SHIVAJI UNIVERSITY, KOLHAPUR
416 004, MAHARASHTRA
PHONE : EPABX – 2609000, BOS Section – 0231-2609094, 2609487
Web : www.unishivaji.ac.in Email: bos@unishivaji.ac.in
शिवाजी विद्यापीठ, कोल्हापूर ४१६ ००४, महाराष्ट्र
दूरध्वनी - इपीबीएक्स - २०६०९०००, अभ्यासमंडळे विभाग : ०२३१- २६०९०९४, २६०९४८७
वेबसाईट : www.unishivaji.ac.in ईमेल : bos@unishivaji.ac.in

Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

**SU/BOS/Sci & Tech/ 316** **Date: 23/05/2025**

**To,**

The Director,
School of Engineering and Technology,
Shivaji University, Kolhapur.

**Subject:** Regarding revised syllabus of **B. Tech.** Part - III (Sem - V & VI) degree **Programme (Deparment of Technolgy)** under the Faculty of Science and Technology as per NEP 2020.

**Sir/Madam,**

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, Nature of Question paper and equivalence of B. Tech. Part - III (Sem - V & VI) under the Faculty of Science & Technology as per NEP 2020.

| No. | Course Syllabus |
|---|---|
| 1 | Civil Engineering |
| 2 | Mechanical Engineering |
| 3 | Computer Science and Technology |
| 4 | Chemical Engineering |
| 5 | Electronics and Telecommunication Engineering |
| 6 | Food Technology |

This Syllabus, shall be implemented from the academic year **2025-26** onwards. A soft copy containing the syllabus is attached herewith and it is available on university website **www.unishivaji.ac.in NEP-2020@suk (Online Syllabus).**

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October/ November 2025 & March / April 2026. These chances are available for repeater students, if any

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

**Yours faithfully,**

Dr. S. M. Kubal
Dy. Registrar

**Copy to: for Information and necessary action**

| | | | |
|---|---|---|---|
| 1 | The I/c Dean, Faculty of Science & Technology | 6 | Appointment Section A & B |
| 2 | Director, Board of Examinations & Evaluation | 7 | Affiliation Section (T.1) (T.2) |
| 3 | The Chairpersan, Respective Board of Studies | 8 | P.G.Admission Section, /P.G Seminar Section |
| 4 | OE 4 Exam Section, | 9 | Computer Centrev/ IT Cell |
| 5 | Eligibility Section, | 10 | Internal Quality Assorance Cell (IQAC) |

Shivaji University
Vidya Nagar, Kolhapur, Maharashtra 416004

# Department of Technology

**As per NEP2020 guidelines**

## Third Year B. Tech (Electronics and Telecommunication Engineering), Detailed Curriculum 2025-26 onwards

## A. Component wise distribution of credits

**(Expected range of credits as per AICTE & NEP2020 guidelines is 160-176)**

| Sr. No. | Category Suggested | Course Code | No. of Credits | Components % |
|---|---|---|---|---|
| 1. | Humanities and Social Sciences including Management & Environment Courses | HSMEC | 04 | 2.27 |
| 2. | Indian Knowledge System | IKS | 05 | 2.84 |
| 3. | Ability Enhancement Course | AEC | 03 | 1.70 |
| 4. | Value Education Courses | VEC | 02 | 1.14 |
| 5. | Basic Science courses | BSC | 27 | 15.34 |
| 6. | Engineering Science Courses including workshop, drawing, basics of civil/electrical/mechanical/computer etc. | ESC | 34 | 19.32 |
| 7. | Professional Core Courses | PCC | 54 | 30.69 |
| 8. | Professional Elective Courses relevant to chosen specialization/branch | PEC | 06 | 3.41 |
| 9. | Open subjects – Electives from other technical and /or emerging subjects | OEC | 12 | 6.82 |
| 10. | Project , Seminar and Internship | PSI | 15 | 8.52 |
| 11. | Multidisciplinary Minor | MDM | 14 | 7.95 |
| 11. | Vocational and Skill Enhancement Courses | VSEC | Audit Courses | - |
| 12. | Project Based Learning | PBL | | |
| 13 | Mandatory Audit Courses [Some other courses Decided at the Institute level but that do not get fit in the credits] | MAC (HSMEC)* | | |
| | Total | | 176 | **100** |

* Please note that most of the courses under HSMEC have been covered under audit courses.

## B. Engineering Graduate Attributes

1. Domain specific Engineering Knowledge
2. Problem Analysis Ability
3. Acquiring Skills that enable them to Design & Develop Solutions to the Problems
4. Capacity to investigate Complex Problems
5. Familiarity of using Modern Tools
6. Understanding Engineer's role and connectivity towards Society
7. Awareness about Environment & Sustainability
8. Practicing ethics and values
9. Ability to work as an Individual & in a Team also
10. Acquiring Communication skills
11. Becoming well verse with task of Project management & Finance aspects
12. Developing Lifelong Learning attitude

## C. B. Tech (Electronics & Telecommunication Engineering) Program: Vision, Mission, PEOs and POS.

**Vision**

To develop competent professionals in electronics and communication engineering to serve industry, academia and society.

**Mission**

- To provide strong foundation of basic sciences, mathematics and electronics engineering to graduates.
- To create awareness of social, cultural, technological issues and inculcate strong ethical principles among graduates.
- To develop technological professionals with leadership, management and team qualities.
- To pursue continuous improvement in knowledge and skills.

**Program Educational Objectives (PEOs)**

The Program Educational Objectives (PEOs) provides a clear vision for the long-term achievements of your program's graduates, guiding curriculum design and teaching practices to align with industry and societal needs. PEOs also serve as benchmarks for assessing program success and ensuring that graduates are prepared for their careers and lifelong learning.

PEO 1- Providing strong fundamentals to graduates in Mathematics, Science and Engineering to enable them to provide solutions for problems in electronics, communications and other relevant disciplines.

PEO 2- Provide sound theoretical and practical knowledge in electronics and communication engineering to enable them to contribute in growth of industry and progress of society.

PEO 3- Development of analytical and thinking abilities for research and development activities, leadership and entrepreneurship.

PEO 4- Motivate the qualities required for team work, inter-personal communications, and professional skills and to act as good human being and responsible citizenship.

**Program Outcomes (POs)**

Program Outcomes provide a clear roadmap for the education and development of Electronics & Telecommunication engineering students, ensuring that your program is effective, relevant, and aligned with industry standards and expectations.

1. **Domain Specific Engineering Knowledge:** Apply principles from mathematics, physics, chemistry, and engineering to solve complex Electronics & Telecommunication engineering problems.
2. **Problem Analysis Ability:** Develop skills to analyse and solve problems encountered in Electronics & Telecommunication and allied industries and consultancy services.
3. **Acquiring Skills to Design/Develop Solutions to Problems:** Design and manage Electronics & Telecommunication processes and systems while considering current and emerging industrial practices.
4. **Capacity to Investigate Complex Problems:** Identify new research areas and utilize advanced research methods to analyse data and draw conclusions, aiming for innovative solutions in Electronics & Telecommunication engineering.
5. **Modern Tool Usage:** Select and apply modern engineering and IT tools, including modeling and prediction techniques, to complex engineering tasks.
6. **The Engineer's Connectivity with Society:** Assess and address societal, health, safety, legal, and cultural issues with informed engineering judgement.
7. **Environment and Sustainability Awareness:** Understand and integrate environmental impacts and sustainability into engineering solutions.
8. **Practicing Ethics and Values:** Uphold professional ethics and responsibilities in engineering practice.

9. **Ability to Work as an Individual and in Team:** Work effectively both individually and as a part of diverse and multidisciplinary teams.
10. **Acquiring Communication Skills:** Communicate complex engineering information effectively through written reports, presentations, and interpersonal communication.
11. **Well Versed with Task of Project Management and Finance Aspects:** Apply engineering and management principles to lead and manage projects in multidisciplinary environments.
12. **Life-Long Learning Attitude:** Recognize and engage in lifelong learning to stay abreast of technological advancements in engineering.

# Shivaji University, Kolhapur
## Department of Technology

### Third Year B.Tech (Electronics & Telecommunication Engineering), Semester- V

### Teaching & Evaluation Scheme

| S.N. | Category | Code | Course Title | Hours per week | | | Contact Hours | Credits | Evaluation scheme | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Theory | Practical |
| | | | | L | T | P | | | ISE:ESE | IE:EE |
| 1. | Engineering Science Course | ESC311 | Electromagnetic Fields | 03 | 01 | - | 04 | 04 | 30:70 | 50:00 |
| 2. | Professional Core Course | PCC311 | Power Electronics | 03 | - | 02 | 05 | 04 | 30:70 | 00:50 |
| 3. | Professional Core Course | PCC312 | Microcontrollers | 03 | - | 02 | 05 | 04 | 30:70 | 00:50 |
| 4. | Professional Core Course | PCC313 | Digital Signal Processing | 03 | - | - | 03 | 03 | 30:70 | 00:00 |
| 5. | Professional Core Course | PCC314 | Advanced Programming Techniques | 02 | - | 02 | 04 | 03 | 30:70 | 00:50 |
| 6. | MDM Course | MDM 311 | Multidisciplinary Minor Course II* | 03 | - | - | 03 | 03 | 30:70 | 00:00 |
| 7. | Project Based Learning | PBL311 | Mini Project –I | - | - | 02 | 02 | 01 | - | 50:00 |
| 8. | Ability Enhancement Courses | AEC311 | Introduction to Foreign Language | 01 | - | - | 01 | 01 | - | 50:00 |
| | | | | | | | - | **23** | **600** | **300** |
| 9. | Mandatory Audit Course | MAC311 | Aptitude Enhancement Course II | 02 | - | - | 02 | IE at Course in charge end | | |
| | | | **Total Hours** | 20 | 01 | 08 | **29** | - | - | - |

# Shivaji University, Kolhapur
## Department of Technology

### Third Year B. Tech (Electronics and Telecommunication Engineering), Semester- VI

### Teaching and Evaluation Scheme

| S.N. | Category | Code | Course Title | Hours per week | | | Contact Hours | Credits | Evaluation scheme | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Theory | Practical |
| | | | | L | T | P | | | ISE:ESE | IE:EE |
| 1. | Engineering Science Course | ESC321 | Antenna & Wave Propagation | 03 | - | 02 | 05 | 04 | 30:70 | 50:00 |
| 2. | Professional Core Course | PCC321 | Control Systems | 03 | 01 | - | 04 | 04 | 30:70 | 50:00 |
| 3. | Professional Core Course | PCC322 | VLSI Design | 03 | - | 02 | 05 | 04 | 30:70 | 00:50 |
| 4. | Professional Core Course | PCC321 | Program Elective –I | 03 | - | 02 | 05 | 04 | 30:70 | 00:50 |
| 5. | Program Elective Course | OE 321 | Open Elective-I | 03 | - | - | 03 | 03 | 30:70 | 00:00 |
| 6. | MDM Course | MDM 321 | Multidisciplinary Minor Course III* | 03 | - | - | 03 | 03 | 30:70 | 00:00 |
| 7. | Ability Enhancement Course | AEC321 | Mini Project & Industrial Visit | - | - | 02 | 02 | 01 | | 50:50 |
| | | | | | | | - | **23** | **600** | **300** |
| 8. | Vocational and Skill Enhancement Course | VSEC321 | Design Thinking & Innovation – III | 01 | - | - | 01 | IE at Course in charge end | | |
| 9. | Mandatory Audit Course | MAC 321 | Aptitude Enhancement Course III | 02 | - | - | 02 | IE at Course in charge end | | |
| | | | **Total Hours** | 21 | 01 | 08 | **30** | - | - | - |

*Note: The MDM course will be from the chosen multidisciplinary title.

**List of Program Elective – I**

1. ARM & Embedded systems
2. Computer Networks
3. Optical Fiber Communication

**List of Open Elective – I**

1. Industrial Organization and Management
2. Professional Communication

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester V</td></tr>
<tr><td>Course Code</td><td colspan="5">ESC311</td></tr>
<tr><td>Course Category</td><td colspan="5">Engineering Science Course</td></tr>
<tr><td>Course title</td><td colspan="5">Electromagnetic Fields (Theory)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>01</td><td>--</td><td>04</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="3">ISE: 30</td><td>ESE: 70</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Engineering Mathematics 3, Analog and Digital Communication Engineering</td></tr>
<tr><td>Course Rationale</td><td colspan="5">The Electromagnetic Field course is designed to provide students with a fundamental understanding of electric and magnetic fields, their interactions, and their applications in modern engineering and technology.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Study of physical interpretation of vectors , integral and differential operators for electromagnetics.<br>2. Study of the physical interpretation and application of laws and theorems of electric fields<br>3. Describe the physical interpretation and application of laws and theorems of magnetic fields.<br>4. To know field equations from Maxwell’s Equations<br>5. To explain fields under time varying situations & effect of materials on electric and magnetic fields<br>6. To describe transmission line parameters and derive equation for transmission line</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">Upon successful completion of this course, the student will be able to:<br>1. Explain physical interpretation of vectors ,integral and differential operators for electromagnetics<br>2. Understand the physical interpretation and application of laws and theorems of electric fields<br>3. Describe the physical interpretation and application of laws and theorems of magnetic fields.<br>4. Develop field equations from Maxwell’s Equations<br>5. Analyse fields under time varying situations & effect of materials on electric and magnetic fields<br>6. Identify transmission line parameters and derive equation for transmission</td></tr>
</table>

| | |
|---|---|
| | line |

## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **Introduction**<br>Introduction and Significance of Electromagnetic Fields, Vector Analysis, Calculus, Coordinate Systems, Concepts of Gradient, Divergence and Curl. | 07 |
| 2 | **Electrostatic Field**<br>Coulomb's Law, Electric Field Intensity, Electric Field due to Distributed Charges, Flux Density, Gauss Law and Applications, Divergence Theorem, Work Done, Electric Potential, Potential Gradient, Electric Dipole, Polarization, Electrostatic Energy Density, Boundary Conditions for Electrostatic Field. | 06 |
| 3 | **Magnetostatic Field**<br>Biot-Savart Law, Ampere's Circuital Law and Application, Stoke's Theorem, Magnetic Flux Density, Magnetic Scalar & Vector Potential, Energy Stored in Magnetic Field, Boundary Conditions for Magnetic Field. | 07 |
| 4 | **Maxwell's Equations**<br>Continuity Equation for Static Conditions, Displacement Current, Faraday's Law, Inconsistency of Ampere's Law, Maxwell's Equations in Point and Integral Form, Maxwell's Equations for Time Varying Fields, Comparison of Field & Circuit Theory | 07 |
| 5 | **Uniform Plane Wave**<br>Wave Propagation in Perfect Dielectric, Lossy Dielectric and Conducting Media, Wave Equations for Sinusoidal Time Variations, Poynting Theorem and Power Flow in Electromagnetic Field, Skin Depth, Phase Velocity and Group Velocity. | 06 |
| 6 | **Transmission Lines**<br>Types of Transmission Lines, Transmission Line Equation, Transmission Line Parameters, The Terminated Transmission Line, Reflection Coefficient, VSWR, Group Velocity, Phase Velocity, Impedance Matching Techniques, Smith Chart and Applications. | 06 |
| **General Instructions:**<br>Based on the syllabus content students have to complete any one of the following activities: | | |

1. Simulation based small project work
2. Case study work
3. Site visit
4. Solve technical quiz

5. Solve home assignments

6. Question paper will be based on all six units covering of theory , derivations and numericals.

| Sr. No. | Reference Books |
|---|---|
| 1 | William Hayt, "Engineering Electromagnetics", Mc Graw Hill. |
| 2 | R.K. Shevgaonkar, "Electromagnetic Waves", Tata McGraw Hill India, |
| 3 | Matthew. N.O. Sadiku, "Elements of Electromagnetics", Oxford University Press |
| 4 | E.C. Jordan & K.G. Balmain, "Electromagnetic waves & Radiating Systems", Prentice Hall, India |
| 5 | K.D. Prasad, "Antenna & Wave Propagation" Satya Prakashan |
| 6 | N. Narayana Rao, "Elements of Engineering Electromagnetics", Prentice Hall |
| 7 | Griffiths David J, "Introduction to Electrodynamics", Pearson Education |
| **Sr. No.** | **Important web references** |
| 1 | https://swayam.gov.in/ |
| 2 | https://nptel.ac.in/ |

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester V</td></tr>
<tr><td>Course Code</td><td colspan="5">ESC311</td></tr>
<tr><td>Course Category</td><td colspan="5">Engineering Science Course</td></tr>
<tr><td>Course title</td><td colspan="5">Electromagnetic Fields (Tutorial)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>01</td><td>-</td><td>01</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="3">-</td><td>IE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Engineering Mathematics 3, Analog and Digital Communication Engineering</td></tr>
<tr><td>Course Rationale</td><td colspan="5">The Electromagnetic Field course is designed to provide students with a fundamental understanding of electric and magnetic fields, their interactions, and their applications in modern engineering and technology.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Study of physical interpretation of vectors , integral and differential operators for electromagnetics.<br>2. Study of the physical interpretation and application of laws and theorems of electric fields<br>3. Describe the physical interpretation and application of laws and theorems of magnetic fields.<br>4. To know field equations from Maxwell’s Equations<br>5. To explain fields under time varying situations & effect of materials on electric and magnetic fields<br>6. To describe transmission line parameters and derive equation for transmission line</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">Upon successful completion of this course, the student will be able to:<br>1. Explain physical interpretation of vectors ,integral and differential operators for electromagnetics<br>2. Understand the physical interpretation and application of laws and theorems of electric fields<br>3. Describe the physical interpretation and application of laws and theorems of magnetic fields.<br>4. Develop field equations from Maxwell’s Equations<br>5. Analyse fields under time varying situations & effect of materials on electric and magnetic fields<br>6. Identify transmission line parameters and derive equation for transmission</td></tr>
</table>

| | |
|---|---|
| | line |

## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| | **Course Content** | **Hours** |
|---|---|---|
| **1** | Examples on dot product, cross product and coordinate systems | **1** |
| **2** | Examples on curl, divergence and gradient | **1** |
| **3** | Examples on Coulomb's Law, Electric Field, Electric Flux Density, Potential | **1** |
| **4** | Gauss Law and application | **1** |
| **5** | Boundary Conditions for Electrostatic Field | **1** |
| **6** | Examples on Biot-Savart Law, Ampere's Circuital Law and Application | **1** |
| **7** | Boundary Conditions for Magnetic Field. | **1** |
| **8** | Maxwell's Equations in point and integral form, Maxwell's equation for time varying fields | **1** |
| **9** | Wave Propagation, Poynting Theorem and Power Flow, Skin Depth, Phase and Group Velocity | **1** |
| **10** | Transmission Line Parameters, Reflection Coefficient, VSWR | **1** |
| **11** | Any other tutorial based on above syllabus. | **1** |

**General Instructions:**

1. Minimum 8 tutorials should be carried out based on course contents. At-least one tutorial must be conducted on every unit.
2. Batch wise tutorials are to be conducted. The number of students per batch should be as per the practical batches.
3. Students should be encouraged to solve problems using different mathematical software's like MATLAB, Scilab etc.

| **Sr. No.** | **Reference Books** |
|---|---|
| 1 | William Hayt, "Engineering Electromagnetics", 8th Edition, Mc Graw Hill |

| | |
|---|---|
| 2 | Matthew. N.O. Sadiku, "Elements of Electromagnetics", Fourth Edition, Oxford University Press, First Indian Edition 2007 |
| 3 | R.K Shevgaonkar "Electromagnetic Waves", Tata McGraw-Hill |
| 4 | John D. Kraus, "Electromagnetics with Applications", Fifth edition, McGraw-Hill |
| 5 | C.A. Balanis "Advanced Engineering Electromagnetics", 2nd Edition, John Wiley & Sons |
| **Sr. No.** | **Important web references** |
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<table>
<tr><td>Year, Program, Semester</td><td colspan="6">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester V</td></tr>
<tr><td>Course Code</td><td colspan="6">PCC 311</td></tr>
<tr><td>Course Category</td><td colspan="6">Professional core course</td></tr>
<tr><td>Course title</td><td colspan="6">Power Electronics (Theory)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td colspan="2">Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>--</td><td>02</td><td colspan="2">05</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="3">ISE: 30</td><td colspan="2">ESE: 70</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="6">Electronics Circuit Design, Analog Electronics</td></tr>
<tr><td>Course Rationale</td><td colspan="6">The course contains power processing electronic circuits like controlled rectifiers, AC voltage controllers, DC-DC converters and inverters. Course introduces the basics of power semiconductor devices like SCRs, power BJTs, IGBTs and MOSFETs. The analysis of power circuits presented in detail along with the waveforms and control techniques</td></tr>
<tr><td>Course Objectives</td><td colspan="6">1. Explain the Difference between power devices and low power devices.<br>2. Explain internal mechanism, limitations of the different power devices<br>3. Analyze configurations of controlled rectifier circuit.<br>4. Analyze chopper circuits and its voltage control methods.<br>5. Explain different Inverter Circuits.<br>6. Explain different application of power electronics in industry</td></tr>
<tr><td>Course Outcomes</td><td colspan="6">1. Describe structure and working of power devices<br>2. Analyze triggering methods, Commutation methods and protection circuits used for SCR<br>3. Calculate different parameters of controlled rectifier<br>4. Calculate different parameters of chopper circuit<br>5. Describe different inverters and industrial application of power devices<br>6. Demonstrate and validate power electronics circuits in the laboratory</td></tr>
</table>

**Course Outcome and Program Outcome Mapping**

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **Power Devices & Driving Circuits**<br>Construction, working, V-I Characteristics: Power Diode, Power BJT, Schokkttey Diode, Diac, Triac, GTO, MOSFET, IGBT. | 07 |
| 2 | **Silicon Controlled Rectifier**<br>SCR, Construction, V-I Characteristics, gate triggering Characteristics, rating & specifications, SCR triggering methods- R, RC, UJT triggering (using pulse Transformer), PUT, SUS, SBS triggering methods. SCR Turn off method - Class A, Class B, Class C, Class D, Class E, & Class F, SCR protection circuits | 06 |
| 3 | **Single & Three Phase Controlled Rectifier**<br>1 Φ Half Wave, Full Wave and semi controlled Rectifier, 3 Φ Half, Full and Semi Controlled rectifier with and without freewheeling diode. Study and Analysis for R, RL, RLE loads of load voltage and current. 1 Φ and 3 Φ dual converter. | 07 |
| 4 | **Inverters**<br>Concept of inverter, types of inverters. Thyristorised inverters: series inverter, parallel inverter, IGBT based inverters: 1-phase half and full bridge inverter. 3-phase bridge inverter (120 and 180 mode of conduction) Voltage control of 1-phase and 3-phase inverter, harmonic reduction techniques | 07 |
| 5 | **Choppers**<br>IGBT based Choppers: Step up and Step down chopper, Type A, Type B, Type C, Type D and type E choppers, voltage control techniques of choppers (TRC). Case Study: DC to DC converter in Solar System | 06 |
| 6 | **Applications**<br>High frequency heating: Induction Heating, Electric welding: Introduction, Resistance welding, energy storage welding. Ultrasonic wave generation, AC voltage stabilizer, UPS - basic configuration and types. Electric Vehicle charging system | 06 |

**General Instructions:**

Based on the syllabus content students have to complete any one of the following activities:

1. Simulation based small project work
2. Case study work
3. Site visit
4. Solve technical quiz

5. Solve home assignments
6. Question paper will be based on all six units covering of theory , derivations and numericals.

| Sr. No. | Reference Books |
|---|---|
| 1 | P.C. Sen, "Power Electronics", 1st Edition, Tata McGraw Hill. |
| 2 | M.D. Singh, K.B. Khanchandani, "Power Electronics", 2nd Edition, Tata- McGraw Hill |
| 3 | Mohan, Undeland, Riobbins, "Power Electronics" 3rd Edition, Wiley. |
| 4 | M.H. Rashid, "Power Electronics", TMH |
| 5 | Dubey, Doralda, Joshi,Sinha, "Thyristorised Power Controllers", New Age International Edition. |
| **Sr. No.** | **Important web references** |
| 1 | https://swayam.gov.in/ |
| 2 | https://nptel.ac.in/ |

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester V</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC 311P</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course</td></tr>
<tr><td>Course title</td><td colspan="5">Power Electronics (Practical)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>-</td><td>02</td><td>02</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">-</td><td colspan="2">EE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Electronics Circuit Design, Analog Electronics</td></tr>
<tr><td>Course Rationale</td><td colspan="5">The course contains power processing electronic circuits like controlled rectifiers, AC voltage controllers, DC-DC converters and inverters. Course introduces the basics of power semiconductor devices like SCRs, power BJTs, IGBTs and MOSFETs. The analysis of power circuits presented in detail along with the waveforms and control techniques</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Explain the Difference between power devices and low power devices.<br>2. Explain internal mechanism, limitations of the different power devices<br>3. Analyze configurations of controlled rectifier circuit.<br>4. Analyze chopper circuits and its voltage control methods.<br>5. Explain different Inverter Circuits.<br>6. Explain different application of power electronics in industry</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Describe structure and working of power devices<br>2. Analyze triggering methods, Commutation methods and protection circuits used for SCR<br>3. Calculate different parameters of controlled rectifier<br>4. Calculate different parameters of chopper circuit<br>5. Describe different inverters and industrial application of power devices<br>6. Demonstrate and validate power electronics circuits in the laboratory</td></tr>
</table>

## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| | List of Practical | Hours |
|---|---|---|
| **1** | VI Characteristics of SCR. | **2** |
| **2** | Single phase Half wave controlled rectifier. | **2** |
| **3** | Single phase full wave controlled rectifier. | **2** |
| **4** | Single phase Bridge Full controlled rectifier. | **2** |
| **5** | SCR Triggering Circuits. | **2** |
| **6** | SCR Commutation Circuits. | **2** |
| **7** | 3 Phase controlled rectifier. | **2** |
| **8** | Cyclo-converter circuit | **2** |
| **9** | Step down chopper. | **2** |
| **10** | Step up chopper. | **2** |
| **11** | Series inverter. | **2** |
| **12** | Parallel inverter. | **2** |
| **13** | Bridge inverter. | **2** |

**General Instructions:**

1. Minimum 8 practical should be carried out based on above list or syllabus.
2. Batch wise practical are to be conducted. The number of students per batch should be as per the practical batches.

| **Sr. No.** | **Reference Books** |
|---|---|

| | |
|---|---|
| 1 | P.C. Sen, "Power Electronics", 1st Edition, Tata McGraw Hill. |
| 2 | M.D. Singh, K.B. Khanchandani, "Power Electronics", 2nd Edition, Tata- McGraw Hill |
| 3 | Mohan, Undeland, Riobbins, "Power Electronics" 3rd Edition, Wiley. |
| 4 | M.H. Rashid, "Power Electronics", TMH |
| 5 | Dubey, Doralda, Joshi,Sinha, "Thyristorised Power Controllers", New Age International Edition. |
| **Sr. No.** | **Important web references** |
| 1 | https://swayam.gov.in/ |
| 2 | https://nptel.ac.in/ |

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<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester V</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC 312</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course</td></tr>
<tr><td>Course title</td><td colspan="5">Microcontrollers (Theory)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>--</td><td>02</td><td>05</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:30</td><td colspan="2">ESE: 70</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Digital Electronics, Programming Techniques</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course deals with the study of architecture, device interfacing, assembly and C language programming for MCS-51, PIC microcontrollers. After learning this course students will be able to develop microcontroller based systems</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Discuss the fundamentals of microprocessors and microcontrollers<br>2. Explain the architecture of MCS 51 family<br>3. Illustrate the assembly language instructions and write assembly language programs<br>4. Illustrate C language programming for 8051 microcontroller<br>5. Describe interfacing and device programming<br>6. Discuss the architecture and programming for PIC microcontrollers</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Compare between microprocessors and microcontrollers<br>2. Describe the architectural features of 8051 microcontroller<br>3. Develop programs in assembly for 8051 microcontroller<br>4. Develop programs in C language for 8051 microcontroller<br>5. Interface the devices to microcontroller and write program to control the devices<br>6. Describe architecture of PIC microcontrollers and develop programs</td></tr>
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**Course Outcome and Program Outcome Mapping**

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **Fundamentals of Microcontrollers**<br>Evolution of microprocessors & microcontrollers, microprocessors v/s microcontrollers 8/16/32 bit processors & controllers, CISC v/s RISC architectures, registers, memory & types of memory, bus, interrupts | 07 |
| 2 | **MCS-51 Microcontroller family**<br>Introduction to MCS-51 architecture, 8051 microcontroller hardware, Input /output pins, external memory, register files, counters and timers, interrupts, serial communication, development tools IDE | 06 |
| 3 | **Instruction set and assembly language programming**<br>Addressing modes, instruction set of 8051 microcontroller, assembly language programs | 07 |
| 4 | **Embedded C programming**<br>Comparison of assembly and embedded c language programming, data types, variables, operators, storage classes, arrays, strings, C language programming for 8051 microcontroller | 07 |
| 5 | **MCS-51 Microcontroller interfacing and programming**<br>Interfacing of LEDs, DC motors, stepper motors, buzzers, switches, matrix keyboards, seven segment displays, LCD displays, ADC, DAC, relays, thumbwheel , interfacing I2C,SPI bus devices,RS232 | 06 |
| 6 | **Introduction to other microcontroller families**<br>PIC 16F8XX microcontroller family, Arduino microcontrollers, ARM microcontrollers, Raspberry Pi microcontrollers. | 06 |

**General Instructions:**

Based on the syllabus content students have to complete any one of the following activities:

1. Simulation based small project work
2. Case study work
3. Site visit
4. Solve technical quiz
5. Solve home assignments
6. In End Semester Examination for question paper setting 60 % weightage should be given for programming and interfacing part.

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| Sr. No. | Reference Books |
|---|---|
| 1 | Kenneth Ayala, "The 8051 Microcontroller Architecture, programming and Applications" Penram Intrnational |
| 2 | Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded systems" Pearson Education Asia LPE |
| 3 | Ajay Deshmukh, " Microcontrollers: Theory and applications ", Tata McGraw hill edition |
| 4 | Microchip PIC 16F877 family Microcontrollers Data sheet |
| 5 | Intel or Atmel MCS 51 Family Microcontrollers Data Sheets |
| 6 | Mike Predcko "8051 Microcontrollers programming and practice" |
| 7 | John B. Peatman, "Design with PIC Microcontrollers " Pearson Education Asia. LPE |
| 8 | Microchip PIC 16F8XX family Microcontrollers Data sheet |
| 9 | ARM architecture reference manual |
| 10 | Arduino microcontroller manual |
| **Sr. No.** | **Important web references** |
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| 2 | https://nptel.ac.in/ |

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<tr><td>Course Code</td><td colspan="5">PCC312P</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course</td></tr>
<tr><td>Course title</td><td colspan="5">Microcontrollers (Practical)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>--</td><td>02</td><td>02</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">-</td><td colspan="2">EE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Digital Electronics, Programming Techniques</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course deals with the study of architecture, device interfacing, assembly and C language programming for MCS-51, PIC microcontrollers. After learning this course students will be able to develop microcontroller based systems</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Discuss the fundamentals of microprocessors and microcontrollers<br>2. Explain the architecture of MCS 51 family<br>3. Illustrate the assembly language instructions and write assembly language programs<br>4. Illustrate C language programming for 8051 microcontroller<br>5. Describe interfacing and device programming<br>6. Discuss the architecture and programming for PIC microcontrollers</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Compare between microprocessors and microcontrollers<br>2. Describe the architectural features of 8051 microcontroller<br>3. Develop programs in assembly for 8051 microcontroller<br>4. Develop programs in C language for 8051 microcontroller<br>5. Interface the devices to microcontroller and write program to control the devices<br>6. Describe architecture of PIC microcontrollers and develop programss</td></tr>
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## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| | List of Experiments | Hours |
|---|---|---|
| **1** | Bit handling operations | **2** |
| **2** | Serial communication using assembly and embedded C language | **2** |
| **3** | Programming 7 segment displays using assembly and embedded C language | **2** |
| **4** | Programming LCD displays using assembly and embedded C language | **2** |
| **5** | Programming DC motor using assembly and embedded C language | **2** |
| **6** | Programming geared motor using assembly and embedded C language | **2** |
| **7** | Programming stepper motor using assembly and embedded C language | **2** |
| **8** | Traffic light control system using assembly and embedded C language | **2** |
| **9** | Programming timer and counter using assembly and embedded C language | **2** |
| **10** | Relay interfacing and programming in assembly and embedded C | **2** |
| **11** | Buzzer interfacing and programming in assembly and embedded C | **2** |
| **12** | Programming ADC/ DAC using assembly and C language | **2** |

**General Instructions:**

1. Minimum 8 experiments should be carried out based on above list or syllabus.
2. Batch wise practical are to be conducted. The number of students per batch should be as per the practical batches.

| **Sr. No.** | **Reference Books** |
|---|---|

| | |
|---|---|
| 1 | Kenneth Ayala, "The 8051 Microcontroller Architecture, programming and Applications" Penram Intrnational |
| 2 | Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded systems" Pearson Education Asia LPE |
| 3 | Ajay Deshmukh, " Microcontrollers: Theory and applications ", Tata McGraw hill edition |
| 4 | Microchip PIC 16F877 family Microcontrollers Data sheet |
| 5 | Intel or Atmel MCS 51 Family Microcontrollers Data Sheets |
| 6 | Mike Predcko "8051 Microcontrollers programming and practice" |
| 7 | John B. Peatman, "Design with PIC Microcontrollers " Pearson Education Asia. LPE |
| 8 | Microchip PIC 16F8XX family Microcontrollers Data sheet |
| 9 | ARM architecture reference manual |
| 10 | Arduino microcontroller manual |
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<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester V</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC313</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course</td></tr>
<tr><td>Course title</td><td colspan="5">Digital Signal Processing (Theory)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>--</td><td>--</td><td>03</td><td>03</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE: 30</td><td colspan="2">ESE: 70</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Digital Electronics , Programming Techniques , Signals & systems</td></tr>
<tr><td>Course Rationale</td><td colspan="5">The course covers theory and methods for digital signal processing including basic principles, relationship between DTFT and DFT, Discrete Fourier transforms and z-transforms, computation of DFT & IDFT, FFT algorithms and its implementation, impulse response, finite and infinite impulse response, digital filter design and implementation, DSP applications in different fields.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Expalin DFT and its properties, IDFT, FFT algorithms, circular convolution, correlation<br><br>2. Discuss different algorithms to find linear convolution, DFT and IDFT<br><br>3. Analyze FIR filter design using different methods<br><br>4. Analyze study FIR filter design using different methods<br><br>5. Explain adaptive signal processing and adaptive filters<br><br>6. Study applications of Digital Signal Processing in different fields</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Calculate DFT, IDFT and convolution<br><br>2. Apply different algorithms for linear convolution and DFT, IDFT<br><br>3. Design FIR filters using different techniques<br><br>4. Design IIR filters using different methods<br><br>5. Describe adaptive signal processing and adaptive filter models<br><br>6. Illustrate the role of DSP in different areas</td></tr>
</table>

## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **Introduction to DSP System**<br>DSP, Basic elements of DSP, Advantages of Digital Signal Processing, Comparison between Digital and Analog Signal Processing, Applications | 07 |
| 2 | **Discrete Fourier Transform (DFT)**<br>DFT, Properties of DFT, Circular Convolution and Circular Co-relation using DFT and IDFT , Linear Convolution using Circular Convolution, Fast Convolution. Overlap Save and Overlap add algorithm. Relationship between DTFT, DFT and ZT. FFT Algorithms – Radix 2: DIT-FFT and Radix 2: DIF.- FFT | 06 |
| 3 | **FIR Filter Design**<br>FIR Filter, Characteristics of FIR Filters, Properties of FIR Filters, FIR filter design using Windowing Technique :Rectangular, Hamming , Kaiser Window, FIR filter Design using Frequency Sampling Technique, FIR filter realization- Direct Form I and Direct Form II, Cascade and Parallel form realization | 07 |
| 4 | **IIR Filter Design**<br>Introduction to IIR Filters, IIR Filter Design using Impulse Invariant method and Bilinear Transformation method, Butterworth Approximation, Chebyshev filters design, IIR filter realization- Direct form I and Direct form II, Cascade and parallel realization. | 07 |
| 5 | **Adaptive Filter**<br>Introduction to adaptive filters, Applications of adaptive filters, Adaptive direct form FIR filter and its use, Adaptive algorithm: Least Mean Square (LMS) algorithm | 06 |
| 6 | **Application of Digital Signal Processing**<br>Mobile communication, Bio-medical Engineering, image processing, Acoustic Noise Canceller, Dynamic range compression, LPC analysis and synthesis, SSB modulation, Radar tracking & implementation ,Study of architecture of TMS 320C6XXX processor | 06 |

**General Instructions:**

Based on the syllabus content students have to complete any one of the following activities:

1. Simulation based small project work
2. Case study work
3. Site visit
4. Solve technical quiz

5. Solve home assignments
6. Question paper will be based on all six units covering of theory , derivations and numericals.

| Sr. No. | Reference Books |
|---|---|
| 1 | John G Prokis , "Digital Signal Processing ,Principles, Algorithms and Application", PHI |
| 2 | S.K.Mitra, "Digital Signal Processing", TMH |
| 3 | Avtar Singh, S. Srinivasan, "Digital Signal Processing Implementation using DSP, Microprocessors with examples from TMS 320C6XXX", Thomas Publication |
| 4 | A.V.Oppenheins and R.W. Schalfer , "Discrete Time Signal Processing", PHI |
| 5 | S. Salivahanam, A Vallavaraj, C. Guanapriya, "Digital Signal Processing",TMH |
| 6 | Raghuveer M. Rao and Ajit S. Boperdikar , "Wavelet Transforms – Introduction to theory and applications", Pearson Education. |
| 7 | Smith, "Scientist and Engg. Guide on Digital Signal Processing" |
| **Sr. No.** | **Important web references** |
| 1 | https://swayam.gov.in/ |
| 2 | https://nptel.ac.in/ |

| | | | | | |
|---|---|---|---|---|---|
| **Year, Program, Semester** | Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester V | | | | |
| **Course Code** | PCC314 | | | | |
| **Course Category** | Professional Core course | | | | |
| **Course title** | **Advanced Programming Techniques (Theory)** | | | | |
| **Teaching Scheme and Credits** | **L** | **T** | **P** | **Total Contact Hours** | **Total Credits** |
| | 02 | -- | 02 | 04 | 03 |
| **Evaluation Scheme** | **ISE:30** | | | **ESE: 70** | **Total=100** |
| **Pre-requisites (if any)** | Digital Electronics , Programming Techniques | | | | |
| **Course Rationale** | This course deals with programming using Python language | | | | |
| **Course Objectives** | 1. Illustrate Python installation<br>2. Discuss numeric and string operations<br>3. Illustrate lists and dictionaries<br>4. Explain tuples and file operations<br>5. Explain statements and functions<br>6. Discuss modules and packages | | | | |
| **Course Outcomes** | 1. Demonstrate Python installation<br>2. Experiment on numeric types and strings<br>3. Demonstrate lists and dictionaries operations<br>4. Demonstrate tuples and file operations<br>5. Use statements and functions<br>6. Experiment modules and packages | | | | |

## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **Introduction and installation of python**<br>Introduction and advantages, Python versions, installation on different OS like Windows MacOS, Ubuntu Linux, OpenIDLE , Interactive window, python shell, editor, operators , variables in python, | 07 |
| 2 | **Numeric types and strings**<br>Numeric types: Basics, literals, variables, expressions, numeric display formats, comparison, division, integer precision, complex numbers, Hex-octal-binary numbers and conversions, decimal, fractional, sets, Booleans. **Strings:** Basics, string literals, basic string operations- indexing and slicing, string methods, string formatting expressions | 06 |
| 3 | **Lists and dictionaries**<br>Basics of list, list operations, list iterations, dictionaries and operations in dictionaries | 07 |
| 4 | **Tuples and file operations**<br>Tuples, File operations | 07 |
| 5 | **Statements and functions**<br>If, if-else, while loop, for loop, pass, continue, break, loop else, loop coding techniques. **Functions:** Coding functions, calls, polymorphism, recursive functions | 06 |
| 6 | **Modules and packages**<br>Modules, search path, module creation, module uses, module namespaces, module reloading, **Package:** package basics, package imports, search path settings | 06 |

**General Instructions:**

Based on the syllabus content students have to complete any one of the following activities:

1. Simulation based small project work
2. Case study work
3. Site visit
4. Solve technical quiz
5. Solve home assignments
6. Question paper will be based on all six units.

| Sr. No. | Reference Books |
|---|---|
| 1 | Mark Lutz, " Learning Python ", O'Reilly media |
| 2 | Miles, " Begin to code with Python", Pearson |
| 3 | Anurag Gupta, G. Biswas, "Python Programming", TMH |
| 4 | Mark Lutz, " Learning Python ", O'Reilly media |
| 5 | Qingkai Kong, Timmy Siauw, Bayen , " Python programming and numerical methods- A guide for engineers and scientists", Elsevier |
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<tr><td>Course Category</td><td colspan="5">Professional Core Course</td></tr>
<tr><td>Course title</td><td colspan="5">Advanced Programming Techniques (Practical)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>-</td><td>02</td><td>02</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">-</td><td colspan="2">EE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Digital Electronics , Programming Techniques</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course deals with programming using Python language</td></tr>
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## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| | **List of Experiments** | **Hours** |
|---|---|---|
| **1** | Write a program to demonstrate basic data types in Python | **2** |
| **2** | Write a program to perform different arithmetic operations | **2** |
| **3** | Write a program to create, concatenate and print a string and accessing substring from a given string. | **2** |
| **4** | Write a python script to print the current date | **2** |
| **5** | Write a python program to create, append and remove lists in python. | **2** |
| **6** | Write a program to check odd /even number | **2** |
| **7** | Write a program to demonstrate list and tupple in python | **2** |
| **8** | Write a program to demonstrate working with dictionaries in python | **2** |
| **9** | Write a python program to find largest of three numbers | **2** |
| **10** | Write a python program to convert temperature to and from Celsius to fahrenheit | **2** |
| **11** | Write a python program to construct the given pattern using nested for loop | **2** |
| **12** | Write a python program to print prim numbers less than 50 | **2** |
| **13** | Write a python program to find factorial of a number using recursion | **2** |
| **14** | Write a python program to define a module to find Fibonacci Numbers and import the module to another program | **2** |
| **15** | Write a python program to define a module and import a specific function in that module to another program | **2** |
| **16** | Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order | **2** |

| | | |
|---|---|---|
| **17** | Write a Python class to convert an integer to a roman numeral. | **2** |
| **18** | Write a program to find area of given structure like triangle, circle, equilateral triangle etc. | **2** |

**General Instructions:**

1. Minimum 8 experiments should be carried out based on above list or syllabus.
2. Batch wise experiments are to be conducted. The number of students per batch should be as per the practical batches.

| **Sr. No.** | **Reference Books** |
|---|---|
| 1 | Mark Lutz, " Learning Python ", O'Reilly media |
| 2 | Miles, " Begin to code with Python", Pearson |
| 3 | Anurag Gupta, G. Biswas, "Python Programming", TMH |
| 4 | Mark Lutz, " Learning Python ", O'Reilly media |
| 5 | Qingkai Kong, Timmy Siauw, Bayen , " Python programming and numerical methods- A guide for engineers and scientists", Elsevier |
| **Sr. No.** | **Important web references** |
| 1 | https://swayam.gov.in/ |
| 2 | https://nptel.ac.in/ |

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester V</td></tr>
<tr><td>Course Code</td><td colspan="5">PBL311</td></tr>
<tr><td>Course Category</td><td colspan="5">Project based learning</td></tr>
<tr><td>Course title</td><td colspan="5">Mini project-I</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>-</td><td>02</td><td>02</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">-</td><td colspan="2">IE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Electronic circuit design, Analog Electronics, Digital Electronics, Microcontrollers,</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course deals with inculcating students skills for design, development, simulation, programming of electronics / software based systems to solve societal/ industrial problems.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Illustrate basic steps in electronic system design<br>2. Survey the problem and find technological solution<br>3. Design small scale electronics systems to accomplish task<br>4. Construct circuit models and simulate<br>5. Work in team to complete the task<br>6. Manage project in given time</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Illustrate fundamental stages in development of electronics engineering projects<br>2. Apply engineering knowledge for providing technological solutions<br>3. Simulate and design the circuits<br>4. Work in team environment<br>5. Write report , consider ethical issues in report writing / project management and express technical details<br>6. Consider social, environmental, industrial issues</td></tr>
</table>

## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| | **Curriculum Content** | **Hours** |
|---|---|---|
| **1** | **Curriculum Content**<br>Group size and activities:<br>1) Mini project group size should not exceed three students per every group.<br>2) Project idea should be proposed and finalized in consultation with guide.<br>3) Proposed weekly plan of the project should be finalized with guide.<br>4) Project work should be carried out in following steps<br>a) Selection of project & problem definition.<br>b) Paper design ( Circuit design and flow chart of software)<br>c) Simulation if required.<br>d) Hardware implementation<br>e) Software implementation ( if required)<br>f) Testing and calibration<br>g) Report writing<br>5) Compulsory submission of mini project report by each group is a must.<br>6) Projects of two or more groups should not be same.<br>7) Seminar must be delivered after completion of project by each group preferably by using power point presentation.<br>8) Mini-project report must be submitted before/at the time of viva-voce .<br>Project Contents:<br>1) It should consists of hardware part and software part is optional.<br>2) Design of PCB by using suitable CAD tool, simulation if necessary, component mounting, soldering, testing , result analysis should be done by group.<br>3) Design and development of cabinet should be done for the project.<br><br>**Guidelines for mini-project selection**<br>Parameter monitoring, parameter / system controlling applications, data acquisition systems, microcontroller based systems, digital design, communication projects, VLSI based project, power supply and batteries | |

**General Instructions:**

1. A report should be submitted by students to he department in the given format.

| **Sr. No.** | **Reference Books** |
|---|---|

| | |
|---|---|
| 1 | Articles from reputed journals, magazines, websites, real world problems, case studies |
| **Sr. No.** | **Important web references** |
| 1 | https://swayam.gov.in/ |
| 2 | https://nptel.ac.in/ |

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester V</td></tr>
<tr><td>Course Code</td><td colspan="5">AEC311</td></tr>
<tr><td>Course Category</td><td colspan="5">Ability Enhancement Course</td></tr>
<tr><td>Course title</td><td colspan="5">Introduction to Foreign Language</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>01</td><td>-</td><td>-</td><td>01</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="3"></td><td>IE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">--</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course provides a competitive edge for engineering graduates in their career choices. They will be able to communicate in a second language. The course enhances listening, reading skills and memory. Our graduates may be able to participate more effectively and responsibly in a multi-cultural world if they know another foreign language in addition to the English</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Help students to understand basics and deepen their knowledge in a chosen foreign language<br><br>2. Guide them to communicate and translate in the chosen foreign languages<br><br>3. Help them describe, narrate, and ask/answer questions in the foreign language in the present time about a variety of topics related to family, daily activities, eating, and traveling<br><br>4. Comprehend the foreign language with sufficient ability to grasp the main idea and some supporting details in short conversations (spontaneous or recorded) that pertain to the topics mentioned above<br><br>5. Explain how to write sentences and short paragraphs on familiar topics relating to personal interests and practical needs<br><br>6. Narrate on how the foreign language functions with awareness and understanding of the language culture</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Learn alphabets and acquire knowledge of basic grammar of the foreign language, common words and phrases therein<br><br>2. Learn to read the simple texts in foreign language<br><br>3. Speak a little using the greetings, well wishes etc. in Foreign Language<br><br>4. Count numbers, answer to the questions like, what is your name, surname, tell age, and can initiate little communication in Foreign</td></tr>
</table>

| | |
|---|---|
| | Language<br><br>5. Translate both verbally and written, simple sentences in the foreign language<br><br>6. Achieve institute's mission with respect to global education and foreign language education |

**Course Outcome and Program Outcome Mapping**

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| **1** | General Information on Basic Grammar of the foreign language, Introduction to alphabets | **2** |
| **2** | Gender of Noun, Number of Noun, Pronouns, Adjectives, Verbs and their usage in simple sentences, Numbers (up to 10), Simple Greetings in foreign language | **2** |
| **3** | General Questions in foreign language, like What is your name/surname? Who/What is this? etc. | 2 |
| **4** | Simple narration about self/family/friend/University in foreign language chosen for studies. Practicing the learnt topics in the class itself. | 2 |
| **5** | Formation of simple sentences using Parts of Speech, Information on Cases, One or Two simple lessons from any book. | 2 |
| **6** | Basic information on Country & Culture of language under study. | 2 |

**General Instructions:**
The assessment shall be done based on the 50 marks written examination.

| Sr. No. | Reference Books |
|---|---|
| 1 | Based on the language chosen, the suitable text and reference books may be selected. |
| **Sr. No.** | **Important web references** |
| 1 | https://swayam.gov.in/ |
| 2 | https://nptel.ac.in/ |

<table>
<tr><td>Year, Program, Semester</td><td colspan="4">T.Y. B.Tech (Electronics and Telecommunication Engineering) , Part III, Semester V</td></tr>
<tr><td>Course Code</td><td colspan="4">MAC311</td></tr>
<tr><td>Course Category</td><td colspan="4">Mandatory Audit Course</td></tr>
<tr><td>Course title</td><td colspan="4">Aptitude Enhancement Course II</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td></tr>
<tr><td>02</td><td>-</td><td>-</td><td>02</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="4">IE at Course in charge end</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="4">Basic Mathematical Concepts</td></tr>
<tr><td>Course Objectives</td><td colspan="4">The Course is aimed to-<br>1. Understand key concepts such as HCF, LCM, decimal fractions, square roots, and cube roots, to build a strong base for problem-solving.<br>2. Enhance skills in simplifying complex mathematical expressions and perform efficient computations using the principles of simplification, surds, and logarithms.<br>3. Learn to solve practical problems involving percentages, profit-loss scenarios, and partnership calculations.<br>4. Grasp the principles and formulas used in solving problems related to time and work, pipes and cisterns, and time and distance.<br>5. Sharpen the ability to analyze and solve problems involving analogies, classifications, series, and coding-decoding sequences.<br>6. Develop problem-solving skills related to blood relations, direction sense tests, puzzles, and logical Venn diagrams.</td></tr>
<tr><td>Course Outcomes</td><td colspan="4">Upon completion of this course, student should be able to –<br>1. Demonstrate an ability to solve problems related to number systems, including HCF, LCM, decimal fractions, square roots, and cube roots, accurately.<br>2. Solve complex problems involving simplification, surds, and logarithms more efficiently, and improve calculation speed and accuracy.<br>3. Apply knowledge of percentages, profit and loss, ratio and proportion, and partnership to real-life scenarios and mathematical problems.<br>4. Solve time, work, and distance-related problems, including pipes and cisterns, with a clear understanding of concepts and application of formulas.<br>5. Solve questions involving analogies, classifications, series completions, and coding-decoding with greater confidence.<br>6. Demonstrate enhanced ability to solve puzzles, directional sense, blood relation, and logical Venn diagram problems with precision and logical deduction.</td></tr>
</table>

Course Outcome and Program Outcome Mapping

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 2 | | | | | | | | | 1 |
| CO 2 | 3 | 1 | 2 | | | | | | | | | 1 |
| CO 3 | 3 | 1 | 2 | | | | | | | | | 1 |
| CO 4 | 3 | 1 | 2 | | | | | | | | | 1 |
| CO5 | 1 | | 1 | | | | | | | | | 1 |
| CO6 | 1 | | 1 | | | | | | | | | 1 |

**Level of Mapping as: Low 1, Moderate 2, High 3**

| Unit No. | Course Content | Hours |
|---|---|---|
| I | **Quantitative Aptitude 1**<br>Number System, H.C.F. and L.C.M. of Numbers, Decimal Fractions, Simplification, square Roots and Cube Roots. | 2 |
| II | **Quantitative Aptitude 2**<br>Average, Problems on Numbers, Problems on Ages, Surds and Indices, Logarithms. | 2 |
| III | **Quantitative Aptitude 3**<br>Percentage, Profit and Loss, Ratio and Proportion, Partnership. | 2 |
| IV | **Quantitative Aptitude 4**<br>Chain Rule, Pipes and Cisterns, Time and Work, Time and Distance. | 2 |
| V | **Logical Reasoning 1**<br>Analogy, classification, series completion, coding and decoding. | 2 |
| VI | **Logical Reasoning 2**<br>Blood relation, Puzzle test, direction sense test, logical Venn diagram. | 2 |

**General Instructions:**
Each Student has to write at least 6 assignments on entire syllabus.

**Reference Books**


i) Dr. R S Aggarwal — Quantitative aptitude, S. Chand Publication.

ii) R V Praveen — Quantitative aptitude and logical reasoning, 2nd Edition, PHI Publication.


**Assessment**

Assessment will be done by Course Teacher. MCQ Test can be conducted based on the syllabus.

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester VI</td></tr>
<tr><td>Course Code</td><td colspan="5">ESC321</td></tr>
<tr><td>Course Category</td><td colspan="5">Engineering science course</td></tr>
<tr><td>Course title</td><td colspan="5">Antenna and wave propagation</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>02</td><td>05</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE: 30</td><td colspan="2">ESE: 70</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Engineering Physics, Electromagnetic Fields</td></tr>
<tr><td>Course Rationale</td><td colspan="5">Antennas are an indispensable part of wireless communication systems. Wave propagation effects play a crucial role in wireless systems, although they are often overlooked. In practice, designing a working system such as mobile phone networks, Wi-Fi, RFID, Embedded systems, Satellite communication, Radars, GPS etc. requires a good understanding of these components. This course teaches the fundamentals of antenna and wave propagation and shows the application in practical examples. The course covers the theory of radiation, fundamental antenna parameters and concepts, various types of antennas, arrays, and wave propagation effects.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Explain the basic terminology and concepts of Antennas<br>2. Estimate the electric and magnetic fields from various wire antennas<br>3. Compare and contrast the working of patch antenna and their specialties<br>4. Discuss working of antenna arrays<br>5. Discuss working of aperture antennas<br>6. Explain wave propagation and modes</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Describe the radiation mechanism of antenna and calculate antenna parameters<br>2. Identify and analyze various wire antennas with applications.<br>3. Design and analyze Microstrip Patch Antenna<br>4. Analyze array of antennas and their applications<br>5. Design and analyze aperture antennas for different applications<br>6. Evaluate effect of wave propagation on communication systems</td></tr>
</table>

## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **Antennas and Fundamental Parameters**<br>Introduction, Radiation Mechanism, Radiation Pattern, Basic Antenna Parameters: Beam Width, Beam Area, Directivity, Radiation Intensity, Beam Efficiency, Gain, Radiation Resistance, Front to Back Ratio, Antenna Aperture, Effective Height, Bandwidth, Reflection Coefficient , Polarization, The Radio Communication Link: Friis Transmission Equation. | 07 |
| 2 | **Wire antennas**<br>Infinitesimal Dipole, Small Dipole, Half-Wavelength Dipole, Ground Effect, Monopole | 06 |
| 3 | **Microstrip Patch Antenna**<br>Introduction, Regular Shape MSAs (Rectangular, Circular, Equilateral, Triangular), Feeding Techniques, Transmission Line Model, Design of Rectangular MSA, Mobile Phone Antenna | 07 |
| 4 | **Antenna Arrays**<br>Linear arrays, Array of Two Isotropic Point Sources, Linear Arrays of N Elements, Broadside and End-fire Array, Principle of Pattern Multiplication, Yagi Uda Antenna, Log Periodic Antenna. | 07 |
| 5 | **Aperture Antennas**<br>Horn Antennas: E-Plane Sectoral Horn, H-Plane Sectoral Horn, Pyramidal Horn, Conical Horn, Reflector Antennas: Introduction, Parabolic Reflector, Parabolic Reflector Feeding Techniques. | 06 |
| 6 | **Wave Propagation**<br>Structure of Atmosphere, Modes of Wave Propagation: Ground Wave, Sky Wave Space Wave Propagation, Virtual Height, Maximum Usable Frequency, Critical Frequency, Angle of Incidence, Lowest Usable Frequency, Skip Distance. | 06 |

**General Instructions:**

Based on the syllabus content students have to complete any one of the following activities:

1. Simulation based small project work
2. Case study work
3. Site visit
4. Solve technical quiz
5. Solve home assignments
6. Question paper will be based on all six units covering of theory , derivations and numericals.

| Sr. No. | Reference Books |
|---|---|
| 1 | John. D. Kraus, "Antennas & Wave Propagation", Fifth Edition, Tata McGraw Hill. |
| 2 | C. A. Balanis, "Antenna Theory Analysis and Design", John Wiley. |
| 3 | Girish Kumar, K.P. Ray, "Broadband Microstrip Antennas", Artech House Publishers |

| | |
|---|---|
| 4 | K. D. Prasad, "Antenna and Wave Propagation", Satya Prakashan. |
| 5 | G. S. N. Raju, "Antennas and Wave Propagation", Pearson Education. |
| 6 | E.C. Jordan & K.G. Balmain, "Electromagnetic waves & Radiating Systems", Prentice Hall, India |
| **Sr. No.** | **Important web references** |
| 1 | https://swayam.gov.in/ |
| 2 | https://nptel.ac.in/ |

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester VI</td></tr>
<tr><td>Course Code</td><td colspan="5">ESC321P</td></tr>
<tr><td>Course Category</td><td colspan="5">Engineering Science Course</td></tr>
<tr><td>Course title</td><td colspan="5">Antenna and Wave propagation (Practical)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>--</td><td>02</td><td>02</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">-</td><td colspan="2">IE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Engineering Physics, Electromagnetic Fields</td></tr>
<tr><td>Course Rationale</td><td colspan="5">Antennas are an indispensable part of wireless communication systems. Wave propagation effects play a crucial role in wireless systems, although they are often overlooked. In practice, designing a working system such as mobile phone networks, Wi-Fi, RFID, Embedded systems, Satellite communication, Radars, GPS etc. requires a good understanding of these components. This course teaches the fundamentals of antenna and wave propagation and shows the application in practical examples. The course covers the theory of radiation, fundamental antenna parameters and concepts, various types of antennas, arrays, and wave propagation effects.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Explain the basic terminology and concepts of Antennas<br>2. Estimate the electric and magnetic fields from various wire antennas<br>3. Compare and contrast the working of patch antenna and their specialties<br>4. Discuss working of antenna arrays<br>5. Discuss working of aperture antennas<br>6. Explain wave propagation and modes</td></tr>
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</table>

## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| | List of experiments | Hours |
|---|---|---|
| **1** | Study of antenna trainer kit. | **2** |
| **2** | Measurement of radiation pattern of Simple λ/2 Dipole Antenna. | **2** |
| **3** | Study of monopole antenna | **2** |
| **4** | Measurement of radiation pattern of folded Dipole Antenna | **2** |
| **5** | Measurement of radiation pattern of Loop antenna. | **2** |
| **6** | Study of Helical Antenna | **2** |
| **7** | Measurement of radiation pattern of 3 element Yagi-UDA antenna | **2** |
| **8** | Measurement of radiation pattern of 5 element Yagi-UDA antenna | **2** |
| **9** | Measurement of radiation pattern of 7 element Yagi-UDA antenna | **2** |
| **10** | Measurement of radiation pattern of Log Periodic Antenna | **2** |
| **11** | Measurement of radiation pattern λ/2 Phase Array | **2** |
| **12** | Study of broadside array antenna | **2** |
| **13** | Study of end fire array antenna | **2** |
| **14** | Any simulator based practical based on the above syllabus | **2** |

**General Instructions:**

1. Minimum 8 experiments should be carried out based on above list or syllabus.
2. Batch wise experiments are to be conducted. The number of students per batch should be as per the practical batches.

| Sr. No. | Reference Books |
|---|---|
| 1 | John. D. Kraus, "Antennas & Wave Propagation", Fifth Edition, Tata McGraw Hill. |
| 2 | C. A. Balanis, "Antenna Theory Analysis and Design", John Wiley. |
| 3 | K. D. Prasad, "Antenna and Wave Propagation", Satya Prakashan. |
| 4 | Girish Kumar, K.P. Ray, "Broadband Microstrip Antennas", Artech House Publishers |
| 5 | G. S. N. Raju, "Antennas and Wave Propagation", Pearson Education. |
| 6 | E.C. Jordan & K.G. Balmain, "Electromagnetic waves & Radiating Systems", Prentice Hall, India |
| **Sr. No.** | **Important web references** |
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| 2 | https://nptel.ac.in/ |

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester VI</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC 321</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course</td></tr>
<tr><td>Course title</td><td colspan="5">Control Systems (Theory)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>01</td><td>-</td><td>04</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:30</td><td colspan="2">ESE:70</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Engineering Mathematics 3, Microcontrollers, Network Theory</td></tr>
<tr><td>Course Rationale</td><td colspan="5">Control Systems is the study of the analysis and regulation of the output behaviors of dynamical systems subject to input signals. This subject will develop the theory, concepts tools used in engineering disciplines such as mechanical, electrical, engineering. The knowledge acquired by the students will help them to design control system.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. To study mathematical modeling of physical system<br>2. To study and analyze time domain and frequency domain methods<br>3. To study stability of linear control system using different methods</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Describe the basic principles, types of control systems and I/P –O/P relationship by using mathematical model and transfer function<br>2. Understand and analyze parameters of a feedback control system and its transient behavior<br>3. Evaluate the stability of a system by using different stability criteria<br>4. Plot the Root locus and Nyquist plot, for a given control system for stability analysis<br>5. Plot the Bode for a given control system for stability analysis<br>6. Analyze performance of control system by using state space</td></tr>
</table>

## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **System Modeling**: Introduction to control system, Types of control system, Laplace transform review, Transfer function of electrical, mechanical, thermal, hydraulic system, Electrical circuits analogs, Block dia. Representation and reduction, types of feedback systems, signal flow graph , Mason's gain rule, SFG | 07 |
| 2 | **Time domain Response**<br>Time domain Response of first and second order system, Types of standard inputs, response with additional pole and zeros, steady state error for unity feedback system, static error constants and systems type, steady state error specifications,<br>Concept of stability for linear systems, Absolute and relative stability, Routh stability criterion and its application in special cases. | 06 |
| 3 | **Frequency Domain Techniques**<br>Frequency domain specification, Correlation between time and Frequency domain specifications, Bode plot, Nyquist criterion, stability, gain margin, phase margin by Nyquist diagram and bode plot, Effect of gain variation and addition of poles and zeros on Bode plot | 07 |
| 4 | **Modelling in Time domain**<br>state-space representation, Applying the state- space representation, converting the transfer function to state- space, converting from state -space to transfer function. | 07 |
| 5 | **Root Locus Techniques**<br>Definition of root locus, Rules for plotting root loci, Root contour, stability analysis using root locus, effect of addition of pole and zero. | 06 |
| 6 | **Feedback control systems**<br>Feedback control system characteristics, error analysis, P , PI, PD and PID Controllers. Digital control system, Introduction, Transfer function of digital control system. | 06 |

**General Instructions:**

Based on the syllabus content students have to complete any one of the following activities:

1. Simulation based small project work
2. Case study work / MATLAB based simulation
3. Site visit
4. Solve technical quiz
5. Solve home assignments
6. Question paper will be based on all six units covering of theory , derivations and numericals.

| Sr. No. | Reference Books |
|---|---|
| 1 | "Control System Engineering", Norman S. Nise,John willey and Sons, 6th Edition, 2015. |
| 2 | "Control System Engineering",I.J. Nagrath and M. Gopal,New age International publication, 5th Edition, 2014. |
| 3 | "Automatic Control Systems",Kuo B.C.,Prentice-Hall of India Pvt.Ltd.New Delhi.6th edition.1991 |
| 4 | "Modern Control Engineering", Katsuhiko Ogata,Prentice Hall of India Pvt Ltd, 5th edition. |
| 5 | "Automatic Control System", Benjamin C. Kuo, Prentice Hall of India Pvt Ltd, Wiley publication, 9th edition |
| 6 | "Control Systems-Principles and Design", M.Gopal, Tata McGraw-Hill Education Pvt. Ltd, 4th edition, 2014. |
| 7 | "Control System Engineering",R.Anandanatarajan,P.Ramesh Babu,Second Edition,Scitech publications Pvt.(India)Ltd.2008 |
| **Sr. No.** | **Important web references** |
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<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester VI</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC321T</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course</td></tr>
<tr><td>Course title</td><td colspan="5">Control Systems (Tutorial)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>01</td><td>-</td><td>01</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">-</td><td colspan="2">IE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Engineering Mathematics 3, Microcontrollers, Network Theory</td></tr>
<tr><td>Course Rationale</td><td colspan="5">Control Systems is the study of the analysis and regulation of the output behaviors of dynamical systems subject to input signals. This subject will develop the theory, concepts tools used in engineering disciplines such as mechanical, electrical, engineering. The knowledge acquired by the students will help them to design control system.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. To study mathematical modeling of physical system<br>2. To study and analyze time domain and frequency domain methods<br>3. To study stability of linear control system using different methods</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Describe the basic principles, types of control systems and I/P –O/P relationship by using mathematical model and transfer function<br>2. Understand and analyze parameters of a feedback control system and its transient behavior<br>3. Evaluate the stability of a system by using different stability criteria<br>4. Plot the Root locus and Nyquist plot, for a given control system for stability analysis<br>5. Plot the Bode for a given control system for stability analysis<br>6. Analyze performance of control system by using state space</td></tr>
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## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| | **Course Content** | **Hours** |
|---|---|---|
| **1** | | |

**General Instructions:**

1. Minimum 8 tutorials should be carried out based on above list or syllabus.
2. Batch wise tutorials are to be conducted. The number of students per batch should be as per the practical batches.
3. Students must be encouraged to solve engineering mathematics problems using different mathematical software's like MATLAB, Scilab etc.

| **Sr. No.** | **Reference Books** |
|---|---|
| 1 | "Control System Engineering", Norman S. Nise,John willey and Sons, 6th Edition, 2015. |
| 2 | "Control System Engineering",I.J. Nagrath and M. Gopal,New age International publication, 5th Edition, 2014. |
| 3 | "Automatic Control Systems",Kuo B.C.,Prentice-Hall of India Pvt.Ltd.New Delhi.6th edition.1991 |
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<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester VI</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC322</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course</td></tr>
<tr><td>Course title</td><td colspan="5">VLSI Design (Theory)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>02</td><td>05</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:30</td><td colspan="2">ESE: 70</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Digital Electronics , Programming Techniques</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course deals with understanding working of MOS transistors, MOS transistor based circuits, chip manufacturing and chip design, programming and prototyping.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Illustrate the construction, characteristics of MOS transistors<br>2. Discuss CMOS IC manufacturing process<br>3. Illustrate Verilog and other HDLs<br>4. Learn Hardware Description Language<br>5. Develop Verilog codes to design various digital circuits<br>6. Familiarity with UVM (Universal Verification Methodology)</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Describe the structure, working principle and characteristics of MOS devices<br>2. Explain CMOS IC fabrication technology & IC design flow.<br>3. Experiment using Verilog language and explain features of HDL<br>4. Develop Verilog code for different digital circuits<br>5. Describe construction and features of programmable logic devices<br>6. Describe the UVM (Universal Verification Methodology)</td></tr>
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## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **MOS Devices**<br>Introduction to MOS Technology, I – V Characteristics of NMOS and PMOS, Transfer Characteristics Of CMOS Inverter, Detailed analysis of CMOS inverter, Logic realization using nMOS and CMOS circuits, effect of parasitic elements. | 07 |
| 2 | **CMOS IC Fabrication and Layout**<br>Basic CMOS Technology: Self aligned CMOS process, N well, P well, Twin tub, Layout of CMOS Inverter, CMOS Layout and Design rules. Silicon on Insulator technology, IC Design flow | 06 |
| 3 | **Introduction to Verilog**<br>Abstraction levels, modules, port, declarations, registers, arrays, identifiers, parameters, arithmetic and logical operators, expressions, procedural statements, blocking and non-blocking statements, control statements, delays, memory modeling, VHDL V/s Verilog comparison | 07 |
| 4 | **Circuit Design using Verilog**<br>Designing basic gates, combinational circuit, designing general purpose processor, datapath, ALU, encoder, decoder, comparator, adder, subtractor, multiplexer, de-multiplexer, tri-state drivers, PIPO, SIPO, sequential circuits | 07 |
| 5 | **Circuit Design Using CPLD & FPGA**<br>Introduction, study of architecture of CPLDs and FPGAs. Function block architecture, input/output Block and interconnect, switch matrix, FPGA fabric. System on Chip architecture. Case study of FPGA and SoC | 06 |
| 6 | **Verification**<br>UVM (Universal Verification Methodology), Need of UVM, UVM class hierarchy, UVM class categories, | 06 |

**General Instructions:**

Based on the syllabus content students have to complete any one of the following activities:

1. Simulation based small project work
2. Case study work
3. Site visit
4. Solve technical quiz
5. Solve home assignments
6. Question paper will be based on all six units.

| Sr. No. | Reference Books |
|---|---|
| 1 | N. Weste and K. Eshranghian, "Principles of CMOS VLSI Design", Addison Wesley |
| 2 | Angsuman Sarkar, Swapnadip De, Ckandan Kumar Sarkar, "VLSI Design and EDA tools", Scitech |
| 3 | Amar Mukharjee, "Introduction to nMOS and cMOS VLSI systems design", Prentice Hall |
| 4 | Samir Palnitkar, "Verilog HDL, A guide to digital design and synthesis", Pearson |
| 5 | Stephen Brown and Zvonko, " Vranesic, Fundamaentals of Digital Logic with VHDL design", Tata McGraw Hill |
| 6 | BushnellAgrawal , "Essentials of Electronic Testing for digital memory and mixed signal VLSI circuits", Kulwar Academic Publisher |
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<tr><td>Course Code</td><td colspan="5">PCC322</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course</td></tr>
<tr><td>Course title</td><td colspan="5">VLSI Design (Practical)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>-</td><td>02</td><td>02</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">-</td><td colspan="2">EE: 50</td><td>Total=50</td></tr>
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## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| | **List of Experiments** | **Hours** |
|---|---|---|
| **1** | Simulation, modeling and characteristics study of nMOS & pMOS transistors (Custom and semicustom) | **2** |
| **2** | Simulation, modeling and characteristics study of CMOS inverter circuitry (Custom and semicustom) | **2** |
| **3** | Design and implementation of gates and combinational logic in CPLD / FPGA | **2** |
| **4** | Design and implementation of adder in CPLD / FPGA | **2** |
| **5** | Design and implementation of subtractor in CPLD / FPGA | **2** |
| **6** | Design and implementation of ALU in CPLD / FPGA | **2** |
| **7** | Design and implementation of encoder in CPLD / FPGA | **2** |
| **8** | Design and implementation of decoder in CPLD / FPGA | **2** |
| **9** | Design and implementation of multiplexer in CPLD / FPGA | **2** |
| **10** | Design and implementation of demultiplexer in CPLD / FPGA | **2** |
| **11** | Design and implementation of comparator in CPLD / FPGA | **2** |
| **12** | Design and implementation of tristate driver in CPLD / FPGA | **2** |
| **13** | Design and implementation of Flip-Flops in CPLD / FPGA | **2** |
| **14** | Design and implementation of sequential circuits in CPLD / FPGA | **2** |

**General Instructions:**

1. Minimum 8 experiments should be carried out based on above list or syllabus.
2. Batch wise experiments are to be conducted. The number of students per batch should be as per the practical batches.

| **Sr. No.** | **Reference Books** |
|---|---|
| 1 | N. Weste and K. Eshranghian, "Principles of CMOS VLSI Design", Addison Wesley |

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| 3 | Amar Mukharjee, "Introduction to nMOS and cMOS VLSI systems design", Prentice Hall |
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| 6 | Bushnell Agrawal , "Essentials of Electronic Testing for digital memory and mixed signal VLSI circuits", Kulwar Academic Publisher |
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<tr><td>Course Code</td><td colspan="5">OE321-1</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course (Program Elective I)</td></tr>
<tr><td>Course title</td><td colspan="5">ARM and Embedded systems</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>02</td><td>05</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE: 30</td><td colspan="2">ESE: 70</td><td>Total = 100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Digital Electronics , Programming Techniques , Microcontrollers</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course deals with study of 32-bit ARM 7 architecture and understanding the fundamentals of Embedded systems</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Study and understand the architecture of ARM7TDMI family<br>2. Study assembly language instructions of ARM microcontroller<br>3. Write programs for ARM microcontroller in assembly<br>4. Understand the memory management techniques<br>5. To be familiar with embedded systems<br>6. Understand applications of embedded systems</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Discuss the architecture of ARM7TDMI microcontroller<br>2. Explain the instruction set of ARM microcontroller<br>3. Write programs in assembly and C language for ARM microcontroller family<br>4. Discuss the memory management scheme of ARM microcontroller<br>5. Compare the features of 8-bit, 16-bit and 32-bit microcontrollers<br>6. Illustrate the features and applications of embedded systems</td></tr>
</table>

## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **INTRODUCTION TO ARM ARCHITECTURE**<br>ARM7TDMI architecture, registers, interrupts, exception process, status registers processor modes, memory, memory mapped I/O, endianness | 07 |
| 2 | **ARM INSTRUCTION SET**<br>ARM instruction set: Data processing instruction, Load, store, Branch, interrupt instruction, program status register instruction, loading constants, conditional execution | 06 |
| 3 | **THE THUMB INSTRUCTION SET**<br>Entering thumb state, Thumb instruction set: Thumb register usage, ARM Thumb Interworking, branch instructions, Data processing, single register load-store, multiple register load-stores, stack instructions, software interrupt instruction. | 07 |
| 4 | **INTERRUPTS , MEMORY MANAGEMENT UNIT**<br>Interrupts and exception-handling schemes; Memory architecture, Memory access sequence, translation process, access permissions, domains, Aborts. | 07 |
| 5 | **ARM APPLICATIONS AND PLATFORMS**<br>ARM applications – IoT, Machine Learning, Automotive, mobile , graphics, embedded systems applications; ARM development platforms | 06 |
| 6 | **EMBEDDED SYSTEMS**<br>Introduction, CISC and RISC architectures, features of 16/32 bit microcontrollers, device drivers, Interrupt servicing mechanisms, programming concepts in embedded c and c++, Prototype development phases, software design and implementation, Hardware software co design, Case study: Adaptive cruise control system in car. | 06 |

**General Instructions:**

Based on the syllabus content students have to complete any one of the following activities:

1. Simulation based small project work
2. Case study work
3. Site visit
4. Solve technical quiz
5. Solve home assignments
6. Question paper will be based on all six units.

| Sr. No. | Reference Books |
|---|---|
| 1 | ARM architecture reference manual |
| 2 | Sloss, Symes, Wright, “ARM system developers guide” Morgan Kaufman, Elsevier, publication |

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| 3 | Raj Kamal, "Embedded Systems: Architecture, Programming and Design", TMH, 2003. |
| 4 | Wolf, Wayne, "Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2001 |
| 5 | Vahid, Frank and Givargi, Tony, "Embedded System Design: A Unified Hardware/Software Introduction", John Wiley & Sons, New York, 2000. |
| 6 | Deshmukh, Ajay V., "Microcontroller Theory and Applications", Tata McGraw-Hill. |
| 7 | ARM7TDMI manual |
| 8 | Philips LPC 2148 manual |
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<tr><td>Course Code</td><td colspan="5">OE 321-1P</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course (Program Elective I)</td></tr>
<tr><td>Course title</td><td colspan="5">ARM and Embedded Systems (Practical)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>-</td><td>02</td><td>02</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">-</td><td colspan="2">EE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Digital Electronics , Programming Techniques , Microcontrollers</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course deals with study of 32-bit ARM 7 architecture and understanding the fundamentals of Embedded systems</td></tr>
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## Course Outcome and Program Outcome Mapping

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| CO 2 | 3 | 2 | 3 | 2 | 3 | | | | | | | 1 |
| CO 3 | 3 | 2 | 3 | 2 | 3 | | | | | | | 2 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | | | | | | | 3 |
| CO 5 | 3 | 3 | 3 | 3 | 3 | | | | | | | 3 |
| CO 6 | 3 | | 2 | 1 | 3 | | | | | | | 2 |

Level of Mapping as: Low 1, Moderate 2, High 3

| | List of Experiments | Hours |
|---|---|---|
| **1** | Blinking LEDs interfaced with ARM microcontroller. | **2** |
| **2** | Switch interfacing and programming | **2** |
| **3** | Relay interfacing and programming | **2** |
| **4** | Seven segment interfacing and programming | **2** |
| **5** | DC motor clockwise and anticlockwise programming | **2** |
| **6** | ADC/DAC interfacing and programming | **2** |
| **7** | LCD interfacing and programming | **2** |
| **8** | Buzzer interfacing and programming | **2** |
| **9** | Stepper motor interfacing and programming | **2** |
| **10** | RTOS programming | **2** |
| **11** | ARM based simulation | **2** |
| **12** | Use and handling Integrated Development Environments for ARM controller | **2** |

**General Instructions:**

1. Minimum 8 experiments should be carried out based on above list or syllabus.
2. Batch wise experiments are to be conducted. The number of students per batch should be as per the practical batches.

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|---|---|
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| 2 | Sloss, Symes, Wright, “ARM system developers guide” Morgan Kaufman, Elsevier, publication |

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| 3 | Raj Kamal, "Embedded Systems: Architecture, Programming and Design", TMH, 2003. |
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<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester VI</td></tr>
<tr><td>Course Code</td><td colspan="5">PCC321-2</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course (Program Elective I)</td></tr>
<tr><td>Course title</td><td colspan="5">Computer Networks (Theory)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>02</td><td>05</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:30</td><td colspan="2">ESE: 70</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Digital Electronics , Programming Techniques</td></tr>
<tr><td>Course Rationale</td><td colspan="5">The course covers fundamental concepts of computer networks. This course will introduce basics of networking from reference models (OSI and TCP), network categories, topologies and various transmissions medium. It includes all the protocols at data link and network layer. Introduction to IEEE standards and different connecting devices</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Introduce the student with fundamental concept of computer networking<br>2. Introduce network categories, topologies and various transmissions medium<br>3. Explain Working of Protocols at Data link layer<br>4. Introduce different addressing mechanism<br>5. Explain connecting devices respect to OSI model.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Explain and Compare OSI and TCP/IP reference models<br>2. Discuss different guided and unguided transmission media and switching techniques<br>3. Discuss error detection and correction mechanism for data link layer<br>4. Explain multiple access protocols and Data link control protocols<br>5. Illustrate IEEE standards and connecting devices<br>6. Explain congestion control, traffic shaping and protocols at network layer</td></tr>
</table>

## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **Introduction to Computer Networks**<br>Introduction to Computer Networks, components, data representation, data flow: simplex, half duplex, full duplex, networks, Network topology: Mesh, Star, Bus, Ring, Network Categories: LAN, MAN, WAN, internet, Network Models: OSI model, TCP-IP protocol suite, Comparison of OSI and TCP-IP model, types of addressing. | 07 |
| 2 | **Physical Layer**<br>Types of Guided transmission media, Types of Unguided transmission media, switching - circuit switched networks, datagram networks, virtual circuit networks. | 06 |
| 3 | **Data Link Layer**<br>Error detection and correction: types of errors, Block coding : error detection and error correction, Linear Block Codes Hamming code, Cyclic Redundancy check ,Checksum | 07 |
| 4 | **Data link control and Medium Access Control Sublayer**<br>Framing, flow control and error control DLL protocols: Noiseless channels and noisy channels, sliding window protocols HDLC point to point protocol Channel allocation, multiple access protocols: random access, controlled access, channelization | 07 |
| 5 | **Wired and Wireless LANS**<br>IEEE Standards, Ethernet, wireless LAN IEEE 802.11, addressing mechanism, hidden station and exposed station problem, Bluetooth, zigbee, wifi, Wi-max, Connecting devices. | 06 |
| 6 | **Network Layer and Security**<br>Network layer services, Packet switching, performance, congestion control algorithms, IPv4 address, IPv6 address, Transition from IPv4 to IPv6, Routing Protocols (RIP, OSPF, BGP), QoS. **Network Security:** Authentication, Authorization accounting (AAA), Multifactor authentication Virtual private Network(VPN) Remote VPN, IPSEC VPN/ Tunnel, Remote browser VPN | 06 |

**General Instructions:**

Based on the syllabus content students have to complete any one of the following activities:

1. Simulation based small project work
2. Case study work
3. Site visit
4. Solve technical quiz
5. Solve home assignments
6. Question paper will be based on all six units.

| Sr. No. | Reference Books |
|---|---|
| 1 | Behrouz Forouzan, "Data Communications and Networking", Fourth Edition, TMH |
| 2 | Andrew S. Tanenbaum, "Computer Networks",Fourth Edition, PHI Publications |
| 3 | W. Stallings, "Data and Computer Communications", Sixth Edition, PHI Publications |
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<tr><td>Course Code</td><td colspan="5">PCC321-2</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course (Program Elective I)</td></tr>
<tr><td>Course title</td><td colspan="5">Computer Networks (Practical)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>-</td><td>02</td><td>02</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">-</td><td colspan="2">EE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">The course covers fundamental concepts of computer networks. This course will introduce basics of networking from reference models (OSI and TCP), network categories, topologies and various transmissions medium. It includes all the protocols at data link and network layer. Introduction to IEEE standards and different connecting devices</td></tr>
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<tr><td>Course Outcomes</td><td colspan="5">The course covers fundamental concepts of computer networks. This course will introduce basics of networking from reference models (OSI and TCP), network categories, topologies and various transmissions medium. It includes all the protocols at data link and network layer. Introduction to IEEE standards and different connecting devices</td></tr>
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## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| | Course Content | Hours |
|---|---|---|
| **1** | Study of Half duplex and full duplex communication by using coaxial and twisted pair cable. | **2** |
| **2** | Study of Half duplex, Full duplex file transfer between two PC by using RS – 232. | **2** |
| **3** | Implementation of Local area network in packet tracer(simulation) | **2** |
| **4** | Implementation of Mesh, Bus, Star, Ring topology in packet tracer (Simulation) | **2** |
| **5** | Demonstration of bit stuffing. | **2** |
| **6** | Demonstration of Stop and wait protocol. | **2** |
| **7** | Demonstration of Go Back N protocol. | **2** |
| **8** | Demonstration of Selective repeat protocol. | **2** |
| **9** | Demonstration of error detection method using Hamming code method | **2** |
| **10** | Demonstration of error detection method using CRC method | **2** |
| **11** | Shortest path routing algorithm (By simulation) | **2** |
| **12** | Study of QOS by using NETFLOW and Live action Softwares. | **2** |

**General Instructions:**

1. Minimum 8 experiments should be carried out based on above list or syllabus.
2. Batch wise experiments are to be conducted. The number of students per batch should be as per the practical batches.

| Sr. No. | Reference Books |
|---|---|
| 1 | Behrouz Forouzan, “Data Communications and Networking”, Fourth Edition, TMH |

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| 2 | Andrew S. Tanenbaum, "Computer Networks", Fourth Edition, PHI Publications |
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<tr><td>Course Code</td><td colspan="5">PCC321-3</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course (Program Elective I)</td></tr>
<tr><td>Course title</td><td colspan="5">Optical Fiber Communication (Theory)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>02</td><td>05</td><td>04</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE: 30</td><td colspan="2">ESE:70</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Engineering physics</td></tr>
<tr><td>Course Rationale</td><td colspan="5">The course introduces fundamentals of optical communication system. The course covers Optical fiber material properties and fabrication methods and signal distortion and degradation in optical fiber. The working principles of optical sources and detectors</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Explain fundamental concept of Optical communication system<br><br>2. Explain basic elements of optical fiber transmission link, fiber modes configurations and structures<br><br>3. Calculate different types of loss<br><br>4. Explain optical sources, materials and fiber splicing<br><br>5. Explain working of optical receivers and noise performance in photo detector<br><br>6. Explain WDM, solitons and SONET/SDH network</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Interpret functions of different blocks of optical communication<br><br>2. Understand the properties of optical fiber that affect the performance of a communication link<br><br>3. Explain types of dispersion and able to measure attenuation and scattering losses of optical fiber<br><br>4. Discuss fiber splicing, connectors and calculate intrinsic and extrinsic losses in fiber<br><br>5. Explain working principles of optical sources and detectors<br><br>6. Understand working of different optical networks and operational principles of WDM</td></tr>
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## Course Outcome and Program Outcome Mapping

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 |
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| CO 5 | 3 | 3 | 2 | 3 | 2 | | | | | | | 1 |
| CO 6 | 3 | 3 | 2 | 3 | 2 | | | | | | | 2 |

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **Introduction to Optical Fiber communications**<br>Overview of optical fiber communication system, advantages of optical fiber communications, ray theory transmission, total internal reflection, acceptance angle, numerical aperture, skew rays. V number, Single mode fibers, step index fibers, graded index fibers. | 07 |
| 2 | **Optical fiber material and fabrication methods**<br>Single mode fibers,cut off wavelength, mode field diameter, effective refractive index. Fiber materials:Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers, Fiber fabrication methods: Outside vapor phase oxidation, Vapour axial deposition, Chemical vapour deposition and Plasma activated vapour deposition method. | 06 |
| 3 | **Signal Degradation, distortion and Fiber splicing**<br>Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, group delay, types of dispersion, material dispersion, wave guide dispersion, polarization mode dispersion, intermodal dispersion. pulse broadening.Fiber Splicing- Splicing techniques, Splicing single mode fibers. Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints,. optical fiber connectors connector types. | 07 |
| 4 | **Optical Sources**<br>Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies. Reliability of LED&ILD. light emitting diodes (LEDs), laser diodes, light source linearity, modal, partition and Reflection Noise, source to fiber power launching , output patterns, power coupling, power launching, equilibrium numerical aperture, laser diode to fiber coupling. | 07 |
| 5 | **Optical Detectors and Receivers**<br>physical principles of PIN and APD, detector response time, temperature effect on avalanche gain, comparison of photo detectors, optical receiver operation, fundamental | 06 |

| | | |
|---|---|---|
| | receiver operation, digital signal transmission, error sources, receiver configuration, digital receiver performance, probability of error, quantum limit, analog receivers. | |
| **6** | **Optical Networks**<br>Basic Networks, SONET/SDH, Broadcast-and –Select WDM Networks, Wavelength Routed Networks, Nonlinear Effects on Network Performance, Performance of WDM + EDFA Systems, Solitons, optical CDMA. | **06** |

**General Instructions:**

Based on the syllabus content students have to complete any one of the following activities:

1. Simulation based small project work
2. Case study work
3. Site visit
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5. Solve home assignments
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<tr><td>Course Code</td><td colspan="5">PCCC 321-3P</td></tr>
<tr><td>Course Category</td><td colspan="5">Professional Core Course (Program Elective I)</td></tr>
<tr><td>Course title</td><td colspan="5">Optical Fiber Communication (Practical)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
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<tr><td>Evaluation Scheme</td><td colspan="2">-</td><td colspan="2">EE: 50</td><td>Total=50</td></tr>
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## Course Outcome and Program Outcome Mapping

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| CO 4 | 3 | 3 | 2 | 3 | 2 | | | | | | | 1 |
| CO 5 | 3 | 3 | 2 | 3 | 2 | | | | | | | 1 |
| CO 6 | 3 | 3 | 2 | 3 | 2 | | | | | | | 2 |

Level of Mapping as: Low 1, Moderate 2, High 3

| | **List of Experiments** | **Hours** |
|---|---|---|
| **1** | Setting up Fiber optic analog link | **2** |
| **2** | Setting up Fiber optic digital link | **2** |
| **3** | Intensity Modulation system using analog input signal | **2** |
| **4** | Intensity Modulation system using digital input signal | **2** |
| **5** | Frequency modulation system | **2** |
| **6** | Pulse width modulation system | **2** |
| **7** | Study of propagation loss in optical fiber | **2** |
| **8** | Measurement of Bending loss in optical fiber | **2** |
| **9** | Measurement of Numerical Aperture | **2** |
| **10** | Setting up Fiber optic voice link using Frequency modulation | **2** |
| **11** | Setting up Fiber optic voice link using PWM | **2** |

**General Instructions:**

1. Minimum 8 experiments should be carried out based on above list or syllabus.
2. Batch wise experiments are to be conducted. The number of students per batch should be as per the practical batches.

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|---|---|
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<tr><td>Course Code</td><td colspan="5">OE 321-1</td></tr>
<tr><td>Course Category</td><td colspan="5">Program Elective Course (Open Elective I)</td></tr>
<tr><td>Course title</td><td colspan="5">Industrial Organization and Management (Theory)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>-</td><td>03</td><td>03</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE: 30</td><td colspan="2">ESE:70</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">-</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course is emphasis on the industry / organization aspects such as Management, Administration, Ethical Practices required in industry and leadership qualities. Industry drives by people working in organization. Good engineer should have knowledge of industrial environment, how organization works, and importance of team work. This course gives you introductory information about all above issue which will help you in comfortable working at industry</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Introduces the basic concepts of management and organization structure of an industry<br>2. Explore concept of Entrepreneurship<br>3. Discuss Material management and cost analysis<br>4. Introduce engineering economics and encourage for doing project management<br>5. Introduce ethical values<br>6. Introduce leadership qualities</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Explain the concepts of Management and organizational structure<br>2. Discuss the values of human and industrial relation<br>3. Explain industrial environment<br>4. Apply the project management tools effectively<br>5. Use ethical and professional practices<br>6. Demonstrate leadership quality</td></tr>
</table>

**Course Outcome and Program Outcome Mapping**

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **Organization and Management**<br>Organization: Concept, Important, Characteristics, Elements, Structure and process of an industrial organization, Types of Organization, Functions of different departments. Relationship between individual departments. Management, Administration, Principals, process, functions and Characteristics of management, Objectives of management | 07 |
| 2 | **Human and Industrial Relations**<br>Human relations and performance in organization, Understand self and others for effective behavior, Behaviour modification techniques, Industrial relations and disputes, Relations with subordinates, peers and superiors, Characteristics of group behaviour and trade unionism, Mob psycholog, Grievance, handling of grievances, Agitations, strikes, lockouts, picketting and gherao, Labour welfare, Workers' participation in management. Functions of HRD manager: Introduction, Staff development and career development, Training strategies and methods | 06 |
| 3 | **Industrial Psychology and Leadership**<br>Industrial Psychology and personal management, aim, objective and scope. Individual and group, difference in behavior, moral, Motivation: Factors determining motivation, Characteristics of motivation, Methods for improving motivation, Incentives, pay, promotion, rewards, Job satisfaction and job enrichment. Leadership: Need for leadership, Functions of a leader, Factors for accomplishing effective, leadership, Manager as a leader | 07 |
| 4 | **Materials and Financial Management**<br>Material management, procurement, buying techniques, purchase procedure, accounting, physical verification. Financial Management: Types of capital, sources of capital, book keeping, assets, capital gearing, return of investment. | 07 |
| 5 | **Professional ethics and environmental pollution**<br>Concept, ethics and moral, business and professional ethics, importance and need of ethics , ethical dilemmas, ethical problem in business. *Pollution:* ecology, factors causing pollutions, effect of pollution on wealth, air and water pollution and control, solid waste management, noise and control. | 06 |
| 6 | **Cost accounting and control** | 06 |

| | | |
|---|---|---|
| | Elements of cost, prime cost, overheads, factory and total cost. Selling price, nature and type of cost, process and production cost. Depreciation, breakeven analysis and chart | |

**Assignments: Based on the following activity**

- The Assignment work includes six assignments based on theory curriculum
  and
- The tutorial work is also consisting of the industrial survey and report writing. Students have to follow the guidelines given below. Evaluation of the students will be done on completion of the report and presentation.
  1. Form the group of students not exceeds than five.
  2. Select the appropriate product or service based industry in the nearby region.
  3. Take permission of industry for the visit.
  4. Visit the industry and make the survey with respect to organization structure, various departments and their functions, processing of raw material to form final product, administration, vision, mission, goals, growth etc.
  5. Go for multiple visits if required.
  6. Prepare the Industrial Survey report in detail and submit at the end of semester.

Prepare and make presentation on the industrial survey.

| Sr. No. | Reference Books |
|---|---|
| 1 | OP Khanna, 'Industrial Engineering and Management', Dhanpat Rai Publications, Delhi. |
| 2 | T R Banga, 'Industrial Engineering and Management', TMH Publications |
| 3 | J. Michael. Jacob —Application & Design with Analog Integrated Circuits, PHI. |
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<tr><td>Course Category</td><td colspan="5">Program Elective Course (Open Elective I)</td></tr>
<tr><td>Course title</td><td colspan="5">Professional Communication (Theory)</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>03</td><td>-</td><td>-</td><td>03</td><td>03</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE: 30</td><td colspan="2">ESE:70</td><td>Total=100</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">-</td></tr>
<tr><td>Course Rationale</td><td colspan="5">The Professional Communication course is designed to equip students with essential communication skills required for success in academic, professional, and business environments. Effective communication is a crucial competency in today’s globalized world, where professionals must convey their ideas clearly, persuasively, and professionally in various settings</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1.Enhance Verbal and Non-Verbal Communication Skills<br>2.Improve Business and Technical Writing<br>3.Develop Public Speaking and Presentation Skills<br>4.Strengthen Interpersonal and Team Communication<br>5.Adapt to Digital and Cross-Cultural Communication<br>6.Prepare for Career Success</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1.Communicate Effectively in Professional Settings<br>2.Write Clear and Professional Documents<br>3.Deliver Engaging and Persuasive Presentations<br>4.Demonstrate Strong Interpersonal and Teamwork Skills<br>5.Adapt to Digital and Cross-Cultural Communication<br>6.Enhance Employability and Professional Growth</td></tr>
</table>

**Course Outcome and Program Outcome Mapping**

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| **1** | Communication principles:<br>Business and professional excellence in the workplace, Verbal and non-verbal communication, Listening | **07** |
| **2** | Entering the workplace:<br>Resumes, interviews and negotiations; Diverse workplace, | **06** |
| **3** | Developing in the workplace:<br>Interpersonal communication, Strengthening terms and conducting meetings, | **07** |
| **4** | Excellence in the workplace:<br>Technology in the workplace, Business and professional writings, Leadership and conflict management, | **07** |
| **5** | Presenting in the workplace:<br>Informing and persuading, Speech design, speech delivering | **06** |
| **6** | Surviving in the workplace:<br>Work life balance | **06** |

**Assignments: Based on the following activity**

- The Assignment work includes six assignments based on theory curriculum
  and
- The tutorial work is also consisting of the industrial survey and report writing. Students have to follow the guidelines given below. Evaluation of the students will be done on completion of the report and presentation.
  1.Form the group of students not exceeds than five.
  2.Select the appropriate product or service based industry in the nearby region.
  3.Take permission of industry for the visit.
  4.Visit the industry and make the survey with respect to organization structure, various departments and their functions, processing of raw material to form final product, administration, vision, mission, goals, growth etc.

| | |
|---|---|
| 5.Go for multiple visits if required.<br>6.Prepare the Industrial Survey report in detail and submit at the end of semester.<br>7.Prepare and make presentation on the industrial survey. | |
| **Sr. No.** | **Reference Books** |
| 1 | Kelly M.Quintanilla, Shawn T. Wahl,"Business and progessional Communication-Keys for workplace excellence", 4th Edition, Sage publications |
| **Sr. No.** | **Important web references** |
| 1 | https://swayam.gov.in/ |
| 2 | https://nptel.ac.in/ |

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester V</td></tr>
<tr><td>Course Code</td><td colspan="5">AEC321</td></tr>
<tr><td>Course Category</td><td colspan="5">Ability Enhancement Course</td></tr>
<tr><td>Course title</td><td colspan="5">Mini project and industrial visit</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>-</td><td>-</td><td>02</td><td>02</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">IE:50</td><td colspan="2">EE: 50</td><td>Total=50</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Electronic circuit design, Analog Electronics, Digital Electronics, Microcontrollers,</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course deals with inculcating students skills for design, development, simulation, programming of electronics / software based systems to solve societal/ industrial problems.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1. Illustrate basic steps in electronic system design<br>2. Survey the problem and find technological solution<br>3. Design small scale electronics systems to accomplish task<br>4. Construct circuit models and simulate<br>5. Work in team to complete the task<br>6. Manage project in given time</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Illustrate fundamental stages in development of electronics engineering projects<br>2. Apply engineering knowledge for providing technological solutions<br>3. Simulate and design the circuits<br>4. Work in team environment<br>5. Write report , consider ethical issues in report writing / project management and express technical details<br>6. Consider social, environmental, industrial issues</td></tr>
</table>

## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| | **Curriculum Content** | **Hours** |
|---|---|---|
| **1** | **Curriculum Content**<br>Group size and activities:<br>1) Mini project group size should not exceed three students per every group.<br>2) Project idea should be proposed and finalized in consultation with guide.<br>3) Proposed weekly plan of the project should be finalized with guide.<br>4) Project work should be carried out in following steps<br>a) Selection of project & problem definition.<br>b) Paper design ( Circuit design and flow chart of software)<br>c) Simulation if required.<br>d) Hardware implementation<br>e) Software implementation ( if required)<br>f) Testing and calibration<br>g) Report writing<br>5) Compulsory submission of mini project report by each group is a must.<br>6) Projects of two or more groups should not be same.<br>7) Seminar must be delivered after completion of project by each group preferably by using power point presentation.<br>8) Mini-project report must be submitted before/at the time of viva-voce .<br>Project Contents:<br>1) It should consists of hardware part and software part is optional.<br>2) Design of PCB by using suitable CAD tool, simulation if necessary, component mounting, soldering, testing , result analysis should be done by group.<br>3) Design and development of cabinet should be done for the project.<br><br>**Guidelines for mini-project selection**<br>Parameter monitoring, parameter / system controlling applications, data acquisition systems, microcontroller based systems, digital design, communication projects, VLSI based project, power supply and batteries<br><br>**Guidelines for industrial visit**<br>A visit should be arranged to suitable industry. Students have to submit the report of the industrial visit to department. | |

**General Instructions:**

1. A mini project report should be submitted by students to department in the given format.
2. Industrial visit report should be submitted to department in given format.

| | |
|---|---|
| **Sr. No.** | **Reference Books** |
| 1 | Articles from reputed journals, magazines, websites, real world problems, case studies |
| **Sr. No.** | **Important web references** |
| 1 | https://swayam.gov.in/ |
| 2 | https://nptel.ac.in/ |

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester VI</td></tr>
<tr><td>Course Code</td><td colspan="5">VSEC321</td></tr>
<tr><td>Course Category</td><td colspan="5">Vocational and skill enhancement course</td></tr>
<tr><td>Course title</td><td colspan="5">Design Thinking and Innovation- III</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>01</td><td>-</td><td>-</td><td>01</td><td>01</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE: NIL</td><td colspan="2">ESE:NIL</td><td>IE should be conducted at course in-charge end</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">--</td></tr>
<tr><td>Course Rationale</td><td colspan="5">The Design Thinking & Innovation III course aims to bridge the gap between conceptual design and real-world application. By integrating advanced design thinking methodologies with industry-relevant challenges, the course prepares students to develop, validate, and execute innovative solutions. This progression ensures that students transition from ideation to actionable strategies that are market-ready and impactful</td></tr>
<tr><td>Course Objectives</td><td colspan="5">1.To advance students' capabilities in synthesizing complex design challenges into feasible solutions.<br><br>2.To refine iterative problem-solving skills through industry-focused projects and case studies.<br><br>3.To cultivate a proactive, entrepreneurial mindset that addresses sustainability and societal needs.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">1. Analyze complex problems to develop innovative, user-centric design solutions<br><br>2. Apply advanced prototyping techniques to validate and optimize product concepts<br><br>3. Collaborate effectively across disciplines to deliver actionable and sustainable innovations<br><br>4. Evaluate and align solutions with market trends, user feedback, and ethical considerations</td></tr>
</table>

**Course Outcome and Program Outcome Mapping**

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **Design Thinking Framework Revisited**<br>Advanced principles of empathy, ideation, and prototyping. Reflection on learning from Design Thinking & Innovation I and II. Introduction to systems thinking in the design context | 2 |
| 2 | **Problem Scoping and Opportunity Identification**<br>Techniques for problem discovery and framing. Identifying gaps and opportunities in existing systems. Leveraging tools like Journey Mapping and SWOT Analysis | 2 |
| 3 | **Ideation Techniques and Advanced Prototyping**<br>Brainstorming 2.0: Mind Mapping and SCAMPER techniques. Prototyping with a focus on technology integration. Real-world prototyping examples from diverse industries | 2 |
| 4 | **Validation and Iterative Development**<br>Usability testing methods and feedback incorporation. Iterative design models: Agile and Lean principles. Creating Minimum Viable Products (MVPs). | 2 |
| 5 | **Innovation Strategy and Entrepreneurship**<br>Bridging design with business models (Canvas Model). Strategies for market positioning and scaling innovations. Ethical considerations and sustainable innovation practices | 2 |
| 6 | **Case Studies and Capstone Projects**<br>Real-world applications of design thinking in Electronics & Telecommunication Engineering. Group projects focusing on an innovative solution for an industry-related problem. Presentation and feedback | 2 |
| **Pedagogical Strategies** | | |

- **Interactive Sessions:** Facilitators to encourage collaborative discussions and problem-solving activities.
- **Hands-On Assignments:** Individual and group-based projects for practical application.
- **Case Studies:** Industry-specific scenarios for analysis and solution generation.
- **Technology Integration:** Use of tools like Miro, Figma, or Scilab for design processes.

**Assessment Methods**

- **Formative Assessments:**

  Assignments: Application of unit-specific tools (20%).

  Group Activities: Problem framing and solution ideation tasks (30%).

- **Summative Assessments:**

  Final Presentation of Capstone Project (50%).

| Sr. No. | Reference Books |
|---|---|
| 1 | Brown, T. (2009). *Change by Design*. HarperBusiness. |
| 2 | Lewrick, M., Link, P., & Leifer, L. (2018). *The Design Thinking Playbook*. Wiley. |
| 3 | Plattner, H., Meinel, C., & Leifer, L. (2020). *Design Thinking Research*. Springer. |
| 4 | Christensen, C. M. (2013). *The Innovator's Dilemma*. Harvard Business Review Press. |
| **Sr. No.** | **Important web references** |
| 1 | https://swayam.gov.in/ |
| 2 | https://nptel.ac.in/ |

<table>
<tr><td>Year, Program, Semester</td><td colspan="5">Third Year B.Tech (Electronics & Telecommunication Engineering ), Part 3, Semester VI</td></tr>
<tr><td>Course Code</td><td colspan="5">MAC321</td></tr>
<tr><td>Course Category</td><td colspan="5">Mandatory Audit Course</td></tr>
<tr><td>Course title</td><td colspan="5">Aptitude Enhancement Course III</td></tr>
<tr><td rowspan="2">Teaching Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Total Contact Hours</td><td>Total Credits</td></tr>
<tr><td>02</td><td>-</td><td>-</td><td>02</td><td>02</td></tr>
<tr><td>Evaluation Scheme</td><td colspan="2">ISE:NIL</td><td colspan="2">ESE: NIL</td><td>IE should be conducted at course in-charge end</td></tr>
<tr><td>Pre-requisites (if any)</td><td colspan="5">Aptitude Enhancement Course 1, 2</td></tr>
<tr><td>Course Rationale</td><td colspan="5">This course sharpens cognitive skills, decision-making, and industry-relevant problem-solving, preparing students for competitive exams and professional challenges.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">The Course is aimed to-<br>1.Equip students with techniques for solving quantitative aptitude problems like interest and mixture.<br>2.Enhance logical reasoning abilities, including decision-making and assertion-reason analysis.<br>3.Develop skills to calculate and apply geometric areas, volumes, and surface areas in problem-solving.<br>4.Introduce fundamental concepts of probability and statistics for solving quantitative problems.<br>5.Strengthen abilities to solve time-based problems, improving speed and accuracy.<br>6.Train students to recognize and solve logical sequences and patterns in reasoning and mathematics.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">Upon completion of this course, student should be able to –<br>1.Solve quantitative aptitude problems related to Boats and Streams, Trains, Mixtures, and Interest calculations effectively.<br>2.Develop logical reasoning skills for problems like decision-making, number ranking, and time sequence tests.<br>3.Calculate areas, volumes, and surface areas of geometric shapes and apply them to practical problems.<br>4.Apply probability and statistical analysis in solving real-world problems like stocks, shares, and series.<br>5.Solve time-based problems involving calendars, clocks, and distances, enhancing time management skills.<br>6.Master advanced techniques in Permutations, Combinations, and other mathematical concepts for higher-level exams.</td></tr>
</table>

## Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

| Unit No. | Course Content | Hours |
|---|---|---|
| 1 | **Quantitative Aptitude 1**<br>Boats and Streams, Problems on Trains, Allegation or Mixture, Simple Interest. | 2 |
| 2 | **Quantitative Aptitude 2**<br>Compound Interest, Area, Volume and Surface Area, Races and Games of Skill. | 2 |
| 3 | **Quantitative Aptitude 3**<br>Calendar, Clocks, Stocks and Shares, Permutations and Combinations. | 2 |
| 4 | **Quantitative Aptitude 4**<br>Probability, True Discount, Banker's Discount, Heights and Distances, Odd Man Out and Series. | 2 |
| 5 | **Logical Reasoning 1**<br>Number ranking and time sequence test, Decision making, Assertion and reason, Situation reaction Test. | 2 |
| 6 | **Logical Reasoning 2**<br>Mathematical Operations, Inserting the missing one, logical sequence of words. | 2 |
| **General Instructions:**<br>Each Student has to write at least 6 assignments on entire syllabus. | | |
| **Sr. No.** | **Reference Books** | |
| 1 | Dr. R S Aggarwal — Quantitative aptitude, S. Chand Publication. | |
| 2 | R V Praveen — Quantitative aptitude and logical reasoning, 2nd Edition, PHI Publication. | |
| | **Assessment** | |
| | Assessment will be done by Course Teacher. MCQ Test can be conducted based on the syllabus. | |
| **Sr. No.** | **Important web references** | |
| 1 | https://swayam.gov.in/ | |
| 2 | https://nptel.ac.in/ | |

**SEM – V**

| Sr. No. | Third Year B. Tech Semester V Pre-revised syllabus | Third Year B. Tech Semester V Revised syllabus (NEP -2020) | Remark |
|---|---|---|---|
| 1 | Power Electronics | Power Electronics | Minor changes are done |
| 2 | Electromagnetic Fields | Electromagnetic Fields | Minor changes are done |
| 3 | Microcontrollers | Microcontrollers | Minor changes are done |
| 4 | Signals & Systems | | Minor changes are done |
| 5 | Computer Networks | Shifted to 6th Semester as program elective | |
| 6 | | Digital Signal Processing | Shifted from 6th Semester to 5th Semester |
| 7 | | Multi Disciplinary Minor Course II | Newly added |
| 8 | Advanced programming Techniques | Advanced programming Techniques | |
| 9 | Power Electronics Laboratory | Power Electronics Laboratory | |
| 10 | Electromagnetic Fields Tutorial | Electromagnetic Fields Tutorial | |
| 11 | Microcontrollers Laboratory | Microcontrollers Laboratory | |
| 12 | Computer Networks Laboratory | Shifted to 6th Semester as program elective | |
| 13 | Advanced programming techniques | Advanced programming techniques | |
| 14 | Internship-I | Replaced with Mini Project 1 | |
| 15 | Research Methodology (Audit Course) | | |
| 16 | | Introduction to foreign language | Shifted from 6th Semester to 5th Semester |
| 17 | | Aptitude Enhancement Course 2 | Newly added |

**SEM – VI**

| Sr. No. | Third Year B. Tech Semester VI Pre-revised syllabus | Third Year B. Tech Semester VI Revised syllabus (NEP-2020) | Remark |
|---|---|---|---|
| 1 | Digital Signal Processing | | Shifted to 5th Semester , Minor changes are done |
| 2 | Digital Communication | | Removed from TY curriculum , Minor changes are done |
| 3 | Antenna & Wave Propagation | Antenna & Wave Propagation | Minor changes are done |
| 4 | VLSI Design | VLSI Design | Minor changes are done |
| 5 | Control Systems | Control Systems | Minor changes are done |
| 6 | | Multidisciplinary Minor Course 3 | Newly added |
| 7 | | **Program Elective 1**<br>1. ARM & Embedded systems<br>2. Computer Networks<br>3. Optical Fiber Communication | Newly Added |
| 8 | | **Open Elective 1**<br>1.Industrial Organization and Management<br>2. Professional Communication | Newly added |
| 9 | Digital Signal Processing Laboratory | | Removed |
| 10 | Digital Communication Laboratory | | Minor changes are done |
| 11 | Antenna & Wave Propagation Laboratory | | Minor changes are done |
| 12 | VLSI Design Laboratory | | Minor changes are done |
| 13 | Seminar | | Removed |
| 14 | Mini Project and Seminar Laboratory | Mini Project and Industrial Visit | Minor changes are done |
| 15 | Introduction to foreign language | | Minor changes are done |
| 16 | | Design Thinking & innovation 3 | Newly added |
| 17 | | Aptitude Enhancement Course 3 | Newly added |