.  **Course Outcomes:**  On successful completion of the course, students will be able to:   1. Identify the essentials of human values and skills. 2. Understand between profession and happiness 3. Understand practically the importance of trust, mutually satisfying human behaviour. 4. Develop and enrich interaction with nature. 5. Develop appropriate technologies and management patterns to create harmony in professional and personal life. | | | | | | | |

**SYLLABUS:**

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| **UNIT** | **DETAILS** |
| **I** | Course introduction-need, basic guidelines, content and process for value education: understanding the need, basic guidelines, content and process for value education. Self-exploration. what is it?-its content and process ; 'natural acceptance' and experiential validation as the mechanism for self-exploration. Continuous happiness and prosperity- a look at basic human aspirations. Right understanding, relationship and physical facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding happiness and prosperity correctly, a critical appraisal of current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. |
| **II** | Understanding harmony in the human being. harmony in myself understanding human being as a coexistence of the sentiment I and the material body. Understanding the needs of self and body Sukh and Suvidha. Understanding the body as an instrument of I (being the doer, seer enjoyer) understanding the harmony of I with the body Sanyam and Swasthya. Correct appraisal of physical needs meaning of prosperity in detail programs to ensure Sanyam and Swasthya. |
| **III** | Understanding harmony in the family and society -how many in human, human relationship understanding harmony in the family, the basic unit of human interaction. Understanding values in human- human relationship; meaning of justice and program for its fulfilment. Trust and respect essay foundational values of relationship. Difference between intention and competence. difference between respect and differentiation. The other salient values in relationship. Understanding the harmony in the society (society being an extension of family). |
| **IV** | Understanding harmony the nature of existence: whole existence as coexistence: understanding the harmony in the nature, interconnectedness and mutual fulfilment among the four orders of nature -recyclability and self-regulation in nature. |
| **V** | Understanding existence as coexistence of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence. implications of the above holistic understanding of harmony on professional ethics; natural acceptance of human values, definition Ness of ethical human conduct, basic for humanistic education, humanistic constitution and humanistic universal order. |

**Suggested Reading:**

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| -. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics. |
| - Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, SmartStudent Publications, 3rd Edition.Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA |
| E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if peoplemattered. Blond & Briggs, Britain |
| A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986 |
| . Smriti Shristava, "Human Values and Professional Ethics", Katson Publications,2007 |

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| Course Code | Course Title | | | | Core /Elective |
| **SBS0902CH** | **ENGINEERING CHEMISTRY** | | | | **Core** |
| Prerequisite | Contact Hours per Week | | CIE | SEE | Credits |
| L | T |
| - | 3 | 1 | **40** | **60** | 4 |
| **Course Objectives**   1. Apply the principles of electrochemistry in storage of electrical energy in Batteries. 2. Gains knowledge about the causes of Corrosion and its prevention and attains Knowledge about the hard water and treatment of water for drinking purpose. 3. Correlate the properties of polymeric materials with their internal structure and use for engineering applications. 4. Exposed to qualitative and quantitative parameters of chemical fuels. 5. Familiarizes with green chemistry and Engineering Materials. Explore the knowledge of Synthesis & Applications of Nanomaterials.   **Course Outcomes :**  **Student will be able to:**   1. Apply the concept of electrode potential in identifying feasibility of electrochemical reaction: illustrate electro analytical techniques and working of batteries.(Application). 2. Identify the mechanism of corrosion of materials on basis of electrochemical approach and devise corrosion control methods .Water Chemistry enables understanding the causes effects of hardness(Knowledge) . 3. Analyse the preparation, properties and applications of polymeric materials .(Analysis) 4. Classify chemical fuels and grade them through qualitative analysis. (Knowledge, Analysis). 5. Understanding the examples of clean technology and Preparatrion of Nanomaterials with Engineering applications .(Knowledge ,Application) | | | | | |

**UNIT 1: (10 Hrs) ELECTRO CHEMISTRY & BATTERIES**

**Electrochemistry:** Electrochemical cells: Electrolytic cells and Galvanic cells, Cell representation. Types of electrodes: Calomel electrode, Quinhydrone Electrode. Determination of pH of a solution by using Quinhydrone electrode. Nernst equation and its derivation. Applications of Nernst equation . Numerical problems.

**Battery chemistry:**

Types of Batteries: Primary batteries: Zinc- Carbon Battery, Secondary Batteries: Lead – acid battery, Lithium ion batteries, and their application,

**Fuel cells**: Concept of fuel cells and their advantages, H2 – O2 fuel cell and, CH3OH – O2 fuel cell

**UNIT 2: (10 Hrs) WATER CHEMISTRY & CORROSION**

**Water Chemistry:** Hardness of water, types of hardness, units of hardness, Determination of temporary permanent & total hardness by EDTA method, Numericals. Alkalinity of water - its determination.Alkaline water – its uses. Water softening by ion exchange and reverse osmosis methods. Specification of potable water. Sterilization by chlorination. Basic Concepts of BOD & COD.

**Corrosion:**

Causes and effects of corrosion, chemical(dry) corrosion, Electrochemical(wet) corrosion-Mechanisms. Types of electrochemical corrosion, Factors affecting on the rate of corrosion –Corrosion control methods- cathodic protection: sacrificial anode method and impressed current method.

**UNIT 3: (10 Hrs) POLYMER CHEMISTRY**

**Polymers**: Basic terms of polymers: Monomer, Polymer, Functionality, Degree of polymerization. Nomenclature of Polymers- Types of Polymerization(Addition, Condensation, Co Polymeration).Preparation, Properties and Applications- Plastics: PET and Bakelite, Elastomers: Buna-S Rubber. Fibers: Kevlar

**Biodegradable polymers:** Introduction- Preparation, Properties and Applications of Polylactic acid. **Conducting polymers:** Introduction, classification. Mechanism of conduction in Polyacetylene. Applications of conducting polymers

**UNIT 4: (10 Hrs) CHEMICAL FUELS**

**Chemical fuels:** Introduction,Definition and classification of Chemical fuels-Primary and Secondary fuels. Requirements of good fuel. Calorific value --HCV,LCV. Theoretical calculation of calorific value by Dulong’s formula - Numerical.

**Solid fuels**: Coal and its chemical composition, Proximate analysis, Ultimate analysis and significance.

**Liquid fuels**: Source – Fractional distillation of petroleum, important fractions, and their uses.

**Gaseous fuels**: LPG, CNG composition and uses. Green Hydrogen- Sourcing Green Hydrogen. **Combustion :** Ignition temperature of a fuel, calculation of air quantities by weight and volume required for the combustion of the fuels-Numericals.

**UNIT 5 (10 Hrs) COMPOSITES, NANO MATERIALS,BIODIESEL & GREEN CHEMISTRY**

**Composites:** Introduction – Definition and Constituents of Composites- Types of composites – Advantages and Applications of Composites.

**Nanomaterials:** Introduction, Chemical Synthesis by Sol-gel ,Precipitation methods. Industrial Applications of Nano materials.

**Biodiesel :** Sources, concept of trans esterification, Applications of Biodiesels.

**Green Chemistry**: Concept and principles of green chemistry, examples of clean technology.

# Text Books :

1. P.C.Jain and M.Jain, Engineering Chemistry,Dhanapathi Rai publishing
2. Text Book of Engineering Chemistry bu Shashi Chawla
3. Chemistry in Engineering and Technology by Kuriacose & Rajaram.
4. Engineering chemistry by B Shivashankar
5. Text Book of Engineering Chemistry by Dr. S.S. Dara, Dr. K. Mukkanti, S.Chand

# Reference Books:

1. Principles of Physical Chemistry by Puri, Sharma and Pathania S.N Chand & Co. New Delhi.
2. Engineering Chemistry by O G Palanna, TMH, and New Delhi.
3. Engineering Chemistry by Prasanta Rath, Cengage Learning India Pvt. Ltd.
4. Engineering Chemistry ( NPTEL – web book), by B.L. Tembe, Kamaluddin and M.S. Krishna
5. Concise Inorganic Chemistry by J.D. Lee, Blackwell publications V Edition
6. Organic chemistry by T.W. Graham Solomons & Craig B.Fryhle, 7th Edition, Wiley Publications.
7. Engineering Physics by Prof. Battacharya, Oxford press
8. Engineering Physics by Gupta & Gupta
9. Advances in Alkaline water Electrolisers- A review” Journal of Energy Storage”.

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| Course Code | Course Title | | | | | | Core /  Elective |
| SBS0201MT | **Mathematics-II**  **(Common to all)** | | | | | | **Core** |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| L | T | D | P |
| - | 3 | 1 | - | - | **40** | **60** | 4 |
| **Course Objectives**   1. To study matrix algebra and its use in solving system of linear equations and solving eigen value problems. 2. To provide the over view of ordinary differential equations and higher order differential equations. 3. To explain and predict how individuals behave in a specific strategic situation , and therefore help improve decision making.   **Course Outcomes**   1. Apply the concept of rank of matrices and Solve system of equations. 2. Solve certain first order differential equations. 3. Solve certain second and higher order differential equations. 4. Apply Laplace transforms, solve ordinary differential equations by using it. 5. Apply problem-solving using complex analysis techniques applied to diverse situations in physics, engineering and other mathematical contexts. | | | | | | | |

**Unit-I**

**Matrices:** Rank of a matrix, Echelon form, Normal form, System of linear equations, Linear dependence, independence of vectors. Eigen values, Eigen vectors, Properties of Eigen values, Cayley-Hamilton theorem. Quadratic forms, Reduction of quadratic form to canonical form by orthogonal transformation, Nature of quadratic form.

**Unit-II**

**Differential Equations of First Order:** Linear differential Equations, Bernoulli's Equation, Riccati's and Clairaut's differential equations, Newton’s Law of Cooling.

**Unit-III**

**Differential Equations of Higher Order:** Solutions of second and higher order linear Homogenous Equations with Constant Coefficients, Solutions of non-homogeneous linear differential equations, Method of Variation of Parameters, Solution of Euler-Cauchy Equation.

**Unit-IV**

**Laplace Transforms:** Laplace Transforms, Inverse Laplace Transforms, Properties of Laplace Transforms and inverse Laplace Transforms, Convolution Theorem (without proof). Solution of ordinary differential Equations using Laplace Transforms.

**Unit-V**

**Complex Analysis:**

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate**;** Taylor’s series, Laurent’s series, zeros of analytic function, singularities**;** Residues, Cauchy Residue theorem (without proof).

# TEXT/REFERENCE/ADDITIONALBOOKS:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 43dEdition, 2014.
2. B.V. Ramana, Higher Engineering Mathematics, 23reprint, 2015.
3. N. Bali, M. Goyal, A text book of Engineering Mathematics, Laxmi Publications,2010.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley, 9\* Edition 2012.

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| Course Code | Course Title | | | | | | Core/Elective |
| **SES0201CS** | **DATA STRUCTURES** | | | | | | Core |
| Prerequisite | Contact Hours per Week | | | | CIE | SEE | Credits |
| L | T | D | P |
| Programming in C | 3 | - | - | - | 40 | 60 | 3 |
| **Course Objectives:**   1. To impart the basic concepts of data structures and algorithms. 2. To understand writing algorithms and making step by step approach in solving problems with the help of fundamental data structures. 3. To understand the applications of linear and nonlinear data structures.   **Course Outcomes:**  At the end of this course, the student will be able to   1. Implement sorting and searching algorithms. 2. Understand the concept of ADT, identify data structures suitable to solve problems. 3. Develop and analyze algorithms for stacks, queues using arrays and linked list. 4. Develop algorithm for Binary trees, Balanced Trees, and Graphs. 5. Implement various Hashing and Collision Resolution Technique. | | | | | | | | |

**UNIT-I INTRODUCTION TO DATA STRUCTURES, SEARCHING AND SORTING**

**Basic concepts**: Introduction to data structures, classification of data structures - Linear and Non-Linear data structures, operations on data structures;

**Searching techniques**: Linear Search, Binary search, and Fibonacci Search;

# Sorting Techniques: **Quick Sort, Merge Sort and Heap Sort.**

# UNIT-II LINEAR DATA STRUCTURES

**Stacks**: Stack ADT, definition and operations, Implementations of stacks using array, applications of stacks, Arithmetic expression conversion and evaluation;

**Queues**: Primitive operations; Implementation of queues using Arrays, applications of linear queue, circular queue, and double ended queue (deque).

# UNIT-III LINKED LISTS

**Linked lists**: Introduction, singly linked list, representation of a linked list in memory, operations on a single linked list; Applications of linked lists: Polynomial representation and sparse matrix manipulation.

# Types of linked lists: **Circular linked lists, doubly linked lists; Linked list representation and operations of Stack, linked list representation and operations of queue.**

# UNIT-IV NON-LINEAR DATA STRUCTURES

**Trees:** Basic concept, binary tree, binary tree representation, array and linked representations, binary tree traversal, binary tree variants, threaded binary trees, application of trees.

# Graphs: **Basic concept, graph terminology, Graph Representations - Adjacency matrix, Adjacency lists, graph implementation, Graph traversals – BFS, DFS.**

# UNIT-V BINARY TREES AND HASHING

**Binary search trees**: Binary search trees, properties, and operations; **Balanced search trees**: AVL trees;

Introduction to M-Way search trees, B trees;

# Hashing and collision: **Introduction, hash tables, hash functions, collisions, applications of hashing.**

# Text Books:

1. Aaron M. Tenenbaum, Yedidyah Langsam, and Moshe J. Augenstein, Data Structures Using C, Pearson Education India

# **Reema Thareja, Data Structures Using C, Oxford, Second Edition, 2014**

# References:

1. S. Lipschutz, “Data Structures”, Tata McGraw Hill Education, 1st Edition,2008.

# **D. Samanta, “Classic Data Structures”, PHI Learning, 2nd Edition,2004.**

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| Course Code | Course Title | | | Core / Elective |
| **SBS0911CH** | **CHEMISTRY LAB**  **(Common to all Branches)** | | | **Core** |
| Prerequisite | Contact Hours per Week | CIE | SEE | Credits |
| P |
| - | 2 | **40** | **60** | 1 |
| **Course Objectives**   1. Apply the theoretical knowledge to experiments and acquire skills to handon. 2. Impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory. 3. Apply various instrumental methods to correlation to theory   and to improve understanding of theoretical concepts.   1. Estimate the water quality analysis. 2. Estimation of purity of materials.   **Course Outcomes: Students will be able to**   1. Knowing of the hardness and alkalinity of sample water. (Analysis) 2. Measure the amount of a substance in a given solution by conductometry, potentiometry snd PH metry (Application) 3. Analysis of physical properties like surface tension and viscosity.(Analysis) 4. Analysis of about rate of reactions and rate constant information (Knowledge) 5. Importance of absorption of light by substance in analysis. (Knowledge, Analysis) | | | | |

# PERMANGANOMETRY

1. Estimation of Ferrous ion

# DICHROMETRY

1. Estimation of Ferrous ion

# WATER ANALYSIS

3, Determination of Total hardness of water by EDTA method.

1. Determination of Carbonate and Bicarbonate Alkalinity.

# CONDUCTANCE MEASUREMENTS

1. Estimation of Strong acid with strong base ( HCl Vs NaOH)
2. Estimation of weak acid with strong base (CH3COOH Vs NaOH )
3. Estimation of Mixture of Acids with Strong base (Hcl+CH3COOH) Vs NaOH

# POTENTIOMETRIC MEASUREMNETS

1. Estimation of HCl
2. Estimation of Ferrous ion

# PH METRY

1. Determination of PH of solution using glass electrode

# SYNTHESIS OF A DRUG MOLECULE

1. Synthesis of Paracetamal.

# COLOROMETRY

1. Verification of Beer’s Law and Estimation of the given Copper Sulphate.

# Reference Books:

1. Senior Practical Physicla Chemistry, B.D.Khosla, A.Gjulati, V.C.Garg., (R.Chand and company, New Delhi 10th Edition)
2. An Introduction to Practical Chemistry, K.K.Sharma and D.S. Sharma (Viaks Publishing, New Delhi)
3. Experiments in Applied chemistry, Sunita Rattan, S. K Kataria & Soms

Quantitative Inorganic chemistry by Vogel

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| Course Code | | Course Title | | | | | | | Core /  Elective |
| **SES0911ME** | | **ENGINEERING GRAPHICS** | | | | | | | **Core** |
| Prerequisite | | Contact Hours per Week | | | | CIE | SEE | | Credits |
|  | | L | T | D | P |
| - | |  | - | 4 | - | 40 | 60 | | 2 |
| **Course Objectives**   1. To inculcate a good understanding of engineering drawing conventions & their significance. 2. To impart skills to make technical drawings. 3. To impart capability to identify and draw engineering curves to scale. 4. To develop skills of drafting projections of standard geometric entities. (points, lines, planes, solids with section). 5. To develop 3D visualization skills to understand 2D drawings in 3D space & vice versa.   **Course Outcomes**  By the end of this course, the students will be able to   1. Use appropriate instruments and apply the engineering conventions to draw engineering objects to scale on a drawing sheet. 2. Make use of AutoCAD software to draft engineering curves like conics, involutes & cycloids. 3. Make use of AutoCAD software to draft projections of lines & determine unknown lengths & angles. 4. Make use of AutoCAD software to draft projection of planes & solids in various positions. 5. Convert isometric views to orthographic & vice versa. | | | | | | | | | |
| **Sheet No** | | **Description of the Topic** | | | | | | | **Contact Hours** | | |
|  | | Principles of Engineering Graphics and their significance, Usage of drawing instruments. | | | | | | | 2 | | |
|  | | Conic Sections – I  Construction of ellipse, parabola and hyperbola given focus and eccentricity. | | | | | | | 2 | | |
|  | | Conic Sections – II  Construction of ellipse (given major and minor axis), parabola (given base and height), rectangular hyperbola. | | | | | | | 2 | | |
|  | | Cycloids (cycloid & epicycloid) and Involutes (involute of triangle, square & circle) | | | | | | | 2 | | |
|  | | Scales (plain & diagonal scales) | | | | | | | 2 | | |
|  | | Introduction to AutoCAD  Basic commands and simple drawings. | | | | | | | 2 + 2 | | |
|  | | Orthographic Projections - Projections of points situated in different quadrants. | | | | | | | 2 | | |
|  | | Introduction to straight lines and projections of straight lines.  Line parallel to both the planes, line perpendicular to or inclined to one reference plane, Line inclined to both the reference planes. | | | | | | | 2+2 | | |
|  | | Projections of planes – I: Perpendicular planes | | | | | | | 2 | | |
|  | | Projections of planes – II: Oblique planes | | | | | | | 2 | | |
|  | | Projections of solids – I: Polyhedra and solids of revolution, Projections of solids in simple position. | | | | | | | 2 | | |
|  | | Projection of solids – II: Projections of solids when the axes inclined to one or both the reference planes. | | | | | | | 2 | | |
|  | | Isometric projection – I: planes and simple solids | | | | | | | 2 | | |
|  | | Isometric projection – II: combination of two or three solids | | | | | | | 2 | | |
|  | | Orthographic Views | | | | | | | 2 | | |

**TEXT/REFERENCE/ADDITIONAL BOOKS:**

|  |  |
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| 1. | Elementary Engineering Drawing, ND Bhatt, Charotar publishers |
| 2. | Engineering Drawing, KL Narayana & P Kannaya, Scitech publications |
| 3. | Engineering Drawing and Graphic Technology, T.E French et al, Mc Graw Hill International |
| 4. | Engineering Drawing Graphics & Auto cad, K Venugopal, New Age International |
| 5. | Engineering Drawing with a primer on Auto cad, AN Siddique et al, Prentice Hall of India Ltd |

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| **Course Code** | **Course Title** | | | | | | **Core / Elective** | |
| **SES0211CS** | **DATA STRUCTURES LAB** | | | | | | | **Core** |
|  | **Contact Hours per Week** | | | | **CIE** | **SEE** | | **Credits** |
| Pre Requisite | L T D P | | | |  |  | |  |
| Programming in C | - | - | - | 4 | 40 | 60 | | 2 |

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| **Course Objectives :**   1. Develop programs for various searching and sorting techniques. 2. Differentiate Linear and Non Linear Data Structures. 3. Implement various operations on trees and graphs   **Course Outcomes : At the end of the course student will be able to**   1. Understand the concept of data structures, C Programming and apply algorithm for solving problems like Sorting, searching, insertion and deletion of data. 2. Understand linear data structures for processing of ordered or unordered data. 3. Explore various operations on dynamic data structures like single linked list a n d doubly linked list. 4. Explore the concept of non linear data structures such as trees and graphs. 5. Understand the binary search trees, hash function, and concepts of collision and its resolution methods. |

**LIST OF EXPERIMENTS**

1. Write C programs for implementing the following searching techniques: Linear, Binary and Fibonacci search.
2. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order: Merge, Quick and Heap Sort.
3. Write a C program to implement stack using arrays and linkedlist.
4. Write a C program to implement queue using arrays and linkedlist.
5. Write a C program that uses stack operations to convert a given infix expression into its postfix equivalent, implement the stack using an array.
6. Write a C program that uses stack operations to evaluate postfix expression, implement the stack using an array.
7. Write a C program to implement single linked list.
8. Write a C program to implement double linked list.
9. Write a C program for implementing Graph Traversal Techniques: Depth First Traversal and Breadth First Traversal.
10. Write a C program to create Binary Search Tree, perform insertion and traversal (in order, pre order, post order)
11. Write a C program to implement hashing.