# B. Tech-Electronics & Telecommunication Engineering

# STRUCTURE

**Bharati Vidyapeeth (Deemed to be) University, Pune**

**Faculty of Engineering & Technology**

| | **Programme :B.Tech (E &Tc) Sem – I (2021 Course)** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Name of the course** | **Teaching Scheme (Hrs. / Week** | | | **Examination Scheme (Marks)** | | | | | | **Credits** | | |
| | | **L** | **P** | **T** | **UE** | **IA** | **TW** | **TW& OR** | **TW& PR** | **Total** | **L** | **P TW/OR/PR** | **T** | **Total** |
| 1 | Linear Algebra and Calculus | 03 | 00 | 01 | 60 | 40 | 00 | 00 | 00 | 100 | 03 | 00 | 01 | 04 |
| 2 | Physics for Electronics Engineering | 03 | 02 | 00 | 60 | 40 | 50 | 00 | 00 | 150 | 03 | 01 | 00 | 04 |
| 3 | Electrical Technology | 04 | 02 | 00 | 60 | 40 | 50 | 00 | 00 | 150 | 04 | 01 | 00 | 05 |
| 4 | Elementary Electronics | 04 | 02 | 00 | 60 | 40 | 00 | 50 | 00 | 150 | 04 | 01 | 00 | 05 |
| 5 | ‘C’ Programming | 04 | 02 | 00 | 60 | 40 | 50 | 00 | 00 | 150 | 04 | 01 | 00 | 05 |
| 6 | MATLAB Fundamentals | 00 | 04 | 00 | 00 | 00 | 50 | 00 | 00 | 50 | 00 | 02 | 00 | 02 |
| | **Total** | 18 | 12 | 01 | 300 | 200 | 200 | 50 | 00 | 750 | 18 | 06 | 01 | 25 |

**Bharati Vidyapeeth (Deemed to be) University, Pune.**
**Faculty of Engineering & Technology**

| | **Programme :B.Tech (E &Tc) Sem – II (2021 Course)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Name of the course** | **Teaching Scheme (Hrs. / Week** | | | **Examination Scheme (Marks)** | | | | | | **Credits** | | | |
| | | **L** | **P** | **T** | **UE** | **IA** | **TW** | **TW & OR** | **TW& PR** | **Total** | **L** | **P TW/OR/PR** | **T** | **Total** |
| 7 | Differential Equations and Complex Analysis | 03 | 00 | 01 | 60 | 40 | 00 | 00 | 00 | 100 | 03 | 00 | 01 | 04 |
| 8 | Chemistry of Electronic Materials | 03 | 02 | 00 | 60 | 40 | 50 | 00 | 00 | 150 | 03 | 01 | 00 | 04 |
| 9 | Digital Electronics | 04 | 02 | 00 | 60 | 40 | 00 | 50 | 00 | 150 | 04 | 01 | 00 | 05 |
| 10 | Semiconductor Devices and Circuits-I | 04 | 02 | 00 | 60 | 40 | 00 | 00 | 50 | 150 | 04 | 01 | 00 | 05 |
| 11 | Python Programming | 04 | 02 | 00 | 60 | 40 | 50 | 00 | 00 | 150 | 04 | 01 | 00 | 05 |
| 12 | Computer Aided Drafting | 00 | 04 | 00 | 00 | 00 | 50 | 00 | 00 | 50 | 00 | 02 | 00 | 02 |
| | **Total** | 18 | 12 | 01 | 300 | 200 | 150 | 50 | 50 | 750 | 18 | 06 | 01 | 25 |

**Bharati Vidyapeeth (Deemed to be) University, Pune**
**Faculty of Engineering & Technology**

| | **Programme :B.Tech (E &Tc) Sem – III (2021 Course)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Name of the course** | **Teaching Scheme (Hrs. / Week** | | | **Examination Scheme (Marks)** | | | | | | **Credits** | | | |
| | | **L** | **P** | **T** | **UE** | **IA** | **TW** | **TW & OR** | **TW& PR** | **Total** | **L** | **P TW/OR/PR** | **T** | **Total** |
| 13 | Advanced Mathematics- for Electronics | 03 | 00 | 01 | 60 | 40 | 00 | 00 | 00 | 100 | 03 | 00 | 01 | 04 |
| 14 | Semiconductor Devices and Circuits-II | 04 | 02 | 00 | 60 | 40 | 00 | 00 | 50 | 150 | 04 | 01 | 00 | 05 |
| 15 | Signals and Linear Systems | 04 | 02 | 00 | 60 | 40 | 25 | 00 | 00 | 125 | 04 | 01 | 00 | 05 |
| 16 | Network Analysis and Synthesis | 04 | 02 | 00 | 60 | 40 | 00 | 00 | 50 | 150 | 04 | 01 | 00 | 05 |
| 17 | Database Management Systems* | 03 | 02 | 00 | 60 | 40 | 25 | 00 | 00 | 125 | 03 | 01 | 00 | 04 |
| 18 | EDA Tool Practices | 00 | 02 | 00 | 00 | 00 | 50 | 00 | 00 | 50 | 00 | 01 | 00 | 01 |
| 19 | PCB Design and Soldering | 00 | 04 | 00 | 00 | 00 | 00 | 50 | 00 | 50 | 00 | 02 | 00 | 02 |
| 20 | Vocational Course - I: Networking | 00 | 00 | 00 | 00 | 00 | 00 | 50 | 00 | 50 | 00 | 02 | 00 | 02 |
| 21 | MOOC-I | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 02 |
| 22 | Environmental Studies** (Mandatory Audit Course) | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| | **Total** | 18 | 14 | 01 | 300 | 200 | 100 | 100 | 100 | 800 | 18 | 09 | 01 | 30 |

*Industry taught course-I

**100 marks end semester exam

**Bharati Vidyapeeth (Deemed to be) University, Pune**

**Faculty of Engineering & Technology**

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Programme :B.Tech (E &Tc) Sem – IV (2021 Course)** | | | | | | | | | | | | | |
| **Sr. No.** | **Name of the course** | **Teaching Scheme Hrs. / Week** | | | **Examination Scheme (Marks)** | | | | | **Total Marks** | **Credits** | | | |
| | | **L** | **P** | **T** | **UE** | **IA** | **TW** | **TW& OR** | **TW& PR** | **Total** | **L** | **P TW/OR/ PR** | **T** | **Total** |
| 23 | Control Systems and Application | 04 | 02 | 00 | 60 | 40 | 25 | 00 | 00 | 125 | 04 | 01 | 00 | 05 |
| 24 | Integrated Circuits and Applications | 04 | 02 | 00 | 60 | 40 | 00 | 00 | 50 | 150 | 04 | 01 | 00 | 05 |
| 25 | Electromagnetics and Transmission Lines | 03 | 00 | 01 | 60 | 40 | 00 | 00 | 00 | 100 | 03 | 00 | 01 | 04 |
| 26 | Analog Communication | 04 | 02 | 00 | 60 | 40 | 00 | 50 | 00 | 150 | 04 | 01 | 00 | 05 |
| 27 | Data Science* | 03 | 02 | 00 | 60 | 40 | 25 | 00 | 00 | 125 | 03 | 01 | 00 | 04 |
| 28 | Advanced Computer Programming | 00 | 04 | 00 | 00 | 00 | 00 | 50 | 00 | 50 | 00 | 02 | 00 | 02 |
| 29 | Sensor Modelling and Simulation Laboratory | 00 | 02 | 00 | 00 | 00 | 00 | 50 | 00 | 50 | 00 | 01 | 00 | 01 |
| 30 | Vocational Course-II Calibration and repair of lab equipments | 00 | 00 | 00 | 00 | 00 | 00 | 50 | 00 | 50 | 00 | 02 | 00 | 02 |
| 31 | Social Activities-I | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 02 |
| 32 | Disaster Management** (Mandatory Audit Course) | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| | **Total** | 18 | 14 | 01 | 300 | 200 | 50 | 200 | 50 | 800 | 18 | 09 | 01 | 30 |

*Industry taught course-II

**100 marks end semester exam

**Bharati Vidyapeeth (Deemed to be) University, Pune.**

**Faculty of Engineering & Technology**

| | **Programme :B.Tech (E &Tc) Sem – V (2021 Course)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Name of the course** | **Teaching Scheme Hrs. / Week** | | | **Examination Scheme (Marks)** | | | | | **Total Marks** | **Credits** | | | |
| | | **L** | **P** | **T** | **UE** | **IA** | **TW** | **TW & OR** | **TW & PR** | **Total** | **L** | **P** **TW/OR/ PR** | **T** | **Total** |
| 33 | Embedded systems | 03 | 02 | 00 | 60 | 40 | 00 | 50 | 00 | 150 | 03 | 01 | 00 | 04 |
| 34 | Digital Communication System | 03 | 02 | 00 | 60 | 40 | 25 | 00 | 00 | 125 | 03 | 01 | 00 | 04 |
| 35 | Power Electronics | 03 | 02 | 00 | 60 | 40 | 25 | 00 | 00 | 125 | 03 | 01 | 00 | 04 |
| 36 | Microwave and Antenna | 04 | 02 | 00 | 60 | 40 | 00 | 50 | 00 | 150 | 04 | 01 | 00 | 05 |
| 37 | Data Communication and Networking * | 03 | 00 | 00 | 60 | 40 | 00 | 00 | 00 | 100 | 03 | 00 | 00 | 03 |
| 38 | Microcontroller Programming | 00 | 04 | 00 | 00 | 00 | 00 | 00 | 50 | 50 | 00 | 02 | 00 | 02 |
| 39 | Project-I Stage –I | 00 | 02 | 00 | 00 | 00 | 00 | 100 | 00 | 100 | 00 | 04 | 00 | 04 |
| 40 | Vocational course III: PLC | 00 | 00 | 00 | 00 | 00 | 00 | 50 | 00 | 50 | 00 | 02 | 00 | 02 |
| 41 | MOOC- II | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 02 |
| | **Total** | 16 | 14 | 00 | 300 | 200 | 50 | 250 | 50 | 850 | 16 | 12 | 00 | 30 |

*Industry taught course-III

**Bharati Vidyapeeth (Deemed to be) University, Pune**

**Faculty of Engineering & Technology**

| | **Programme :B.Tech (E &Tc) Sem – VI (2021 Course)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Name of the course** | **Teaching Scheme Hrs. / Week** | | | **Examination Scheme (Marks)** | | | | | **Total Marks** | **Credits** | | | |
| | | **L** | **P** | **T** | **UE** | **IA** | **TW** | **TW & OR** | **TW & PR** | **Total** | **L** | **P** **TW/OR/PR** | **T** | **Total** |
| 42 | Photonics | 04 | 02 | 00 | 60 | 40 | 25 | 00 | 00 | 125 | 04 | 01 | 00 | 05 |
| 43 | Quantitative techniques, Communication and Values | 02 | 02 | 00 | 60 | 40 | 00 | 00 | 00 | 100 | 03 | 00 | 00 | 03 |
| 44 | Digital Signal Processing | 03 | 02 | 00 | 60 | 40 | 25 | 00 | 00 | 125 | 03 | 01 | 00 | 04 |
| 45 | CMOS Design | 04 | 02 | 00 | 60 | 40 | 00 | 50 | 00 | 150 | 04 | 01 | 00 | 05 |
| 46 | Internet of Things* | 03 | 00 | 00 | 60 | 40 | 00 | 00 | 00 | 100 | 03 | 00 | 00 | 03 |
| 47 | VHDL | 00 | 02 | 00 | 00 | 00 | 00 | 00 | 50 | 50 | 00 | 01 | 00 | 01 |
| 48 | Project-I Stage-II | 00 | 02 | 00 | 00 | 00 | 00 | 100 | 00 | 100 | 00 | 04 | 00 | 04 |
| 49 | *Vocational 4: Web App development | 00 | 00 | 00 | 00 | 00 | 00 | 50 | 00 | 50 | 00 | 02 | 00 | 02 |
| 50 | *** Internship | 00 | 00 | 00 | 00 | 00 | 00 | 50 | 00 | 50 | 00 | 03 | 00 | 03 |
| | Total | 16 | 12 | 00 | 300 | 200 | 50 | 250 | 50 | 850 | 17 | 13 | 00 | 30 |

*Industry taught course-IV

**Bharati Vidyapeeth (Deemed to be) University, Pune**

**Faculty of Engineering & Technology**

| | **Programme :B.Tech (E &Tc) Sem – VII (2021 Course)** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Name of the course** | **Teaching Scheme Hrs. / Week** | | | **Examination Scheme (Marks)** | | | | | **Total Marks** | **Credits** | | | |
| | | **L** | **P** | **T** | **UE** | **IA** | **TW** | **TW& OR** | **TW & PR** | **Total** | **L** | **P** **TW/OR/PR** | **T** | **Total** |
| 51 | Soft Computing | 04 | 02 | 00 | 60 | 40 | 00 | 00 | 50 | 150 | 04 | 01 | 00 | 05 |
| 52 | Radio Frequency Engineering | 04 | 00 | 01 | 60 | 40 | 00 | 00 | 00 | 100 | 04 | 00 | 01 | 05 |
| 53 | Elective- I | 04 | 02 | 00 | 60 | 40 | 00 | 50 | 00 | 150 | 04 | 01 | 00 | 05 |
| 54 | Industrial Wireless Sensor Network* | 04 | 02 | 00 | 60 | 40 | 00 | 50 | 00 | 150 | 04 | 01 | 00 | 05 |
| 55 | Project II Stage I | 00 | 04 | 00 | 00 | 00 | 00 | 200 | 00 | 200 | 00 | 04 | 00 | 04 |
| 56 | Electronic Product Design | 00 | 04 | 00 | 00 | 00 | 00 | 100 | 00 | 100 | 00 | 02 | 00 | 02 |
| 57 | Research paper publication | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 02 |
| 58 | MOOC-III | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 02 |
| | **Total** | 16 | 14 | 01 | 240 | 160 | 00 | 400 | 50 | 850 | 16 | 09 | 01 | 30 |

Elective-I

1) Telecom Network Management
2) Advanced Embedded System Design
3) Image processing

*Industry taught course-V

**Bharati Vidyapeeth (Deemed to be) University, Pune**
**Faculty of Engineering & Technology**

| | **Programme:B.Tech (E &Tc) Sem – VIII (2021 Course)** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sr. No.** | **Name of the course** | **Teaching Scheme Hrs. / Week** | | | **Examination Scheme (Marks)** | | | | | **Total Marks** | **Credits** | | | |
| | | **L** | **P** | **T** | **UE** | **IA** | **TW** | **TW & OR** | **TW & PR** | **Total** | **L** | **P** **TW/OR/PR** | **T** | **Total** |
| 59 | Mobile Communication | 04 | 02 | 00 | 60 | 40 | 00 | 50 | 00 | 150 | 04 | 01 | 00 | 05 |
| 60 | Satellite Communication & Radar | 04 | 02 | 00 | 60 | 40 | 00 | 00 | 50 | 150 | 04 | 01 | 00 | 05 |
| 61 | Elective II | 04 | 02 | 00 | 60 | 40 | 00 | 50 | 00 | 150 | 04 | 01 | 00 | 05 |
| 62 | Cyber security* | 04 | 00 | 01 | 60 | 40 | 00 | 00 | 00 | 100 | 04 | 00 | 01 | 05 |
| 63 | Cloud Computing | 00 | 04 | 00 | 00 | 00 | 00 | 100 | 00 | 100 | 00 | 02 | 00 | 02 |
| 64 | Project -II Stage-II | 00 | 04 | 00 | 00 | 00 | 00 | 200 | 00 | 200 | 00 | 06 | 00 | 06 |
| 65 | Social Activities-II | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 02 |
| | **Total** | **16** | **14** | 01 | 240 | 160 | 00 | 400 | 50 | 850 | **16** | 11 | **01** | **30** |

Elective-II

1) Software Defined Radio
2) Automotive Electronics
3) Computer Vision

*Industry taught course-VI

# SEMESTER:- I
# SYLLABUS

**Bharati Vidyapeeth**
**(Deemed to be University)**
**College of Engineering, Pune**

| **B. Tech. Sem. I: Electronics & Telecommunication Engineering**<br>**SUBJECT: - LINEAR ALGEBRA and CALCULUS** | | |
|---|---|---|
| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 03 | End Semester Examination: 60 Marks | Credits: 03 |
| Practical: 00 | Internal Assessment: 40 Marks | |
| Tutorial: 01 | | Credits: 01 |
| | | Total Credit: 04 |

**Course Pre-requisites:** Class XII Mathematics

**Course Objectives:**

| | |
|---|---|
| **1.** | To teach the differential calculus. |
| **2.** | To teach linear algebra and linear transformation. |
| **3.** | To introduce ordinary differential equations. |

**Course Outcomes: After learning this course students will be able to**

| | |
|---|---|
| **1** | Evaluate the matrices and its application to the system of linear equations. |
| **2** | Evaluate vector spaces and linear transformation |
| **3** | Solve numerical problems involving differential calculus. |
| **4** | Compute maxima, minima, and multiple integrals. |
| **5** | Evaluate the theorems in integral Calculus. |

| | | |
|---|---|---|
| **6** | Use the methods of first order and first-degree differential equation. | |
| | | |
| **UNIT – I** | **Linear algebra: Matrices** | **(06 Hours)** |
| | Algebra of Matrices, System of Linear Equations, Linear Dependence and Independence, rank, row operations and Gauss elimination, Applications to systems of linear equations, Cayley – Hamilton Theorem | |
| | | |
| **UNIT – II** | **Vector space and Linear Transformations** | **(06 Hours)** |
| | Vector spaces, subspaces, Eigen values and Eigen Vectors and their basic properties, Linear and Orthogonal Transformations, rank -nullity theorem, Existence and Uniqueness Theorem for Linear Systems, product spaces, Gram-Schmidt process, Diagonalization | |
| | | |
| **UNIT - III** | **Differential Calculus** | **(06 Hours)** |
| | Limits of sequences and functions, continuity, uniform continuity and differentiability, Mean value theorems, L' Hospital's Rule. Euler's Theorem on Homogeneous Functions. Taylor's theorem with proof, Partial derivatives, Chain rule. | |
| | | |
| **UNIT -IV** | **Maxima and Minima for several** | **(06 Hours)** |
| | Maxima, minima, saddle points. gradient, directional derivatives, Lagrange multipliers, Exact differentials, Errors, and approximations. Repeated and multiple integrals applications to volume, surface area, moments of inertia, etc. | |

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| **UNIT -V** | **Integral Calculus** | **(06 Hours)** |
| | Riemann integral and the fundamental theorem of integral calculus, Rolle's theorem, Applications to length, area, volume, surface area of revolution. Moments, centers of mass and gravity. | |
| | | |
| **UNIT -VI** | **Ordinary differential equation** | **(06 Hours)** |
| | Ordinary differential equations of the 1st order, exactness and integrating factors,applications of first order and first-degree differential equation in orthogonal trajectories and electrical circuits. Picard's iteration method. | |

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| **Topics for projets based learning*** |
| 1. Cramer’s rule |
| 2. System of linear equations solution |
| 3. Rank of matrix |
| 4. Gauss elimination |
| 5. LU-decomposition method |
| 6. Dimension and basis |
| 7. Gram Schmidt Orthogonalization |
| 8. rank -nullity theorem |
| 9. Euler's Theorem on Homogeneous Functions |
| 10. Maxima and minima for two variable function |
| 11. Eigen values and Eigen vectors |
| 12. Multiple integrals applications |
| 13. Formation of differential equation |
| 14. Linear differential equation |
| 15. Kirchhoff’s voltage law |
| *Students in a group of 3 to 4 shall complete any one project from the above list |

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| **Textbooks/Reference Books** |
| 1.'Advanced Engineering Mathematics' by Erwin reyszig |
| 2.'Advanced Engineering Mathematics' by Dennis G. Zill and Warren S. Wright |
| 3.AppliedMathematics(VolumesIandII)byP.N.Wartikar&J.N.Wartikar |
| 4.HigherEngineeringMathematicsbyB.S.Grewal |
| 5.HigherEngineeringMathematicsbyB.V.Ramana |
| 6.AdvancedEngineeringMathematics |

**Bharati Vidyapeeth**
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| **B. Tech. Sem. I: Electronics & Telecommunication Engineering**<br>**SUBJECT: - PHYSICS FOR ELECTRONICS ENGINEERING** | | |
|---|---|---|
| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 03 | End Semester Examination: 60 Marks | Credits: 03 |
| Practical: 02 | Internal Assessment: 40 Marks | |
| Tutorial: 00 | TW: 50 Marks | Credit: 01 |
| | | Total Credit: 04 |

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| **Course Pre-requisites:** | |
| | Basic Physics and Calculus. |
| **Course Objectives:** | |
| | To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Electronics and Telecommunication. |
| **Course Outcomes:** | |
| **After learning this course students will be able to** | |
| **1** | Demonstrate the knowledge of properties of charged particles and their use in modern instruments |
| **2** | Solve the quantum physics problemsat micro level phenomena. |
| **3** | Explain mechanical properties of solid matter and connect to applications in the field of engineering. |
| **4** | Demonstrate the working of PN junctions in semiconductor devices under various conditions. |

| | | |
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| **5** | Demonstrate the wave nature of light and apply it to measure stress, pressure and dimension. | |
| **6** | Analyze the problems associated with architectural acoustics and give their remedies. | |
| | | |
| **UNIT – I** | **Modern Physics** | **(06 Hours)** |
| | Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focusing, Electron microscope, Wavelength and resolution, Specimen limitation, Depth of field and focus, TEM, SEM and EDS, Separation of isotopes by Bainbridge mass spectrograph, CRT. | |
| | | |
| **UNIT – II** | **Quantum mechanics** | **(06 Hours)** |
| | Dual nature of matter, concept of wave packet, group and phase velocity and relation between them, Physical significance of wave function, Schrodinger's time dependent and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box, Applications of Schrodinger's Equation: Infinite Potential Well and the Potential Barrier. | |
| | | |
| **UNIT - III** | **Solid state Electronics-I** | **(06 Hours)** |
| | Superconductors, properties, Meissner effect, Type I and Type II superconductors, BCS theory of superconductivity (Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.<br>Formation of Energy Bands, E-k Diagram, Origin of band gap, Energy bands in solids, Effective mass of electron, Fermi-Dirac Distribution, Conductivity in conductor and semi-conductors. | |

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| **UNIT -IV** | **Solid State Electronics-II** | **(06 Hours)** |
| | Review of intrinsic and Extrinsic semiconductors, The no and po equations, Drift and Diffusion Currents, Regeneration process, Recombination Process, Derivation of Current Continuity Equation, Position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Minority Carrier injection and recombination in Homogeneous Semiconductor, p-n junction formation, Band structure of p-n junction diode under forward and reverse biasing, Junction Capacitance, Photovoltaic effect, Solar cell and its characteristics. | |
| | | |
| **UNIT -V** | **Interference, Diffraction and Polarization** | **(06 Hours)** |
| | **Interference**: Interference due to thin film of uniform thickness, engineering applications of interference (optical flatness, non-reflecting coatings).<br>**Diffraction**: Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima.<br>**Polarization**: Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism | |
| | | |
| **UNIT -VI** | **Acoustics** | **(06 Hours)** |
| | Elementary Acoustics, reverberation and reverberation time, Sabine's formula, pressure and intensity level, different types of noise and their remedies, Electro Acoustic transducers | |

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|---|---|---|
| | (piezoelectric transducers, electrostatic transducer, magnetic transducer, magneto strictive transducer), Types of Microphones, Loudspeaker, stereophony, sound recording and Sound reinforcement systems. | |

**Lab Experiment :(Any Eight of the Following)**

1. Study of Lissajous figure by Cathode Ray Oscilloscope (CRO)
2. Determination of e/m by Thomson method.
3. Plotting the hysteresis loop for given magnetic material.
4. To study Hall effect and determine the Hall voltage.
5. Calculation of conductivity by four probe methods.
6. Study of solar cell characteristics and calculation of fill factor.
7. Determination of band gap of semiconductor.
8. Determination of radius of Plano convex lens/wavelength of light/Flatness testing by Newton's rings
9. Determination of wavelength of light using diffraction grating.
10. Determination of resolving power of telescope.
11. Determination of thickness of a thin wire by air wedge.
12. Determination of refractive index for O-ray and E-ray.
13. To determine the velocity of sound.
14. Measurement of average SPL across spherical wavefront and behavior with the distance.
15. Expansion chamber muffler: investigation of muffler response as a filter in the low frequency approximation by determining insertion loss.
16. Interference of sound using PC speakers.

**Assignments**

Six assignments to be given by the subject teacher (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum

**Topics for projets based learning***

1. Design and simulation of automatic solar powered time regulated water pumping

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| 2. Solar technology: an alternative source of energy for national development |
| 3. Comparison of various method used in measuring the gravitational constant g |
| 4. Possible effects of electromagnetic fields (emf) on human health |
| 5. The design and construction of the hearing aid device |
| 6. Design and construction of digital distance measuring instrument |
| 7. Design and construction of automatic bell ringer |
| 8. Design and construction of sound or clap activated alarm |
| 9. Electronic eye (Laser Security) as autoswitch/security system |
| 10. Electric power generation by road power |
| 11. Wireless power transfer |
| 12. Determination of velocity of O-ray and E-ray in different double refracting materials |
| 13. Quantum confinement effect in wide band semiconductors |
| 14. Tesla Coil |
| 15. LiFi- wireless data transfer system using light |
| *Students in a group of 3 to 4 shall complete any one project from the above list |
| |
| **Text Books:** |
| 1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018). |
| 2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015) |
| 3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017) |
| **Reference Books:** |
| 1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013) |
| 2. Optics, Francis Jenkins and Harvey White, Tata Mcgraw Hill (2017) |
| 3. Principles of Physics, John W. Jewett,Cengage publishing (2013) |
| 4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004) |
| 5. Principles of Solid-State Physics, H. V. Keer, New Age International (1993) |
| 6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011) |
| 7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014) |
| 8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997) |
| 9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013) |

10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012)

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| **B. Tech. Sem. I: Electronics & Telecommunication Engineering**<br>**SUBJECT: - ELECTRICAL TECHNOLOGY** | | |
|---|---|---|
| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 04 | End Semester Examination: 60 Marks | Credits :04 |
| Practical: 02 | Internal Assessment: 40 Marks | |
| Tutorial: 00 | TW: 50 Marks | Credit: 01 |
| | | Total Credits: 5 |

| **Course Pre-requisites:** | |
|---|---|
| | Physics and Mathematics |

| **Course Objectives:** | |
|---|---|
| **1.** | To introduce fundamental concepts, various laws-principles and theorems associated with electrical systems. |
| **2.** | To impart basic knowledge of all electrical quantities such as current, voltage, power, energy, frequency along with different types of fields. |
| **3.** | To provide knowledge about fundamental parameters such as resistance, inductance and capacitance and magnetic circuits, AC and DC circuits |
| **4.** | To provide knowledge of Electrical Measurement technique and Electrical Safety Practices. |

| **Course Outcomes: After learning this course students will be able to** | |
|---|---|
| **1** | Calculate the circuit parameters using dc network theorems. |
| **2** | Demonstrate the knowledge of various parameters related to magnetic circuit and single-phase ac circuits. |
| **3** | Classify the various parameters of 3-phase AC circuits and apply the concepts of single-phase transformer. |

| | | |
|---|---|---|
| **4** | Demonstrate the knowledge of various power generation and transmission techniques. | |
| **5** | Explain the Construction and working principle of DC and AC machines. | |
| **6** | Apply the various measurement techniques of circuit parameters and safety norms. | |
| | | |
| **UNIT – I** | **DC Circuit Analysis and Network Theorems:** | **(08 Hours)** |
| | Circuit Concepts: Concepts of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements, source transformation. Kirchhoff's laws; loop and nodal methods of analysis; star-delta transformation; Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem (simple numerical problems). | |
| | | |
| **UNIT – II** | **Magnetic Circuit and Single-Phase AC Circuits** | **(08 Hours)** |
| | **Magnetic Circuit:** Magnetic circuit concepts, analogy between electric & magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling<br>**Single Phase AC Circuits:** AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel and series parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement; resonance in series and parallel circuits, quality factor (simple numerical problems | |
| | | |
| **UNIT - III** | **Three Phase AC Circuits:** | **(08 Hours)** |
| | **Three Phase AC Circuits:** Three phase system-its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply and balanced load, line, and phase voltage/current relations (Simple derivations), three-phase power and its measurement (simple numerical problems).<br>**Single Phase Transformer:** Principle of operation, construction, e.m. f. equation, equivalent | |

| | | |
|---|---|---|
| | circuit, power losses, efficiency (simple numerical problems), introduction to auto transformer. Three phase transformer and its different winding connections | |
| | | |
| **UNIT -IV** | **Power Generation and Power System** | **(08 Hours)** |
| | **Power Generation:** Power Generation techniques using conventional (Hydro, Thermal, nuclear, Gas) & non-conventional resources (Solar, Wind, biogas).<br><br>**Introduction to Power System:** General layout of electrical power system and functions of its elements, standard transmission, and distribution voltages, layout. Concept of grid (elementary treatment only) | |
| | | |
| | **DC Machines and AC Machines** | **(08 Hours)** |
| | **DC Machines:** Principle**s** of electromechanical energy conversion, DC machines: types, Construction & working, e. m. f. equation of generator and torque equation of motor, speed control, characteristics and applications of dc motors (simple numerical problems).<br><br>**AC Machines:** Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Induction Motor: Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only | |
| | | |
| **UNIT -VI** | **Electrical Measurement technique** | **(08 Hours)** |
| | **Electrical Measurement technique:** Electrical instruments such as wattmeter, energy meter, tong-tester, megger, and power analyzer. Measurement of circuit parameters like resistance, inductance and capacitance using DC and AC bridges.<br><br>**Electrical Safety Practises:**Electric shock, precautions against shock, First aid for electric shock other hazards of electrical laboratories & safety rules, Objectives of Earthing, types of earthing; | |

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| | pipe and plate earthing, Residual current circuit breaker (RCCB). | |

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| **Term Work:** |
| |
| 1. Find the current in the given network using Super position Theorem |
| 2. Find the current in the given network using Thevenin's and Notton's Theorem |
| 3. To Plot the B-H characteristics for a magnetic material |
| 4. To find the voltage and current relationships in R-L series, R-C series, R-L-C series circuit |
| 5. To find the voltage and current relationships in R-L-C series resonance circuit. |
| 6. Verification of voltage and current relationships in star and delta connected 3-phase networks |
| 7. To find efficiency and regulation of single-phase transformer |
| 8. To control the speed of DC shunt motor using fulx control and armature voltage control method. |
| 9. To control the speed of DC shunt motor using fulx control and armature voltage control method. |
| 10. Find the unknown resistance using Kelvin's double bridge. |
| 11. Find the unknown inductance using Anderson's bridge. |
| 12. Measurement of power and energy in single phase ac circuit. |
| |
| **Note**: The term work shall be the record of minimum eight experiments performed from the above list. |
| |
| **Topics for projets based learning*** |
| 1.Design a small circuit for superposition theorem. |
| 2. Design small circuit to study Thevenin's Theorem. |
| 3. Design Small circuit to study Norton's Theorem. |
| 4. Design small circuit to study R-C series circuit. |
| 5. Design small circuit to study R-L series circuit. |
| 6. Design small circuit to study R-L-C series circuit. |
| 7. Design of Tesla Coil. |
| 8. Design small two winding transformer. |
| 9. Design small electromagnet. |
| 10. Design a small doorbell. |

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| 11. Design of wireless power transmission. |
| 12. Design of electric buzzer. |
| 13. Design of small wind farm. |
| 14. Design of small solar power plant. |
| 15. Design of small galvanometer. |
| *Students in a group of 3 to 4 shall complete any one project from the above list |
| |
| **Text-books:** |
| |
| 1. Electrical Technology - Edward Huges (Pearson |
| 1. Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC) |
| 2. Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall) |
| |
| **Reference Books:** |
| 1. Principles of Electronics-Dr. H. M. Rai (Satya Prakashan) |
| 2. Electronic Devices and Circuit Theory- R. L. Boylestad and L. Nashelsky (PHI) |
| 3. Electrical, Electronics Measurements and Instruments - (SatyaPrakashan) |
| 4. Principles of Communication Engineering - Anokh Singh, A. K. Chhabra (S Chand) |
| 5. Electrical Technology - Volume I & volume – II by B L Theraja and AK Theraja*( S Chand)* |

**Bharati Vidyapeeth**
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**College of Engineering, Pune**

| **B. Tech. Sem. I: Electronics & Telecommunication Engineering**<br>**SUBJECT: - ELEMENTRY ELECTRONICS** | | |
|---|---|---|
| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 04 | End Semester Examination: 60 Marks | Credits: 04 |
| Practical: 02 | Internal Assessment: 40 Marks | |
| Tutorial: 00 | TW & OR: 50 Marks | Credit: 01 |
| | | Total Credit: 05 |

| **Course Pre-requisites:** | |
|---|---|
| | Physics, Chemistry, Mathematics (Class XII) |

| **Course Objectives:** | |
|---|---|
| 1. | To teach the construction, working, ratings and application of passive devices like resistors, capacitors, inductors, transformers, and relays |
| 2. | To introduce types of Voltage and current sources |
| 3. | To teach the construction, working and ratings of devices like PNjunction diode, Schottky diode, Zener diode, bipolar junction transistor |
| 4. | To teach the construction, working and ratings of field effect transistor and MOSFET |
| 5. | To teach the construction, working and ratings of optoelectronic devices like LDR, LED, phototransistor, and photovoltaic cell |
| 6. | To introduce the concept of grounding and shielding, PCB layout design, PCB fabrication process, with the aid of an EDA tool. |

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|---|---|---|
| **Course Outcomes: After learning this course students will be able to** | | |
| **1** | Classify resistors, capacitors, inductors, and transformer based on their construction, types and ratings and analyze simple circuits consisting of passive devices | |
| **2** | Analyze circuits using voltage and current sources | |
| **3** | Classifyactive devices based on their types and ratings and plot their characteristic curves | |
| **4** | Classifyoptoelectronic devices based on their types and ratings and plot their characteristic curves. | |
| **5** | Use the concepts of grounding and shielding while designing PCB, explain the PCB design and fabrication and assembly process | |
| **6** | Use EDA tools for designing single sided PCB for simple circuits | |
| | | |
| **UNIT – I** | **Passive Electronic Components** | **(08 Hours)** |
| | Introduction to the concept of active and passive electronic devices, Types of resistors, construction, ratings and typical applications, Types of capacitors, construction, ratings and typical applications, Types of inductors, construction, ratings and typical applications, Types of transformers, construction, ratings and typical applications, Construction of relays, types and ratings, Analysis of series and parallel resistors and capacitor circuits | |
| | | |
| **UNIT – II** | **Sources** | **(08 Hours)** |
| | Types of voltage and current sources (AC and DC), Concept of ideal and non-ideal voltage source, Concept of ideal and non-ideal current source, Series and parallel combinations of sources, Loading effect, Dependent voltage and current sources, Electrochemical cells and batteries, Types and characteristics, Regulation concept (Line regulation, load regulation, temperature stability factor) | |
| | | |

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|---|---|---|
| **UNIT - III** | **Diodes and BJT** | **(08 Hours)** |
| | Classification of material based on band gap theory, Types of semiconductors (p-type and n-type), PN junction diode and its characteristics, Schottky diode, Zener diode, Diode models, Concept of DC and AC load line and ratings of PN junction diode, Introduction to BJT (NPN and PNP) and its construction and working mechanism, BJT configurations and their input and output characteristics, Types and ratings of BJT | |
| | | |
| **UNIT -IV** | **FET and MOSFET** | **(08 Hours)** |
| | Construction and working mechanism of FET, Input and output characteristics of FET, FET configurations, Ratings of FET, Construction and working of DMOSFET and EMOSFET, Characteristics of DMOSFET and EMOSFET, Configurations and ratings of EMOSFET | |
| | | |
| **UNIT -V** | **Opto-Electronics** | **(08 Hours)** |
| | Construction and working of LDR and its characteristics, simple application, Construction and working of LED and its characteristics and ratings, Photo-transistor and its characteristics, Introduction to the concept of electrical isolation and its importance, Construction of opto-isolator(opto-coupler) and its ratings, Construction and working of photovoltaic cell and its characteristics and ratings | |
| | | |
| **UNIT -VI** | **PCB (Printed Circuit Board)** | **(08 Hours)** |
| | Concept of grounding, shielding and its importance, building blocks of PCB (track, pads, fills) and design rules, PCB fabrication and assembly, Introduction to EDA tool for artwork design of a simple single sided PCB Soldering: Types of solder alloys, soldering equipment, specifications of solder alloys | |
| | | |
| **List of experiments:** | | |

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| 1. Study of resistors, capacitors, and inductors |
| 2. Plot V-I Characteristics of PN Junction Diode |
| 3. Plot V-I Characteristics of Zener Diode |
| 4. Plot Input and Output Characteristics of BJT in CE Configuration |
| 5. Plot Transfer and output characteristics of FET |
| 6. Plot Transfer and output characteristics of EMOSFET |
| 7. Plot characteristics of LDR |
| 8. Plot characteristics of Opto-isolator |
| 9. Study of Relays |
| |
| **Topics for projets based learning*** |
| 1.Survey report of types of resistors, capacitors, transformers their form factors, specifications and price |
| 2.Survey report of types of batteries, their form factors, specifications and price |
| 3.Survey report of types of low power relays, their form factors, specifications and price |
| 4.Survey report of types of diodes, BJT, MOSFET, their form factors, specifications and price |
| 5.Build a shunt regulator and measure its line and load regulation |
| 6.Build a full-wave rectifier with capacitor input filter and test it |
| 7.Build a small signal voltage amplifier (BJT) and test it |
| 8.Build a switch using BJT, MOSFET, relay and test it |
| 9.Build a simple day light switch with an LDR, BJT and Relay |
| 10.Build a motion sensor switch |
| 11.Build a fire alarm circuit |
| 12.Implement and test a given circuit on a general purpose PCB |

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| 13.Build a simple water level indicator |
| 14.Build a simple temperature indicator |
| 15.Build a LED Light Bulb Circuit |
| *Students in a group of 3 to 4 shall complete any one project from the above list |
| |
| **Text Books/ Reference Books:** |
| 1. Passive Components for Circuit Design, Ian Sinclair,1st Edition 2000, ISBN: 9780750649339, Newnes |
| 2Grob's Basic Electronics, Mitchel Schultz,11th Edition,2010, ISBN-13: 978-0-07-351085-9, McGraw Hill |
| 3.Fundamentals of Electronic Devices and Circuits, David A. Bell, 5th Edition,2008, Oxford University Press, |
| 4Microelectronics Circuits, Adel S. Sedra& Kenneth C. Smith,7th Edition, 2015,Oxford University Press |
| 5.Linden’s Handbook of Batteries, Thomas Reddy,4th Editiion,2010, ISBN: 978-0-07-162419-0, McGraw Hill |
| 6.Printed circuit boards: design, fabrication, assembly and testing, Raghbir Singh Khandpur,2006, ISBN 10:0071464204, McGraw Hill |
| 7. The Circuit Designer’s Companion, Peter Wilson, 4th Edition,2017, ISBN: 978-0-08-101764-7, Newnes |

**Bharati Vidyapeeth**
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| **B. Tech. Sem. I: Electronics & Telecommunication Engineering**<br>**SUBJECT: - C PROGRAMMING** | | |
|---|---|---|
| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 04 | End Semester Examination: 60 Marks | Credits: 04 |
| Practical: 02 | Internal Assessment: 40 Marks | |
| Tutorial: 00 | TW: 50 Marks | Credit: 01 |
| | | Total Credit: 5 |

| **Course Pre-requisites:** | |
|---|---|
| | Flow charts |

| **Course Objectives:** | |
|---|---|
| | • A student will gain a thorough understanding of the fundamentals of C programming.<br>• A student will be able to code, compile, and test C programs.<br>• A Student will be able to solve Problems using C language. |

| **Course Outcomes: After learning this course students will be able to** | |
|---|---|
| **1** | Apply the basic concepts of programming using C language. |
| **2** | Write basic programs using conditional statement. |
| **3** | Use 2 D Array in programming |
| **4** | Create functions and Pass parameters. |
| **5** | Construct structures using Pointers. |
| **6** | Apply basic concepts of graphics using C language. |

| **UNIT – I** | **Introduction Basic of C** | **(08 Hours)** |
|---|---|---|

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|---|---|---|
| | Structure of a C program, identifiers, basic data types and sizes. Constants, variables, arithmetic, relational and logical operators Managing input and output operations, Sample programs. | |
| | | |
| **UNIT – II** | **Conditional Statements and Loops** | **(07 Hours)** |
| | Decision making within a program, conditions, if statement, if-else statement, loops: while loop, do while, for loop. Nested loops, infinite loops, switch statement, sample programs | |
| | | |
| **UNIT - III** | **Arrays & Strings** | |
| | Arrays - concepts, declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, , Array applications: Matrix Operations. | **(08 Hours)** |
| | | |
| **UNIT -IV** | **Functions & Pointers** | **(07 Hours)** |
| | Basics, parameter passing, storage classes- extern, auto, register, static, scope rules, user defined functions, , recursive functions, Recursive solutions for Fibonacci series, example c programs. Passing arrays & strings to functions. | |
| | | |
| **UNIT -V** | **Pointers and Structures** | **(10 Hours)** |
| | Derived types- structures- declaration, definition, and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, bit-fields, program applications. Different types of stacks and queues. | |
| | | |

| UNIT -VI | **Basic of Graphics** | **(08 Hours)** |
|---|---|---|
| | Introduction, what is computer Graphics? Area of Computer Graphics. Graphics programming, initializing the graphics, C Graphical functions, simple programs | |

**List of Experiments:**

1.
   - Write a C program to take user Input and print it on the screen.
   - Write a C program to perform addition or subtraction of two numbers.
   - Write a C program to find whether the number is Odd or Even.
   - Write a C program to find out Prime numbers.
   - Write a C program to find out Fibonacci series.

2.
   - Write C programs to print different patterns.
   - Write a C program to do factorial using recursion.
   - Write a C program to find out Armstrong number

3.
   - Write a C program to sort the array in Ascending & Descending order.
   - Write C programs to perform operations on 2-D arrays.
   - Write a C program to perform different operations on strings.

4.
   - Use of Pointers
   - Write a C program to swap numbers using pointers.

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| 5. | Write a C program to show the use of pointers in arrays. |
| 6. | Write a C program to use functions using pointers. |
| 7. | Write a C program to create student mark sheet using structures. |
| 8. | Write a C program to show the use of structure using pointers. |
| 9. | Write a program showing functions of Graphics programming |
| 10. | Mini Project. |

**Topics for projets based learning***

1.Employee Record System Project
2. Build Calculator (GUI Optional)
3. Customer Billing System Project:
4. Medical Store Management System Project
5. Currency Converter (GUI Optional)
6. Modern Periodic Table (GUI Optional)
7. Number System Conversion Project
8. Phone book / Contact Management System
9. 100 Years Calender
10. Hospital Management System Project
11. Customer Billing system
12. Tic Tac Toe Game (GUI Optional)
13. Departmental Store Management.
14. Build Rock , Paper & Scissors Game (GUI Optional)
15. Bank Management System

*Students in a group of 3 to 4 shall complete any one project from the above list

**Text Books:**

1. Programming in ANSI C – E Balagurusamy ($5^{th}$ Edition-TMH)

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| **2.** C Graphics & Projects – By B M Havaldar |
| **Reference Books:** |
| 1. Let Us C- Yashwant Kanitkar |
| 2. Computer Graphics – By Hearn & Baker |
| 3. The C Programming Language. 2nd Edition By Brian Kernighan and Dennis Ritchie |

**Bharati Vidyapeeth**
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| **B. Tech. Sem. I: Electronics & Telecommunication Engineering**<br>**SUBJECT: -MATLAB FUNDAMENTALS** | | |
|---|---|---|
| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 00 | End Semester Examination: 00 | Credits: 00 |
| Practical: 04 | Internal Assessment: 00 | |
| Tutorial: 00 | TW: 50 Marks | Credit: 02 |
| | | Total Credit: 02 |

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| **Course Pre-requisites:** | |
| | Mathematics (Class XII) and Linear Algebra and Calculus |
| **Course Objectives:** | |
| **1.** | To teach basics of MATLAB software and programming. |
| **2.** | To teach the students Vectors, Arrays and Strings in programming |
| **3.** | To introduce Conditional Statements, Loops and Functions |
| **4.** | To teach the students to perform different operations on Matrices in programming. |
| **5.** | To introduce MATLAB Simulink. |
| **6.** | To introduce MATLAB GUI. |
| **Course Outcomes: After learning this course students will be able to** | |
| **1** | Use MATLAB for basic programming. |

| | |
|---|---|
| **2** | Use Vectors, Arrays and Stringsin programming. |
| **3** | Apply knowledge of conditional statements, loops, and functions in programming. |
| **4** | Use different operations of Matrices in programming. |
| **5** | Design different models using MATLAB Simulink. |
| **6** | Design GUI for different applications. |
| | |

**List of experiments**:

**1. Introduction to MATLAB**

a) Basics of MATLAB

**2. Commands, Variables and Operators.**

a) Write a program to perform arithmetic and logical operations on scalar data.

b) Write a program to display sine and cos wave of particular amplitude and frequency.

**3. Vectors**

a) Write a program to find addition, subtraction, multiplication, transpose, and magnitude of given vector.

b) Write a program to find mean, standard deviation, and variance of given vector.

**4. Conditional Statements and Functions**

a) Write a program to show use of if-then-else statement and while loop

b) Write a program to import and export data from .csv file.

**5. Arrays and Strings**

a) Write a program to display data using string.

b) Write a program to compare two given arrays or array elements.

**6. Operations on Matrix**

a) Write a program to find transpose, determinant, concatenation, and inverse of given matrix.

b) Write a program to solve given linear equation.

**7. GUI**

a) To introduce basics of GUI

b) To design GUI for any one of the programs mentioned above.

**8. Simulink**

a) To introduce basics of Simulink

b) Develop a model to differentiate and integrate sine wave using Simulink.

**Text Books:**


1. MATLAB for Beginners-A Gentle Approach, Peter I. Kattan, 2010, ResearchGate publication
2. Getting started with MATLAB, RudraPratap, 2010, Oxford university press.


**Reference Books:**


1. A Guide to MATLAB, Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, 3rd Edition, Cambridge University Press.
2. Introduction to MATLAB for Engineers,WilliamJ.Palm, 3rd Edition, McGraw-Hill Education.

# SEMESTER:- II
# SYLLABUS

**Bharati Vidyapeeth**
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| **B. Tech. Sem. II: Electronics & Telecommunication Engineering**<br>**SUBJECT: - DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS** | | |
|---|---|---|
| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 03 | End Semester Examination: 60 Marks | Credits: 03 |
| Practical: 00 | Internal Assessment: 40 Marks | |
| Tutorial: 01 | | Credits: 01 |
| | | Total Credit: 04 |

| **Course Pre-requisites:** | |
|---|---|
| | Class XII Mathematics, Linear Algebra and calculus |

| **Course Objectives:** | |
|---|---|
| **1.** | To introduce ordinary differential equations for higher order. |
| **2.** | To introduce partial differential equations. |
| **3.** | To introduce complex analysis and conformal mapping. |
| **4.** | To teach sequences, series, and series expansion. |
| **5.** | To introduce ordinary differential equations for higher order. |
| **6.** | To introduce partial differential equations. |

| **Course Outcomes: After learning this course students will be able to** | |
|---|---|
| **1** | Solve higher differential equations by different methods |

| | |
|---|---|
| **2** | Solve partial differential equations by different methods |
| **3** | Demonstrate the methods of Complex Analysis technique. |
| **4** | Implement the Complex Analysis for potential application |
| **5** | Demonstrate the knowledge of series and sequences. |
| **6** | Solve series expansion problems. |

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| **UNIT – I** | **Ordinary linear differential equations** | **(06 Hours)** |
| | Ordinary linear differential equations of nth order, solution of homogeneous and non-homogeneous equations. Operator method. Methods of undetermined coefficients and variation of parameters, Systems of differential equations. Mass spring system. | |
| | | |
| **UNIT – II** | **Partial Differential Equations** | **(06 Hours)** |
| | Partial differential equations, variable separable method, complementary function and particular integral, initial and boundary value problems (wave equation,1-D and 2-D heat Equation). | |
| | | |
| **UNIT - III** | **Complex Differentiation and Integration** | **(06 Hours)** |
| | gebra of Complex Number (Polar and exponential form, Power and roots, Regions in a complex plan), Analytic functions, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions, Singularities, Residues, Poles and Zeros of Analytic Functions, The Residue Theorem | |

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| **UNIT -IV** | **Conformal mapping** | **(06 Hours)** |
| | G Geometry of analytic functions: conformal mapping, points linear fractional transformations, conformal mapping for other function. Conformal mappings to potential problems: electrostatic fields, use of conformal mapping: modelling, heat problems, fluid flow, Poisson's Integral formula for potentials, General properties of harmonic functions, uniqueness theorem for the Dirichlet problem. | |
| | | |
| **UNIT -V** | **Sequences and Series** | **(06 Hours)** |
| | Review of sequences, series and convergence tests, Power Series, Power Series Expansions of Analytic Functions, Taylor Series (Taylor's Theorem with Proof), Laurent series (Laurent's Theorem without Proof), Leibnitz's Theorem, Maclaurin's Series | |
| | | |
| **UNIT -VI** | **Series Expansion** | **(06 Hours)** |
| | Multiplication, Division, Integration and Differentiation of Power Series, methods for solutions of ordinary differential equations. Legendre equation and Legendre polynomials, Bessel equations and Bessel functions of first and second kind. Orthogonal sets of functions | |

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| **Topics for projets based learning*** |
| 1. Use MATLAB to formulate and solve types of differential equations - Initial value problems and Delay differential equations |
| 2. Use MATLAB to formulate and solve types of differential equations - Boundary value problems and Partial differential equations |
| 3. Ordinary Differential Equation (ODE) solvers in MATLAB, solve initial value problems with a variety of properties |
| 4. Ordinary Differential Equations EULER methods |

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| 5. Ordinary Differential Equations Using built-in function |
| 6. Differential Equations in Python |
| 7. Differential Equations with ODE in Python |
| 8. Partial Differential Equations in Python |
| 9. Solving partial differential equations |
| 10.Complex Line Integration |
| 11. Multi dimentional Conformal mapping |
| 12. Sequences & Series using matlab |
| 13.Sequences and Series -circle packing method |
| 14. An End-to-End Project on Time Series Analysis and Forecasting with Python |
| 15.Time Series Analysis in Python |
| 16.Time Series Classification (with Python) |
| 17.Taylor series with Python |
| 18. Program to print binomial expansion series |
| *Students in a group of 3 to 4 shall complete any one project from the above list |
| |
| **Textbooks/Reference Books** |
| 1.'Advanced Engineering Mathematics' by Erwin reyszig |
| 2.'Advanced Engineering Mathematics' by Dennis G. Zill and Warren S. Wright |
| 3.AppliedMathematics (VolumesIandII)byP.N.Wartikar&J.N.Wartikar |
| 4.HigherEngineeringMathematicsbyB.S. Grewal |
| 5.HigherEngineeringMathematicsbyB.V. Ramana |
| 6.AdvancedEngineeringMathematics |

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| **B. Tech. Sem. II: Electronics & Telecommunication Engineering**<br>**SUBJECT: - Chemistry of Electronic Materials** | | |
|---|---|---|
| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 03 | End Semester Examination: 60 Marks | Credits: 03 |
| Practical: 02 | Internal Assessment: 40 Marks | |
| Tutorial:00 | TW: 50 Marks | Credit: 01 |
| | | Total Credit: 04 |

**Course Pre-requisites:**

Basic knowledge of chemistry,Electrochemical series, Electrode potential, Primary and secondary cells,Capacitor, insulator, classification, and properties of polymers.

**Course Objectives:**

- To develop the interest among the students regarding chemistry and their applications in engineering
- To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field.
- The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the field such as E&TC Engineering

**Course Outcomes: After learning this course students will be able to**

| | |
|---|---|
| **1** | Demonstrate the knowledge of Electrical Insulating Materials with its applications. |
| **2** | Demonstrate the knowledge about Dielectric Strength and Insulation Breakdown for various engineering applications. |
| **3** | Apply the knowledge of crystallography to study of crystal structure |
| **4** | Apply the knowledge Solid Solutions and Two-Phase Solids. |
| **5** | Demonstrate the concept of the battery with its applications |
| **6** | Demonstrate the concepts of spectroscopy and thermogravimetry for various engineering applications. |

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| **UNIT – I** | Electronic Materials 1 | **(06 Hours)** |
| | Electrical Insulating Materials: Introduction - Requirements. Classification based on Substances: Gaseous, Liquid and Solid Insulating Materials. Preparation, Properties and Applications of Ceramic Products: White Wares and Glass - Transformer Oil. Electrical Resistivity: Factors influencing Electrical Resistivity of Materials - Composition, Properties and Applications of High Resistivity Materials: Manganin - Constantan - Molybdenum Disilcide – Nichrome. | |
| | | |
| **UNIT – II** | Electronic Materials 2 | **(06 Hours)** |
| | Dielectric Strength and Insulation Breakdown: Dielectric Strength: Definition, Dielectric Breakdown and Partial Discharges: Gases, Dielectric Breakdown: Liquids, Dielectric Breakdown: Solids, Capacitor Dielectric Materials: Typical Capacitor Constructions, Dielectrics: Comparison. Piezoelectricity, Ferroelectricity, and Pyroelectricity: Piezoelectricity: Quartz Oscillators and Filters,Ferroelectricity, and Pyroelectricity Crystals, Introduction to Compound Semiconductors. | |
| | | |
| **UNIT - III** | Electronic Materials 3 | |
| | The Crystalline State: Types of Crystals, Crystal Directions and Planes, Allotropy and Carbon, Crystalline Defects and Their Significance: Point Defects: Vacancies and Impurities, Line Defects: Edge and Screw Dislocations, Planar Defects: Grain Boundaries, Crystal Surfaces and Surface Properties, Stoichiometry, Nonstoichiometric, and Defect Structures, Single- Crystal Czochralski Growth. Glasses and Amorphous Semiconductors: Glasses and Amorphous Solids, Crystalline and amorphous Silicon. | **(06 Hours)** |
| | | |
| **UNIT -IV** | Phase rule and Polymers | **(06 Hours)** |
| | Solid Solutions and Two-Phase Solids: Isomorphous Solid Solutions: Isomorphous Alloys, Phase Diagrams: Cu–Ni and Other Isomorphous Alloys, Binary Eutectic Phase Diagrams and Pb–Sn Solders. Polymers, Preparation, Properties and Applications of SF6, Epoxy Resin, Conduction Mechanism, Preparation of Conductive Polymers, Polyacetylene, Poly (P- Phenlylene), Polyhetrocyclic Systems, Polyaniline, Poly (Phenylene Sulphide), Poly (1,6-Heptadiyne), | |

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| | Applications. | |
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| **UNIT -V** | Electrochemistry | **(06 Hours)** |
| | Introduction, Acids and Bases, Concept of pH and pOH and Numerical Electrode Potential, Electrochemical Cell, Concentration Cell, Reference Electrodes, Overvoltage, Fuel Cells, Construction and Working of - Acid and Alkaline Storage Battery, Dry Cell, Coin Cell Batteries, Ni-Cd Batteries, Ni-MH Batteries, Li-Ion Batteries, Li-Po Batteries. | |
| | | |
| **UNIT -VI** | Instrumental Methods of Analysis | **(06 Hours)** |
| | Introduction, Absorption of Radiation, Instrumentation and Applications of UV-Visible Spectrophotometer and IR Spectrophotometer. Thermal Methods of Analysis TGA, DTA, DSC, Sensors: Oxygen and Glucose Sensor. | |

**Term Work:**

1. To measure the absorbance of the sample at different wavelengths.
2. Verification of Beer-Lambert's Law.
3. Determination of Viscosity Average Molecular Weight of Polymer
4. Determination of Viscosity of Organic Solvents
5. To find the tensile strength of polymer.
6. To determine the pH value of given solutions using pH meter.
7. To determine pH of soil
8. To find EMF of the cell.
9. To calculate the Equilibrium constant.
10. To predict the spontaneity of the cell reaction.
11. To learn the specific charge/discharge characteristics of a Lithium- ion (Li- ion) battery through experimental testing of a remote triggered Li- ion Battery.
12. To Prepare Phenol formaldehyde/Urea formaldehyde resin.
13. To study set up of Daniel Cell

| **Topics for projets based learning*** |
|---|
| 1. To Prepare and for synthesis of the following polymers,<br><br>a. Bakelite<br><br>b. Polystyrene<br><br>c. Epoxy Resin |
| 2. Synthesis properties and applications of polymer. |
| 3. To Prepare one component system with an example |
| 4. To Prepare two component system with an example 5. How to Make a Battery with Metal, Air, and Saltwater 6. Use a Microbial Fuel Cell to Create Electricity from Waste |
| 7. To Prepare fuel cell |
| 8. To prepare lead acid storage battery. 9. To prepare Oxidic Nanomaterials for High Density Storage in Li-ion Batteries |
| 10 Electrochemical forming is a unique additive manufacturing method which uses electrochemical technologies to manufacture, layer-by-layer, parts of complex geometry. |
| 11. The materials chemistry and electrochemistry of the lithium-air battery |
| 12. . Challenges facing all-solid-state batteries |
| 13. The materials chemistry and electrochemistry of lithium and sodium-ion batteries |
| 14 Electroplating- the principles, how different metals can be used and the practical applications. |
| 15. Electroplating, Metal Polishing, Anodizing, Phosphating Metal Finishing |
| and Powder Coating Projects |
| *Students in a group of 3 to 4 shall complete any one project from the above list |
| |
| |
| **Text Books:** |
| 1. Polymer Science and technology (2nd Edition), P. Ghosh, Tata McGRAW Hill, 2008. |
| 2. Polymers: Chemistry & Physics of Modern Materials (2nd edition) J.M.G.Cowie, Blackie Academic & Professional, 1994. |
| 3. A Text Book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co, 2004 |
| 4. Engineering Chemistry (16th Edition) Jain, Jain, Dhanpat Rai Publishing Company, 2013. |
| 5. Chemical sensors and Biosensors, Fundamentals and applications, Florinel Gabriel Banica, Wiley. |

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| 6. Microelectronics Circuits, Adel S. Sedra& Kenneth C. Smith,7th Edition, 2015, ISBN 978–0–19–933913–6,Oxford University Press |
| |
| **Reference Books:** |
| 1. Inorganic Chemistry (4th edition), D. F. Shrives and P. W. Atkins, Oxford University, Oxford, 2006. |
| 2. Reactions, Rearrangements and Reagents (4th edition), S. N. Sanyal, Bharti Bhawan (P & D), 2003. |
| 3. Applications of Absorption Spectroscopy of Organic Compounds (4th edition), John R. Dyer, Prentice Hall of India Pvt. Ltd., 1978. |

**Bharati Vidyapeeth**
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| **B. Tech. Sem. II: Electronics & Telecommunication Engineering**<br>**SUBJECT: - DIGITAL ELECTRONICS** | | |
|---|---|---|
| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 04 | End Semester Examination: 60 Marks | Credits: 04 |
| Practical: 02 | Internal Assessment: 40 Marks | |
| Tutorial: 00 | TW& OR: 50 Marks | Credit:01 |
| | | Total Credit: 05 |

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| **Course Pre-requisites:** | |
| | Fundamentals of Number Systems. |
| | |
| **Course Objectives:** | |
| **1.** | To present the Digital fundamentals, Boolean algebra, and its applications in digital systems |
| **2.** | To familiarize with the design of various combinational digital circuits using logic gates |
| **3.** | To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits |
| **4.** | To understand the various semiconductor memories and related technology |
| **5.** | To introduce the electronic circuits involved in the making of logic gates |
| | |
| **Course Outcomes: After learning this course students will be able to** | |
| **1** | Demonstrate the knowledge of Digital fundamentals and Boolean algebra. |
| **2** | Apply different minimization techniques on Boolean expression and design logic diagram |
| **3** | Analyze & design digital combinational circuits such as of multiplexers, demultiplexers, encoder, decoder, and arithmetic circuits |

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|---|---|---|
| **4** | Demonstrate the knowledge of operations of basic types of flip-flops & the design of FSM. | |
| **5** | Analyze & design digital Sequential circuits such as Shift Registers and Counters | |
| **6** | Classify the characteristics of different logic families, PLDs, Semiconductor memories and their applications. | |
| | | |
| **UNIT – I** | **Introduction to Digital Systems**: | **(08 Hours)** |
| | Introduction to Digital electronics Fundamentals<br>**Number Systems**: Introduction to Number Systems-Decimal, Binary, Octal, Hexadecimal, Conversion of number system, Representation of Negative Numbers,1's complement and 2's complement.<br>**Binary Arithmetic**: Binary addition, Binary subtraction, Subtraction using 1's complement and 2's complement, Binary multiplication, and division,<br>**Digital Codes**: BCD code, Excess-3 code, Gray code, Binary to Excess -3 code conversion and vice versa, ASCII code, EBCIDIC code.<br>**Logic Gates**: Logical Operators, Logic Gates-Basic Gates, Active high and Active low concepts, Universal Gates, and realization of other gates using universal gates, Gate Performance Characteristics and Parameters | |
| | | |
| **UNIT – II** | **Boolean Algebra**: | **(08 Hours)** |
| | Boolean Expressions and Truth Tables, Rules and laws of Boolean algebra, Demorgan's Theorems, Duality Theorem, Simplification of Boolean functions by Boolean laws, Shannon's Theorem.<br>**Boolean Function minimization Technique**: Introduction: Minterms and sum of minterm form, Maxterm and Product of maxterm form, Reduction technique using Karnaugh maps – 2/3/4/variable K-maps, grouping of variables in K-maps, minimize Boolean expression using K-map and obtain K-map from Boolean expression, Quine Mc Cluskey Method | |
| | | |
| **UNIT - III** | **Combinational Logic Design** | |
| | Introduction to Combinational Circuits, Adders: Half-Adder and Full-Adder, Subtractors-Half and Full Subtractor; Parallel adders: Ripple Carry and Look-Ahead Carry Adders. | **(08 Hours)** |

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|---|---|---|
| | BCD adder, BCD subtractor, Parity Checker/Generator, Multiplexer, Demultiplexer, Encoder, Priority Encoder; Decoder, BCD to Seven segment Display Decoder, ALU, Code converters, Magnitude comparators | |
| | | |
| **UNIT -IV** | **Sequential Logic Design** | **(08 Hours)** |
| | Introduction to Sequential Circuits: 1 Bit Memory Cell, Latches: SR latch, Gated latch,Flip-Flops: Types of Flip Flops -RS, T, D, JK, Triggering of Flip Flops, Master-Salve JK Flip flop, Characteristic table of Flip-flop, excitation table of Flip-flop, Study of timing parameters of flip-flop. | |
| | | |
| **UNIT -V** | **Shift Registers and Counters**: | **(08 Hours)** |
| | Data transmission in shift resister: SISO, SIPO, PISO, PIPO, Bidirectional shift register, universal shift registers. Counters: synchronous counter and asynchronous counter.<br><br>**Introduction to FSM**: Moore and Mealy State machine, state machine as a sequential controller. Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization, Effect of clock skew and clock jitter on synchronous designs (Metastability) | |
| | | |
| **UNIT -VI** | **Logic Families and Memory Technology:** | **(08 Hours)** |
| | **Logic Family**: Digital IC specification terminology, Logic families: TTL, CMOS, ECL families, Interfacing of TTL to CMOS & CMOS to TTL.<br><br>**Programmable logic devices**: Study of PROM, PAL, PLAs. Designing combinational circuits using PLDs.<br><br>**Semiconductor memories:** Classification and characteristics of memory, different types of RAMs, ROMs and their applications | |
| | | |
| **List of Practicals to be performed in the laboratory** | | |

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|---|
| 1. Study of basic gates using TTL, CMOS: 7432, 4011, 4050, 4070,4071,40106 and Universal Gates. |
| 2. K map-based implementation of combinational logic |
| 3. Design and implementation of Half and Full Adder, Half and Full Subtractor |
| 4. Study of four-bit parallel Adder / Subtractor using IC 7 |
| 5. Design and implementation of Code Converters (Binary to Gray, Excess 3 to Binary) |
| 6. Design and implementation of Magnitude Comparator |
| 7. Implementation of combinational logic using MUX |
| 8. Study of Decoder and DEMUX |
| 9. Study of 7 segment decoder driver. |
| 10. Study of Flip Flops (SR FF, D FF, JK FF, T FF) |
| 11. Study of Shift Registers |
| 12. Study of Up-Down Counter and Johnson Counter. |
| 13. Study of Static I/O and transfer Characteristic of TTL |
| **Note**: The term work shall be the record of minimum eight experiments performed from the above list |
| |
| **Topics for projets based learning*** |
| 1.Survey report of basic gates ICs 7432, 4011, 4050, 4070,4071,40106 |
| 2. Implement combinational logic Circuit of given Boolean Equation. |
| 3. Implement Half Adder and Half Subtractor. |
| 4. Implement Full Adder using two Half Adders |
| 5. Build 4-bit parallel Adder / Subtractor using IC. |
| 6. Build Code Converters: Binary to Gray |
| 7. Build Code Converters: Excess 3 to Binary) |
| 8. Implement Two Bit Magnitude Comparator using IC 7485 |
| 9. Implement given combinational logic using MUX |
| 10. Implement 7 segment decoder driver using IC 7447. |
| 11. Build a Decade counter and Up-Down Counter. |
| 12. Build a Shift Registers: SISO and SIPO |
| 13. Implement the Johnson Counter and Ring Counter. |

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| 14.Survey Report on Static I/O and transfer Characteristic of TTL and CMOS. |
| 15. Implement given Boolean Function using PLA. |
| *Students in a group of 3 to 4 shall complete any one project from the above list |
| |
| **Text Books:** |
| 1. R.P. Jain, ―Modern digital electronics‖, 3rd edition, 12threprint Tata McGraw Hill Publication |
| 2. Anand Kumar, ―Fundamentals of digital circuits‖ 1st edition, Prentice Hall of India, 2001 |
| 3. P.Raja ,- Digital Electronics , Second Edition,Scitech Publication (India) Pvt.Ltd. |
| |
| **Reference Books:** |
| 1. A.P. Malvino, D.P. Leach 'Digital Principles & Applications'' –Vith Edition-Tata Mc Graw Hill, Publication. |
| 2. J.F.Wakerly "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2 |
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**Bharati Vidyapeeth**
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| **B. Tech. Sem. II: Electronics & Telecommunication Engineering**<br>**SUBJECT: - SEMICONDUCTOR DEVICES AND CIRCUITS-I** | | |
|---|---|---|
| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 04 | End Semester Examination: 60 Marks | Credits: 04 |
| Practical: 02 | Internal Assessment: 40 Marks | |
| Tutorial: 00 | TW & PR: 50 Marks | Credit: 01 |
| | | Total Credit: 5 |

| **Course Pre-requisites:** | |
|---|---|
| | Elementary Electronics, EDA Tool Practice |

| **Course Objectives:** | |
|---|---|
| 1. | To introduce the methods of analysis, design, and simulation of diode circuits |
| 2. | To introduce the methods of analysis, design, and simulation of BJT biasing circuits |
| 3. | To introducemethods to analyze and design and simulate BJT amplifier circuits |
| 4. | To introduce methods to analyze and design and simulate JFET circuits |
| 5. | To introduce methods to analyze and design and simulate MOSFET circuits |
| 6. | To introduce the concept ofcurrent mirror and transistorized voltage regulator circuits |

| **Course Outcomes: After learning this course students will be able to** | |
|---|---|
| **1** | Analyze and design the diode circuits |
| **2** | Analyze and design the BJT biasing circuits |

| | | |
|---|---|---|
| **3** | Analyze and design the BJT amplifier circuits | |
| **4** | Analyze and design the JFET circuits | |
| **5** | Analyze and design the MOSFET circuits | |
| **6** | Analyze and design the current mirror and transistorized voltage regulator circuits | |
| | | |
| **UNIT – I** | **DIODE CIRCUITS** | **(08 Hours)** |
| | Analysis and design of Rectifier circuits (HWR, FWR, Bridge, Dual Complementary), Capacitor input filter, Clippers, Clampers, Voltage Multipliers, Special diodes (Zener diodes, Schottky diodes, Gold-diffused diodes), Switching circuits, Simple shunt regulator using Zener diode (analysis and design) | |
| | | |
| **UNIT – II** | **BJT CIRCUITS I** | **(08 Hours)** |
| | Need of biasing circuits, Analysis, and design of BJT biasing circuits like fixed bias, collector to base bias, voltage divider bias, split-supply bias, Concept of DC load line, Concept of stability factor, Derivation of stability factor | |
| | | |
| **UNIT - III** | **BJT CIRCUITS II** | **(08 Hours)** |
| | Concept of AC load line, BJT as two-port networks, BJT Models small signal models (h-parameter, Ebers-Moll, hybrid –pi and T), Analysis of CE, CB, CC Amplifiers (Derivation of Zi, Zo, Av, Ai and Ap), Frequency response of BJTamplifiers,Single stage CE voltage amplifier design, large signal BJT model, BJT as switch, power BJT | |
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| **UNIT -IV** | **JFET CIRCUITS** | **(08 Hours)** |

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|---|---|---|
| | Analysis and design of JFET biasing (Fixed bias, Self-bias, Voltage divider bias), JFET models, Analysis of CS, CD, CG Amplifiers, Frequency response of JFET amplifiers, Single stage CS amplifier design, FET as switch. | |
| | | |
| **UNIT -V** | **MOSFET CIRCUITS (8 Hours)** | **(08 Hours)** |
| | EMOSFET biasing (Fixed bias, negotiated bias/Voltage divide bias), DC load line,MOSFET models, Analysis of MOSFET amplifiers, Single stage CS amplifier design, Frequency response of MOSFET amplifiers,MOSFET as switch, Power MOSFET | |
| | | |
| **UNIT -VI** | **OTHER TRANSISTOR CIRCUITS** | **(08 Hours)** |
| | Concept of current mirror, Analysis of Widlar current source (BJT and MOSFET), Wilson current mirror (BJT and MOSFET),Gilbert gain cell,Series pass transistor voltage regulator,Variable output voltage regulator | |

**List of experiments:**

1. Observe and measure outputs for rectifier circuits
2. Observe and measure outputs clipper, clamper, voltage multiplier circuits
3. Construct BJT biasing circuits (Fixed, Collector to base bias circuit, Voltage divider bias circuit and verify the Q-point.
4. Measure and plot the frequency response of single stage CE voltage amplifier
5. Construct FET biasing circuits (Fixed, self-bias circuit, Voltage divider bias circuit and verify the Q-point.
6. Measure and plot the frequency response of single stage JFET CS voltage amplifier

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| 7. Construct MOSFET biasing circuits (Fixed, Voltage divider bias circuit and verify the Q-point. |
| 8. Measure and plot the frequency response of single stage MOSFET CS voltage amplifier |
| 9. Construct BJT and MOSFET switch circuits and compare the performance (power dissipation, transient response) |
| 10. Measure and plot regulation characteristics of shunt regulator, series pass transistorized voltage regulator |
| |
| **Topics for projets based learning*** |
| 1.Build a voltage quadrupler circuit |
| 2. Build a low current, regulated power supply |
| 3. Build a diode, BJT tester |
| 4. Latching burglar alarm |
| 5. Moisture detector |
| 6. Voltage controlled variable gain amplifier |
| 7. Wind shield wiper control |
| 8. Metal detector |
| 9. Car battery charger |
| 10. Under-voltage/Over-voltage indicator |
| 11. Crystal oscillator |
| 12. DC Flasher with adjustable ON/OFF times |
| 13. Emergency Light |
| 14. Simple intercom |
| 15. Water level indicator with alarm |
| *Students in a group of 3 to 4 shall complete any one project from the above list |
| |
| **Reference Books:** |
| 1. Fundamentals of Electronic Devices and Circuits, David A. Bell, 5th Edition,2008, ISBN:0195425235, 9780195425239, Oxford University Press. |
| 2. Microelectronics Circuits, Adel S. Sedra& Kenneth C. Smith,7th Edition, 2015, ISBN 978–0–19–933913–6, Oxford University |

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| **B. Tech. Sem. II: Electronics & Telecommunication Engineering**<br>**SUBJECT: - PYTHON PROGRAMMING** | | |
|---|---|---|
| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 04 | End Semester Examination: 60 Marks | Credits: 04 |
| Practical: 02 | Internal Assessment: 40 Marks | |
| Tutorial: 00 | TW: 50 Marks | Credits :01 |
| | | Total Credits :5 |

**Course Pre-requisites:**

Basic programming.

**Course Objectives:**

- This course will introduce the concepts of Python language as software development tool.
- To gain practical experience in Python programming including fundamental concepts, OOPs, Exception handling, Graphics.

**Course Outcomes: After learning this course students will be able to**

| | |
|---|---|
| **1** | Apply the basic concepts of Python programming. |
| **2** | Write basic programs using control statements. |
| **3** | Use exception handling in Python programs. |
| **4** | Apply object-oriented programming concepts in Python. |
| **5** | Write Python program for simple applications using existing libraries. |

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| **6** | Write simple graphics programs. | |
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| **UNIT – I** | **Python Basics** | **(08 Hours)** |
| | Python Introduction, Python Installation, Relational operators, Bit-wise operators, Logical operators Python Data Types - Numbers (Integer, Floating Point, Complex Numbers), Strings, Lists, Tuples, Dictionaries, List comprehensions, Python Control Statements | |
| | | |
| **UNIT – II** | **Python Core** | **(08 Hours)** |
| | Python Modules & Functions, Lambda, Scope, Python File Handling, Python Regular Expressions, Sequence Types, Input and output, Recursion, Flow Control, Immutable and Mutable Objects | |
| | | |
| **UNIT - III** | **Python Exception Handling** | **(08 Hours)** |
| | Meaning of Exception, Exception Hierarchy Diagram, Types of Exception- Checked Exception, Unchecked Exception, Exception Handling -TRY, CATCH, FINALLY, Raising an Exception, User Defined Exceptions | |
| | | |
| **UNIT -IV** | **OOPS, UML & OOAD** | **(08 Hours)** |
| | Object Oriented Programming (OOPs) - Class & Object, Abstraction, Inheritance, Polymorphism, Encapsulation, Object Oriented (OO) Modelling, Object Oriented Analysis & Design (OOAD) | |
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| **UNIT -V** | **Python Multi-Threading** | **(08 Hours)** |
| | Threads in Python (a) Kernel Threads (b) User Space Threads or User Threads, Advantages of Threading, Thread States: Life Cycle of a Thread, Thread & Threading Modules, Forking & Synchronizing Threads,Networking | |
| | | |
| **UNIT -VI** | **Python Packages and Graphics** | **(08 Hours)** |
| | Numpy: Introduction, data-types, arrays, arrays manipulation, plotting, testing and debugging, Sharing Data using Sockets, Simple applications of python, Scipy, TKinter | |

**Term Work:** Any 8 of below given list

1. Evaluate any given expression involving arithmetic operators.
2. Evaluate any given expression involving logical operators.
3. Develop python functions to produce given patterns such as diamond, pyramid, triangles.
4. Usage of different functions present in “math” module.
5. Write a function that takes two numbers as input parameters and returns their least common multiple.
6. Write a function that takes two numbers as input parameters and returns their greatest common divisor.
7. Write a program that takes a sentence as an input and displays the number of words in the sentence.
8. Ways to sort list of dictionaries by values in Python – Using lambda function.
9. Write program using “matplotlib” module.
10. Write program using “NUMPY” module.
11. Write program using “Scipy” module.

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| 12. Write program using “TKinter” module. |
| |
| **Topics for projets based learning*** |
| 1. Create a Tic-tac-toe game (GUI optional) |
| 2. Build a password encryptor with Hashing. |
| 3. Build Product Price Comparison using webscraping. |
| 4. Create a google image downloader |
| 5. Create a Snake & Ladders game (GUI optional) |
| 6. Build a contact book using indexing |
| 7. Build What’s the word game |
| 8. Build Rock, Paper & Scissors game |
| 9. mp3 file organizer - rebuild a music library's structure from mp3 tag data, and reorganize them in folders. Use Multithreading concepts |
| 10. Create an FTP server |
| 11. Build a functional calculator (GUI optional) |
| 12. Python Email Automation |
| 13. Create a Currency converter (GUI optional) |
| 14. Face Detection using Cv2 |
| 15. Biometric Fingerprint detection |
| *Students in a group of 3 to 4 shall complete any one project from the above list |
| |
| **Text Books:** |
| 1.Sheetal Taneja,NaveenKumar,PythonProgramming,A modular approach,Pearson publication |
| **Reference Books:** |
| 1. Learning Python 5th Edition, Oreilly Publication |
| 2. Beginning Python: From Novic to professional, by Magnus Lie Hetland, Third Edition, Appress Publication |
| 3. Learning with Python by Allen Downey, Jeffrey Elkner, Chris Meyers, Dreamtech Publication |

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| **B. Tech. Sem. II: Electronics & Telecommunication Engineering**<br>**SUBJECT: - COMPUTER AIDED DRAFTING** | | |
|---|---|---|
| **TEACHING SCHEME:** | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 00 | End Semester Examination: 00 | Credits:00 |
| Practical: 04 | Internal Assessment: 00 | |
| Tutorial: 00 | TW: 50 Marks | Credit: 02 |
| | | Total Credit: 02 |

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| **Course Pre-requisites:** | |
| | Mathematics (Class XII) |

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| **Course Objectives:** | |
| **1.** | To teach the studentsFundamentals of engineering drawing and curves |
| **2.** | To introduce the students Isometric views and projection |
| **3.** | To teach the studentsProjections of points, lines, planes & solids |
| **4.** | To introduce the students Use of CAD tools. |

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| **Course Outcomes: After learning this course students will be able to** | |
| **1** | Apply dimensioning methods and drawing of engineering curves. |
| **2** | Draw orthographic projections using I$^{st}$angle and III$^{rd}$angle projection Methods*. |
| **3** | Draw Isometric views from given orthographic projections*. |

| | | |
|---|---|---|
| **4** | Draw projection of Lines, its traces and projections of planes*. | |
| **5** | Createprojection of different solids*. | |
| **6** | Develop lateral surfaces of solids*. | |
| *Using CAD tools | | |
| | | |
| **UNIT – I** | **Lines and Dimensioning in Engineering Drawing and Engineering Curves** | |
| | Different types of lines used in drawing practice, Dimensioning–linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.<br>Ellipse by Arcs of Circles method, Concentric circles method. Involutes of a circle,Cycloid, Archimedean Spiral, Helix on cone & cylinder.<br>Introduction to Auto CAD commands. | |
| | | |
| **UNIT – II** | **Orthographic Projection** | |
| | Basicprinciples of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only.Procedurefor preparing scaled drawing, sectional views,and types of cutting planes and their representation, hatching of sections.<br>(Also using AutoCAD commands) | |
| | | |
| **UNIT - III** | **Isometric Projections** | |
| | Isometric view, Isometric scale to draw Isometric projection, Non-Isometriclines, and construction of Isometric view from given orthographic views and to construct Isometric view. | |

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| | (Also using AutoCAD commands) | |
| | | |
| **UNIT -IV** | **Projections of Points & Lines** | |
| | Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines. (Also using AutoCAD commands) | |
| | | |
| **UNIT -V** | **Projections of Planes** | |
| | Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP.<br>(Also using AutoCAD commands) | |
| | | |
| **UNIT -VI** | **Projections of Solids** | |
| | Projection of prism,pyramid, cone, and cylinder by rotation method.<br>(Also using AutoCAD commands) | |
| | | |
| **List of sheets:** | | |
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| 1. Types of lines, Dimensioning practice, free-hand lettering, 1st and 3rd angle methods symbol. | | |
| 2. Engineering curves. | | |
| 3. Orthographic Projections. | | |
| 4. Isometric views. | | |

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| 5. Projections of Points and Lines and planes. |
| 6. Projection of Solids. |
| 7. Enclosure design |
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| **Term work:**<br>Term work shall consist of half imperial size or A2 size (594 mm x 420 mm) sheets.<br>All sheets should complete in drawing hall manually and sheet no 2-7 also completed using AutoCAD with printout onA2 size papers. |
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| **Text Books/Reference Books:** |
| 3. “Elementary Engineering Drawing”, N. D. Bhatt, CharotarPublishing house, Anand India, |
| 4. “Text Bookon Engineering Drawing”, K. L. Narayana&P. Kannaiah, Scitech Publications, Chennai. |
| 5. “Fundamentals of Engineering Drawing”, Warren J. Luzzader, Prentice Hall of India, New Delhi, |
| 6. “Engineering Drawing and Graphics”, Venugopal K., New Age International publishers. |
| 7. "Engineering Drawing",M. B. Shah and B.C. Rana,1st Ed, Pearson Education, 2005 |
| 8. "Engineering Drawing (Geometrical Drawing)", P. S. Gill, 10thEdition, S. K. KatariaandSons, 2005 |
| 9. "Engineering Drawing", P. J. Shah, C. Jamnadasand Co.,1stEdition,1988 |