
# D. Y. Patil College of Engineering and Technology

Kasaba Bawada, Kolhapur

## B. Tech Programme Structure

## (Autonomous)

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## (Department of Electronics & Telecommunication Engineering)

**2021-22**

# Structure for Second Year Electronics & Telecommunication

**Second Year (B.Tech.) Electronics & Telecommunication**
**SEM-III**

| Sr. No. | Course Code | Course Type | Name of the Course | Teaching Scheme | | | | Total Mark | Evaluation Scheme | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture | Tutorial | Practical | Credits | | Type | Max. Marks | Min. for Passing | |
| 1 | 201ETL201 | BSC | Applied Mathematics | 3 | 1 | | 4 | 100 | ISE<br>MSE<br>ESE | 20<br>30<br>50 | 20<br><br>20 | 40 |
| 2 | 201ETL202 | PCC | Electronics Circuits Analysis and Design - I | 3 | | | 3 | 100 | ISE<br>MSE<br>ESE | 20<br>30<br>50 | 20<br><br>20 | 40 |
| 3 | 201ETL203 | PCC | Analog and Digital Communication | 3 | | | 3 | 100 | ISE<br>MSE<br>ESE | 20<br>30<br>50 | 20<br><br>20 | 40 |
| 4 | 201ETL204 | PCC | Data structures and algorithms | 3 | | | 3 | 100 | ISE<br>MSE<br>ESE | 20<br>30<br>50 | 20<br><br>20 | 40 |
| 5 | 201ETL205 | PCC | Instrumentation and Control System | 3 | 1 | | 4 | 100 | ISE<br>MSE<br>ESE | 20<br>30<br>50 | 20<br><br>20 | 40 |
| 6 | 201ETP206 | PCC - LC | Electronics Circuits Analysis and Design – I-Lab | | | 2 | 1 | 50 | ISE<br>ESE POE | 25<br>25 | 10<br>10 | 20 |
| 7 | 201ETP207 | PCC - LC | Analog and Digital Communication Lab | | | 2 | 1 | 50 | ISE<br>ESE POE | 25<br>25 | 10<br>10 | 20 |
| 8 | 201ETP208 | PCC - LC | Data structures and algorithms Lab | | | 2 | 1 | 50 | ISE<br>ESE POE | 25<br>25 | 10<br>10 | 20 |
| 9 | 201ETP209 | ESC-LC | Electronics workshop practice | | | 2 | 1 | 25 | ISE | 25 | 10 | 10 |
| 10 | 201ETL210 | MC | Environment studies | 2 | | | 0 | 50 | ESE | 50 | 20 | 20 |
| **TOTAL** | | | | 17 | 2 | 8 | 21 | 725 | | 725 | | |
| **Total Contact Hours** | | | | **27** | | | | | | | | |

**Second Year (B.Tech.) Electronics & Telecommunication**
**SEM-IV**

| Sr. No. | Course Code | Course Type | Name of the Course | Teaching Scheme | | | | Total Marks | Evaluation Scheme | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture | Tutorial | Practical | Credits | | Type | Max. Marks | Min. for Passing | |
| 11 | 201ETL211 | PCC | Electronics Circuits Analysis & Design - II | 3 | | | 3 | 100 | ISE<br>MSE<br>ESE | 20<br>30<br>50 | 20<br><br>20 | 40 |
| 12 | 201ETL212 | PCC | Digital System Design using Verilog | 3 | | | 3 | 100 | ISE<br>MSE<br>ESE | 20<br>30<br>50 | 20<br><br>20 | 40 |
| 13 | 201ETL213 | PCC | Signals and Systems | 3 | 1 | | 4 | 100 | ISE<br>MSE<br>ESE | 20<br>30<br>50 | 20<br><br>20 | 40 |
| 14 | 201ETL214 | PCC | Electromagnetic waves & radiating systems | 3 | 1 | | 4 | 100 | ISE<br>MSE<br>ESE | 20<br>30<br>50 | 20<br><br>20 | 40 |
| 15 | 201ETL215 | PCC | Linear Integrated circuit | 3 | | | 3 | 100 | ISE<br>MSE<br>ESE | 20<br>30<br>50 | 20<br><br>20 | 40 |
| 16 | 201ETP216 | PCC -LC | Electronics Circuits Analysis & Design - II - Lab | | | 2 | 1 | 25 | ISE | 25 | 10 | 10 |
| 17 | 201ETP217 | PCC -LC | Digital System Design using Verilog -Lab | | | 2 | 1 | 50 | ISE<br>ESE POE | 25<br>25 | 10<br>10 | 20 |
| 18 | 201ETP218 | PCC -LC | Linear Integrated circuit - Lab | | | 2 | 1 | 50 | ISE<br>ESE POE | 25<br>25 | 10<br>10 | 20 |
| 19 | 201ETP219 | PROJ | Mini-Project-I -Lab | | | 2 | 1 | 50 | ISE<br>ESE POE | 25<br>25 | 10<br>10 | 20 |
| 20 | 201ETL220 | MC | Financial Management | 2 | | | 0 | 50 | ESE | 50 | 20 | 20 |
| **TOTAL** | | | | 17 | 2 | 8 | 21 | 725 | | 725 | | |
| **Total Contact Hours** | | | | **27** | | | | | | | | |

***ISE: In Semester Evaluation, MSE: Mid Semester Examination, ESE: End Semester Examination***

**Note 1 : Tutorials and practical shall be conducted in batches with batch strength not exceeding 20 students .**

**Note 2 : MSE will be conducted for 30 marks**

**Note 3 : ESE will be conducted for 100 marks and converted to 50 marks**

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

### Course Plan

| **Course Title : Applied Mathematics** | |
|---|---|
| **Course Code : 201ETL201** | **Semester : III** |
| **Teaching Scheme : L-T-P : 3-1-0** | **Credits : 4** |
| **Evaluation Scheme : ISE + MSE Marks : 20 + 30** | **ESE Marks : 50** |

**Course Description:**

The course contains Differential Equations, Vector Calculus, Integral Calculus, Fourier Series and Statistics.

**Course Objectives:**

1. To teach Mathematical methodology and models.
2. To develop mathematical skills and enhance logical thinking power of students.
3. To give the knowledge of Applied Mathematics with an emphasis on the applications of solving electronics & telecommunication engineering problems.
4. To produce graduates with mathematical knowledge, computational skills and the ability to deploy these skills effectively in solution of engineering problems.

**Course Outcomes (COs):**

At the end of the course, the student will be able to:

| | |
|---|---|
| **C201.1** | Solve Linear Differential Equations & use for eletronics & telecommunication related problems |
| **C201.2** | Apply knowledge of vector differentiation to find curl and divergence of vector fields |
| **C201.3** | Describe the statistical data numerically by using Lines of regression |
| **C201.4** | Solve problems in Probability theory using Binomial, Poisson and Normal Distribution. |
| **C201.5** | Use Laplace transforms to solve Linear Differential Equations |
| **C201.6** | Express periodic functions into the Fourier series |

| | |
|---|---|
| **Prerequisite:** | Knowledge of Differentiation and Integration , Basic Probability theory |

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

**Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)** and **Program Specific Outcomes (PSO)**

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C201.1 | 3 | 3 | - | - | - | - | - | - | - | - | - | - | 2 | 2 | 3 |
| C201.2 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | 2 | 3 |
| C201.3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | 2 | 2 |
| C201.4 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | 2 | 2 |
| C201.5 | 3 | 3 | - | - | - | - | - | - | - | - | - | - | 2 | 2 | 3 |
| C201.6 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | 2 | 2 |

| Contents | Hours |
|---|---|
| **Unit-1 : Linear Differential Equations (LDE) and its Applications:**<br>Linear Differential equations with constant coefficients<br>Rules to find complementary function<br>1.3 Methods to find particular Integral ($e^{ax}$, sin ax or cos ax, $x^m$, $e^{ax}x^m$, $e^{ax}sinax$ or $e^{ax}cosax$)<br>1.4 Applications of LDE with constant coefficients to Electrical engineering | 6 |

## Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

| | |
|---|---|
| **Unit-2 : Vector Differential Calculus:**<br>2.1 Differentiation of vectors<br>2.2 Gradient of scalar point function<br>2.3 Divergence of vector point function<br>2.4 Curl of a vector point function<br>2.5 Irrotational, Solenoidal and Scalar potential function of a vector field | 6 |
| **Unit-3 –: Correlation and Regression:**<br>3.1 Introduction<br>3.2 Mean, Standard Deviation and Variance<br>3.3 Karl Pearson's Coefficient of Correlaion<br>3.4 Lines of regression of y on x<br>3.5 Lines of regression of x on y | 6 |
| **Unit-4 -: Probability Distribution:**<br>4.1 Random variables<br>4.2 Discrete Probability distribution<br>4.3 Continuous probability distribution<br>4.4 Binomial Distribution<br>4.5 Poisson Distribution<br>4.6 Normal Distribution | 6 |
| **Unit-5 -: Laplace Transform and its Applications:**<br>5.1 Laplace transform of elementary functions<br>5.2 Properties of Laplace transforms (First Shifting , Change of scale property , Multiplication & Division by t)<br>5.3 Inverse Laplace transforms by Partial Fractions & Convolution theorem<br>5.4 Solution of LDE with constant coefficients using Laplace transform | 6 |
| **Unit-6-: Fourier Series:**<br>6.1 Introduction<br>6.2 Dirichlet's conditions<br>6.3.Euler's formulae<br>6.4 Change of interval<br>6.5 Expansions of odd and even functions.<br>6.6 Half range series | 6 |

## Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

**Text Books:**

1. H. K. Dass, Advanced Engineering Mathematics, S.Chand, New Delhi.
2. Dr. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi.

**Reference Books:**

1. P.N.Wartikar & J.N.Wartikar, AText Book of Applied Mathematics Vol.I & II, Pune Vidyarthi Griha Prakashan, Pune.
2. Erwin Kreyszig Advanced Engineering Mathematics, India Pvt, Ltd.
3. A Text Book of Engineering Mathematics by N.P.Bali, Manish Goyal ( Laxmi Publication),New Delhi, 7 th Edition 2007.
4. B.V.Ramana, Higher Engineering Mathematics, Tata M/c Graw-Hill Publication.

## List of Tutorials

| Sr. No. | Title |
|---|---|
| 1 | Linear Differential Equations |
| 2 | Applications Linear Differential Equations |
| 3 | Vector Differential Calculus- Gradient & Divergence |
| 4 | Vector Differential Calculus- Curl , Solenoidal & irrotational fields |
| 5 | Correlation and Regression |
| 6 | Probability Distribution |
| 7 | Laplace Transform and its Applications |
| 8 | Inverse Laplace Transform |
| 9 | Fourier Series- Change of Interval |
| 10 | Fourier Series- Odd & Even Functions, Half range series |

**Instructions:** 1. Minimum 10 tutorials should be conducted covering all the units .

2. Batch wise tutorials should be conducted.

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# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

| **Course Title: Electronics Circuits Analysis and Design - I** | |
|---|---|
| **Course Code: 201ETL202** | **Semester : III** |
| **Teaching Scheme : L-T-P :3-0-0** | **Credit: 3** |
| **Evaluation Scheme : ISE + MSE Marks : 20 + 30** | **ESE Marks : 50** |

**Course Description:**

This course aims to provide the basic knowledge of electronic device operation and the characteristics for various devices along with the basic designing parameters for different applications.

**Course Objectives:**

1. Apply the design techniques of analog electronic circuits using diodes and to develop analytical skills.
2. Apply the design techniques of analog electronic circuits using transistors to develop analytical skills.
3. Analyse the wave shaping circuits using analog components.
4. Provide an introduction and basic understanding of Semiconductor Devices viz.
5. Diodes, BJT& JFET

**Course Outcomes (COs):**

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

| | |
|---|---|
| C202.1 | Analyse and Design unregulated & regulated DC Power supply. |
| C202.2 | Analyse and Design IC regulators |
| C202.3 | Apply the knowledge electronic component basics to linear & non-linear Wave shaping Circuits |
| C202.4 | Analyse and Design biasing circuits of Bipolar Junction Transistor & Field Effect Transistor |

| Prerequisite: | Physics, Fundamentals of Electrical & Electronics Engg. |
|---|---|

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

### Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C202.1 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 2 | 2 | 4 |
| C202.2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 2 | 2 | 4 |
| C202.3 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 2 | 2 | 3 |
| C202.3 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 2 | 2 | 4 |

### Course Content

| Content | Hrs. |
|---|---|
| **Unit 1 – Unregulated Power Supplies**<br>**Rectifiers:** Half, Full and Bridge Rectifier, Analysis for different parameters: Vdc, Idc, PIV, TUF, efficiency, ripple factor, regulation, Form Factor, Regulation.<br>**Filters:** Need of filters, Analysis for ripple factor of Capacitor, Inductor, LC, CLC filters. Design of unregulated power supply with filter. | 6 |
| **Unit 2 –Voltage Regulators**<br>Need of voltage regulator, Stabilization factors, Analysis of Shunt regulator, (using Zener diode & BJT) voltage regulator (using BJT) Series voltage regulator with Pre- regulator & Overload protection circuit. | 6 |
| **Unit 3 - IC Voltage Regulators**<br>IC Voltage Regulators:- Study and design of regulators using IC's:78XX, 79XX, LM723, LM317, Switching regulator: Introduction, study of Switched Mode Power Supply IC: LM3524, Design of DC Power supply using 78XX | 6 |
| **Unit 4:Analysis of Wave Shaping Circuits**<br>**RC Circuits:-** High pass as a differentiator, Low pass as integrator, Low Pass & | 6 |

## Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

| | |
|---|---|
| High Pass (square & step response).<br>**Clipping circuits:-**Classification, construction, working & Transfer characteristics of clipper circuits.<br>**Clamping circuits:-** Classification, construction, working clamping circuits. | |
| **Unit5: Bipolar Junction Transistor &Biasing**<br>**Bipolar Junction Transistor:** Construction, Operation, Common Base Configuration, Transistor Amplifying Action, Common Emitter Configuration, Common Collector Configuration, Transistor specifications, Heat Sinking.<br>**BJT Biasing:** DC Load Line and Operating Point, Need of biasing, Introduction to Fixed & Collector-to-Base Bias, analysis & design of Self or Voltage divider Bias. | 6 |
| **Unit6: Field Effect Transistor& Biasing**<br>**Field Effect Transistor:** *n*-Channel JFET, Characteristics of *n* – Channel JFET, *p* – Channel JFET, JFET Parameters, FET Voltage Amplification.<br>**FET Biasing:** DC Load Line, Analysis of Fixed Voltage Bias Circuit, Self-Bias Circuit, Potential Divider Bias | 6 |

**Text Books:**

1. Electronic devices & circuits, Allen Mottershed Prentice- Hall India
2. Electronic devices & circuits, J. Millman & C. Halkias, Tata Mc Graw Hill Publication
3. A Monograph on Electronics Design Principles N.C. Goyal & R.K. Khetan-Khanna Publishers

**Reference Books:**

1. Electronic devices & circuits, David A. Bell ,Oxford University
2. Electronic devices & circuits', Salivahanan, N Sureshkumar, Tata McGraw Hill Publication
3. Electronic devices &circuit theory, Robert L. Boylsted, Louis Nashelsky, Pearson Education

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

| **Course Title : Analog and Digital Communication** | |
|---|---|
| **Course Code : 201ETL203** | **Semester : III** |
| **Teaching Scheme : L-T-P : 3-0-0** | **Credits : 3** |
| **Evaluation Scheme : ISE + MSE Marks : 20 + 30** | **ESE Marks : 50** |

**Course Description:**

Course deals with understanding the principles of Analog and Digital Communication, study of different types of Noise in communication system .It describes the Fundamentals of baseband transmission modulation techniques.

**Course Objectives:**

1. To understand the different types of Analog Modulation & demodulation techniques.
2. To introduces the different types of Pulse Modulation & demodulation techniques.
3. To study various types of Noise in communication systems
4. To provide the basic of baseband transmission and Reception

**Course Outcomes (COs):**

At the end of the course the student will be able to:

| | |
|---|---|
| C203.1 | Illustrate different modulation schemes |
| C203.2 | Illustrate different demodulation schemes |
| C203.3 | Classify different types of noise |
| C203.4 | Interpret the baseband transmission and Reception. |

| Prerequisite | Electronic devices & circuits |
|---|---|

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C203.1 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | 1 | 1 | 3 |
| C203.2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | 2 | 2 | 3 |
| C203.3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | 3 |
| C203.4 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 |

| Contents | Hours |
|---|---|
| **Unit 1. Amplitude Modulation & Demodulation:**<br>Introduction to Analog Communication System, Radio spectrum and frequency allocation. Need for modulation, Amplitude Modulation principles, AM envelope, frequency spectrum & BW, AM transmitters: Block of low level DSBFC, High level DSBFC, SSB suppression techniques. Characteristics of Receiver, Block diagram of TRF and Super heterodyne receiver | 7 |
| **Unit 2. Angle Modulation:**<br>Introduction to frequency and phase modulation. Mathematical representation of F.M. Frequency spectrum of F.M. wave. Generation of F.M. methods. Types of FM Receivers. Case study of AM/ FM station. | 6 |
| **Unit 3. Digital transmission of analog signals:**<br>Introduction, Shannon's theorem of information, Sampling theorem, Classification of Pulse Modulation, Study of Pulse Code Modulation- Uniform & Non uniform quantization, DPCM, Delta Modulation, ADM | 6 |

| | |
|---|---|
| **Unit 4. Noise:**<br>Noise sources and types. Quantization noise, Signal to quantization noise ratio. Influence of noise on PCM. | 5 |
| **Unit 5. Baseband transmission & reception:**<br>Line codes: Unipolar, Bipolar, NRZ, RZ, RZ-AMI, Manchester Baseband pulse Shaping, M-array Signaling, ISI, eye diagram, scrambler, Unscramble. Optimum Receivers-Matched Filters, Correlation receivers | 5 |
| **Unit 6. Baseband modulation techniques:**<br>ASK, FSK, PSK, DPSK, QPSK, & QAM. Coherent, Non- Coherent Detection. Comparison of modulation techniques based on Baud rate, BER, Power Spectral density. DSSS, FHSS. | 7 |

**Text Books:**

1. George Kennedy, "Electronic Communications", McGraw Hill.
2. Wayne Tomasi 'Electronics Communication System' -Fundamentals through Advanced.-Vth Edition-Pearson Education.
3. Analog and Digital communication – J S Chitode Technical Publications,2009

**Reference Books:**

1. B.P. Lathi, "Analog and Digital Communication", OXFORD University press.
2. Simon Haykin, "An introduction to analog & digital communications", John Wiley &Sons
3. R P Singh, S D Sapre 'Communication System-Analog & Digital' IInd Edition –Tata Mc Graw HillPublication.
4. Louis E. Frenzel, "Principals of electronic communication system", III$^{rd}$ Ed., TMHPub.

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# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

### Course Plan

| | |
|---|---|
| **Course Title : Data Structures and Algorithms** | |
| **Course Code : 201ETL204** | **Semester : III** |
| **Teaching Scheme : L-T-P : 3-0-0** | **Credits : 3** |
| **Evaluation Scheme : ISE + MSE Marks : 20 + 30** | **ESE Marks : 50** |

**Course Description:**

In this course, we will explore several fundamental algorithms and data structures in computer science, and learn to implement them in C.

**Course Objectives:** The course aims to

1. To impart the basic concepts of data structures and algorithms.
2. To introduce the concepts of array, record & pointers.
3. To understand the importance of linked lists and its applications.
4. Provide the concept of stacks, queues & it's applications.
5. To introduce the concepts of non linear data structures & searching techniques.

**Course Outcomes (COs):**

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

| | |
|---|---|
| C204.1 | Compare different data structures and choose a data structure for an application. |
| C204.2 | Apply the Algorithms to Add, delete, sort, and search for data structures like Array, linked list, Stack and Queue |
| C204.3 | Analyze algorithms and determine their time complexity. |
| C204.4 | Explain the concept of trees, graphs and compare different searching techniques. |

| | |
|---|---|
| Prerequisite: | Basics of C programming language |

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

### Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C204.1 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 1 | 1 | 2 |
| C204.2 | 3 | | 2 | 3 | - | 1 | - | - | - | - | - | 1 | 2 | 1 | 3 |
| C204.3 | - | - | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 4 |
| C204.4 | 2 | 2 | 3 | - | - | - | - | - | - | - | - | - | - | - | 2 |

### Course Content

| Content | Hrs |
|---|---|
| **Unit 1 –Introduction to Data Structure:** Introduction to theory of data structures, Abstract data types, Classification of data structures. Algorithms: Algorithm analysis, complexity, Big Oh (O), Big Omega (Ω), Big Theta (Θ) notation, time space trade-off. | 4 |
| **Unit 2 - Arrays:** Introduction of linear arrays: representation of linear array in memory, traversing linear arrays, inserting & deleting. Sorting: bubble sort & quick sort. Searching: linear search & binary search. Two-dimensional Arrays, Multidimensional arrays: matrices and sparse matrices. Pointers: pointer arrays**.** | 6 |
| **Unit 3 –Linked Lists:** Introduction, linked lists & its representation, Traversing & searching a linked list, memory allocation, Garbage collection, insertion & deletion of nodes of linked list, header linked list, two-way lists, applications of linked lists. | 6 |
| **Unit 4 - Stacks & Queues:** Introduction to stacks, stack as an Abstract Data type , representation through Arrays & linked lists ,Applications of stacks , stacks & recursion, Queue as an abstract data type representation, circular, double ended, priority, application of | 6 |

| | |
|---|---|
| queues. | |
| **Unit 5 - Trees:**<br>Basic terminologies, tree representation (using array, using linked list), Binary trees,- binary tree traversal (pre-, in-, post- order), threaded binary tree , Binary search tree- operations (creation, insertion, deletion, searching), Height balanced binary tree – AVL tree (insertion, deletion with examples only),applications of trees. | 7 |
| **Unit 6- Graphs and Hashing:**<br>Introduction, Graph theory terminology, representation of graphs: Adjacency Matrix,Adjacency List, Path matrix, Warshall's Algorithm, Traversing,Topological Sorting, Hashing, Hash functions, collision,Collision Resolution by Open Addressing,chaining. | 7 |

**Text Book:**

1. ISRD group –'Data structure using C 'Tata McGraw Hill

2. S. Lipschutz, "Data Structures" Mc-Graw Hill International Editions

3. Narasimha Karumanchi, "Data Structures and Algorithm Made Easy", Fifth Edition, CareerMonk publication

**Reference Books:**

1. Langsam, Augenstein, Tenenbaun –'Data structure using C & C++ ' - PHI

2. Data structures A Programming Approach with C, D.S.Kushwaha and A.K.Misra, PHI.

3. E. Horwitz , S. Sahani, Anderson-Freed, " Fundamentals of Data Structures in C", Second Edition, Universities Press

4. A.N. Kamthane-" Introduction to Data structures in C"- Pearson Education (LPE)

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

| **Course Title : Instrumentation and Control System** | |
|---|---|
| **Course Code : 201ETL205** | **Semester : III** |
| **Teaching Scheme : L-T-P : 3-1-0** | **Credits : 4** |
| **Evaluation Scheme : ISE + MSE Marks : 20 + 30** | **ESE Marks : 50** |

**Course Description:**

Instrumentation and control system plays the primary role in the designing of control and instrumentation based systems. In today's telecommunication world knowing physical parameter is very important to forecast certain things, and this is possible only when we study instrumentation and control system subject. The students will learn different types of sensors and actuators, and Virtual Instrumentation along with basic concepts of control systems.

**Course Objectives:**

1. To explain student with different types of sensors and transducers along with working principles
2. To motivate students to study the electronic instruments & display devices.
3. To motivate students to study the time domain, frequency domain and stability of LTI systems

**Course Outcomes (COs):**

At the end of the course the student will be able to:

| | |
|---|---|
| C205.1 | Analyze and identify the instrument suitable for specific measurements. |
| C205.2 | Use and identify the basic principles of Sensors and Actuators |
| C205.3 | Analyze the LTI system in time domain and frequency domain |
| C205.4 | Test the stability of LTI system using conventional methods |

| | |
|---|---|
| **Prerequisites**: | Students should know the differential mathematics, Laplace transform and basic electronic components |

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C205.1 | 2 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 4 |
| C205.2 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | 2 |
| C205.3 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | 4 |
| C205.4 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 1 | 1 | 3 |

| Contents | Hours |
|---|---|
| **Unit 1. Sensors and Actuators:**<br>Definition and Classification of sensors/Transducers, Characteristics and Choice of Transducers, Potentiometer, Strain Gauges, RTD, Thermister, Thermocouple, LVDT, Capacitive Transducer, Piezo-Electric Transducer, Photo Emissive Cell, Photoconductive Cell, Photovoltaic Cell, Photo Diode, Photo Transistor, Magnetic sensors: Proximity measurement Hall effect and Hall drive, performance characteristics<br>Definition and Classification of Actuators: Hydraulic Actuators, Pneumatic Actuators, Electrical Actuators, Thermal Actuators, Magnetic Actuators, Relay Actuators. | 7 |
| **Unit 2. Virtual Instrumentation:**<br>Introduction to virtual instrumentation, Role of Software in Virtual Instrumentation, Virtual Instrumentation with Lab VIEW, Components of Lab VIEW applications. | 6 |
| **Unit 3. Digital Storage Oscilloscope and Spectrum Analyzer:**<br>Digital Storage oscilloscope blocks diagram, sampling rate, and bandwidth. 10X Probe<br>Spectrum analyzer block diagram, applications & Wave analyzer block diagram, applications | 5 |

| | |
|---|---|
| **Unit 4. Mathematical Model of Physical Systems:**<br>Introduction, Differential equation representation of physical systems, Transfer function concepts, Block diagram algebra, and Signal flow graphs | 6 |
| **Unit 5. Time And Frequency Response Analysis:**<br>Introduction, Standard test signals, Time response of first and second order systems for standard test inputs<br>Performance indices, Frequency response of second order systems, Polar plots, Bode plots, Assessment of relative stability–Gain Margin and Phase Margin, Illustrative examples | 7 |
| **Unit 6. Stability Analysis:**<br>Concept of Stability in s domain, Classification of Stability (BIBO stability and asymptotic stability), stability analysis by Hurwitz criterion and Routh array, concept of relative stability and its analysis using Routh array | 5 |

**Text Books:**

1. Sawhney A.K., Electrical and Electronics Measurements and Instruments, DhanpatRai&Co.02ndEd..
2. W. D. Cooper & A. D. Helfrick, 'Electronic Instrumentation and Measurement Techniques', PHI, 4the/d,1987.
3. David Bell,' Electronic Instrumentation and Measurements',PHI,2e/d
4. Ogata Katsuhiko,"Modern Control Engineering",5thEdition,PHI
5. NagrathI.J.andM.Gopal,"Control Systems Engineering",6th edition, New Age international

**Reference Books:**

1. Hewlett Packard, Tektronics, Advantest,Aplab,"Application Noteson Measurement".
2. BouwensA.J.,'Digital Instrumentation, McGraw-Hill, second edition

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

**TUTORIALS:**

**List of tutorials**

| Sr. No. | Name of Tutorial | Unit No. |
|---|---|---|
| **1** | Theoretical tutorial on sensors | **1** |
| **2** | Theoretical tutorial on Actuators | **1** |
| **3** | Theoretical tutorial on Virtual Instrumentation | **2** |
| **4** | Theoretical tutorial on Virtual Instrumentation | **2** |
| **5** | Theoretical tutorial on Digital Storage Oscilloscope | **3** |
| **6** | Theoretical tutorial on Spectrum Analyzer | **3** |
| **7** | Numerical on Transfer function | **4** |
| **8** | Numerical on Block diagram algebra, and Signal flow graphs | **4** |
| **9** | Numerical on Time response of first and second order systems for standard test inputs | **5** |
| **10** | Numerical on Polar plots, Bode plots, relative stability–Gain Margin and Phase Margin | **5** |
| **11** | Numerical on relative stability–Gain Margin and Phase Margin | **6** |
| **12** | Numerical on stability analysis by Hurwitz criterion and Routh array, | **6** |

1. Minimum 12 tutorials should be conducted.
2. At least two tutorials on each topic
3. 50% Theoretical & 50% mathematical based tutorials should be conducted

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

| **Course Title: Electronics Circuits Analysis and Design – I - Lab** | |
|---|---|
| **Course Code: 201ETP206** | **Semester : III** |
| **Teaching Scheme : L-T-P : 0-0-2** | **Credit: 1** |
| **Evaluation Scheme : ISE Marks : 25** | **POE Marks : 25** |

**Lab Course Description:**

This lab course aims to introduce students with basics of various electronic components and devices. It will also develop the capacity to analyze, interpret and design different electronics circuits among students.

**Course Objectives:**

1. To introduce the applications of diodes & passive components & ICs in DC power supply
2. To determine regulation of IC regulators
3. To introduce the applications of electronic components in wave shaping circuits
4. Provide an introduction and basic understanding of Semiconductor Devices viz.
5. Diodes, BJT & JFET

**Course Outcomes (COs):**

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

| | |
|---|---|
| C206.1 | **Design** unregulated and regulated power to meet the required parameters |
| C206.2 | **Determine** the line & load regulation of IC regulators |
| C206.3 | **Observe** the performance of linear & non-linear Wave shaping Circuits |
| C206.3 | **Analyse** the performance of biasing circuits using BJT or FET |

| Prerequisite: | Physics, Fundamentals of Electrical Electronics Engg. of First Year |
|---|---|

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C206.1 | 2 | 2 | 1 | - | 2 | - | - | - | - | - | - | - | 2 | 2 | 4 |
| C206.2 | 2 | 2 | 1 | - | 2 | - | - | - | - | - | - | - | 2 | 2 | 4 |
| C206.3 | 2 | 2 | 1 | - | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| C206.3 | 2 | 2 | 1 | - | 2 | - | - | - | - | - | - | - | 2 | 2 | 3 |

## Course Content

| List of Experiments | | | |
|---|---|---|---|
| **Expt. No.** | **Name of Experiment** | **Type** | **Hrs.** |
| 1 | To design Canter tapped Full Wave Rectifier without & with filters | O | 2 |
| 2 | To design Bridge Rectifier without & with filters using simulator | O | 2 |
| 3 | To determine line & load regulation for fixed IC regulator i.e/ 78XXC | O | 2 |
| 4 | To determine line & load regulation for adjustable IC regulator i.e/ LM317 | O | 2 |
| 5 | To study the sinusoidal frequency response and square wave response of Low Pass Filter | O | 2 |
| 6 | To study the sinusoidal frequency response and square wave response of High Pass Filter using Simulator | O | 2 |

| | | | |
|---|---|---|---|
| 7 | To design and observe input output variations for various Clipper Circuits | O | 2 |
| 8 | To design and observe input output variations for various Clamper Circuits using Simulator | O | 2 |
| 9 | To design Collector to base bias using Simulator for BJT | O | 2 |
| 10 | To design Voltage divider bias for BJT | O | 2 |
| 11 | To design Collector to voltage Divider bias using Simulator for FET using Simulator | O | 2 |
| 12 | To design Self bias for FET using Simulator | O | 2 |

**S: indicates Study type and O: Operational type**

* Minimum 10 experiments should be performed to cover the entire curriculum of course.

**Text Books:**

1. Electronic devices & circuits, Allen Mottershed Prentice- Hall India
2. Electronic devices & circuits, J. Millman & C. Halkias, Tata Mc Graw Hill Publication
3. A Monograph on Electronics Design Principles N.C. Goyal & R.K. Khetan-Khanna Publishers

**Reference Books:**

1. Electronic devices & circuits, David A. Bell ,Oxford University
2. Electronic devices & circuits', Salivahanan, N Sureshkumar, Tata McGraw Hill Publication
3. Electronic devices &circuit theory, Robert L. Boylsted, Louis Nashelsky, Pearson Education

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## Department of Electronics & Telecommunication

### S.Y.B.Tech Curriculum w.e.f. 2021-2022

### Lab Course Plan

| **Course Title : Analog and Digital Communication- Lab** | |
|---|---|
| **Course Code : 201ETP207** | **Semester : III** |
| **Teaching Scheme : L-T-P : 0-0-2** | **Credits : 1** |
| **Evaluation Scheme : ISE Marks : 25** | **POE Marks : 25** |

**Course Description:**

The Lab course includes experiments based on Analog & Digital Modulation Techniques. This course will help students to get practical exposure on actual working of transmission & reception of Analog & Digital Signal. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise

**Course Objectives:**

1. To make the students understand the concept of Analog Modulation & Demodulation.
2. To make the students understand the concept of Digital Modulation & Demodulation.
3. To make the students understand the concept of baseband transmission & reception.

**Course Outcomes (COs):**

At the end of the course the student will be able to

| | |
|---|---|
| C207.1 | Apply knowledge related to Analog modulation & demodulation. |
| C207.2 | Apply the theory of Digital Modulation & demodulation. |

## Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

**Course Articulation Matrix: Mapping of Laboratory Outcomes (LOs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)**

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C207.1 | 3 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 | 1 | 3 |
| C207.2 | 3 | 1 | - | - | - | - | - | - | - | - | - | 1 | 2 | 2 | 3 |

| List of Experiments | | | |
|---|---|---|---|
| **Expt. No.** | **Name of Experiment** | **Type** | **Hours** |
| 1 | Amplitude Modulation & Demodulation | O | 2 |
| 2 | Frequency Modulation & Demodulation | O | 2 |
| 3 | DSB Modulation & Demodulation | O | 2 |
| 4 | SSB Modulation & Demodulation | O | 2 |
| 5 | Pulse Amplitude Modulation & demodulation. | O | 2 |
| 6 | signal sampling & reconstruction | O | 2 |
| 7 | PCM Transmitter & Receiver | O | 2 |

| | | | |
|---|---|---|---|
| 8 | Delta Modulation & Demodulation | O | 2 |
| 9 | Adaptive Delta Modulation & Demodulation. | O | 2 |
| 10 | To Study different Data Formats. | O | 2 |
| 11 | Amplitude Shift Keying | O | 2 |
| 12 | Frequency Shift Keying | O | 2 |
| 13 | Phase Shift Keying | O | 2 |

- S-STUDY, O-OPERATIONAL
- Minimum 10 Experiments should be conducted covering all units.

**References Books:**


1. B.P. Lathi, "Analog and Digital Communication", OXFORD University press.
2. Simon Haykin, "An introduction to analog & digital communications", John Wiley &Sons
3. R P Singh, S D Sapre 'Communication System-Analog & Digital' IInd Edition –Tata Mc Graw HillPublication.
4. Louis E. Frenzel, "Principals of electronic communication system", III$^{rd}$ Ed., TMHPub.

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Lab Course Plan

| **Course Title : Data Structures and Algorithms Lab** | |
|---|---|
| **Course Code : 201ETP208** | **Semester : III** |
| **Teaching Scheme : L-T-P : 0-0-2** | **Credits : 1** |
| **Evaluation Scheme : ISE Marks : 25** | **POE Marks : 25** |

**Lab Course Description:**.

The course is designed to develop skills to design and analyze simple linear and non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structure.

**Course Objectives:** The course aims to

1. To impart the basic concepts of data structures and algorithms.
2. To introduce the concepts of array, record & pointers.
3. To understand the importance of linked lists and its applications.
4. Provide the concept of stacks, queues & it's applications.
5. To introduce the concepts of non linear data structures & searching techniques.

**Course Outcomes (COs):**

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

| | |
|---|---|
| C208.1 | Compare different data structures and choose a data structure for an application. |
| C208.2 | Apply the Algorithms to Add, delete, sort, and search for data structures like Array, linked list, Stack and Queue |
| C208.3 | Analyze algorithms and determine their time complexity. |
| C208.4 | Explain the concept of trees, graphs and compare different searching techniques. |

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | PO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C208.1 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 1 | 1 | 2 |
| C208.2 | 3 | - | 2 | 3 | - | 1 | - | - | - | - | - | 1 | 2 | 1 | 3 |
| C208.3 | - | - | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 4 |
| C208.4 | 2 | 2 | 3 | - | - | - | - | - | - | - | - | - | - | - | 2 |

| List of Experiments | | | |
|---|---|---|---|
| **Expt. No.** | **Name of Experiment** | **Type** | **Hrs.** |
| 1 | Program to Insert & Delete the Number in a 1D Array | O | 2 |
| 2 | Program on Bubble Sort | O | 2 |
| 3 | Program on Insertion Sort | O | 2 |
| 4 | Program to Perform Linear search | O | 2 |
| 5 | Program to Perform Binary search | O | 2 |
| 6 | Program to Insert the Node in Link List | O | 2 |
| 7 | Program to Delete the Node from Link List | O | 2 |
| 8 | Program to Perform Operation on Stack. | O | 2 |
| 9 | Program to Perform Operation on Queue | O | 2 |
| 10 | Program for Traversing operation of Tree | O | 2 |

| | | | |
|---|---|---|---|
| 11 | Program for Traversing operation of Graph | O | 2 |
| 12 | Program for Hash Function | O | 2 |

**S: indicates Study type and O: Operational type**

*Minimum ten experiments should be performed to cover the entire curriculum of course.

**References Book :**

1. Seymour Lipschautz, " Data Structures", Tata McGraw Hill, 2002

2. ISRD group, Data structures using C, Tata McGraw Hill, 2006

3. Y. Langsam, M. Augenstin and A. Tannenbaum, "Data Structures using C and C++", PearsonEducation Asia, 2nd Edition, 2002, ISBN-81-7808-729-4.

4. Data structure – A programming Approach with C- D.S Kushawaha, A.K.Misra-PHI Publication.

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

## Lab Course Plan

| | |
|---|---|
| **Course Title : Electronics workshop Practice** | |
| **Course Code : 201ETP209** | **Semester : III** |
| **Teaching Scheme : L-T-P : 0-0-2** | **Credits : 1** |
| **Evaluation Scheme : ISE : 25** | |

### Lab Course Description

This course gives introduction of electronic hardware systems and provides hands-on training with familiarization, identification, testing, assembling, dismantling, fabrication and repairing such systems by making use of the various tools and instruments available in the Electronics Workshop.

### Course Objective:

1. Identification and familiarization with the tools used in electronic shop.
2. To enhance the knowledge of electronics components and their applications.
3. To make students familiar with Interfacing of analogy and digital electronics.
4. To enable students to design & fabricate their own Hardware.

### Course Outcomes (COs):

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

| | |
|---|---|
| C209.1 | Illustrate the different types of Electronics tools and their application. |
| C209.2 | Analyze the working of semiconductor devices and their application. |
| C209.3 | Integrate the knowledge of basic Sensors and digital electronics. |
| C209.4 | Enable the Students to develop application-based micro-projects and estimate project cost. |

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

### Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C209.1 | 3 | | | - | | - | - | - | - | - | - | 1 | 2 | 1 | 4 |
| C209.2 | 3 | | | - | | - | - | - | - | - | - | 1 | 2 | 1 | 4 |
| C209.3 | 3 | 2 | | - | | - | - | - | - | - | - | 1 | 2 | 1 | 5 |
| C209.4 | 3 | 2 | 1 | - | | - | - | - | 1 | - | - | 1 | 2 | 1 | 4 |

| List of Experiments | | | |
|---|---|---|---|
| **Expt. No.** | **Name of Experiment** | **Type** | **Hrs.** |
| 1 | Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.). | O | 2 |
| 2 | Testing of electronic components [Resistor, Capacitor, Diode, Transistor, UJT and JFET using multi-meter.]<br>Inter-connection methods and soldering practice. [Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions, soldering practice in connectors and general purpose PCB, Crimping.] | O | 2 |
| 3 | Familiarization/Application of testing instruments and commonly used tools. [Multi-meter, Function generator, Power supply, CRO etc.] [Soldering iron, De-soldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de-soldering station etc.] | O | 2 |

| | | | |
|---|---|---|---|
| 4 | To familiarise with diode application like Reverse Current Protection Circuits, Logic Gates using diode, Voltage Multiplier etc. | O | 2 |
| 5 | Applications of transistor like switch, transistor as driver, transistor as logic gates etc. | O | 2 |
| 6 | Applications of IC555 like Timer, led flip flop, LED Chaser or Sequencer etc. | O | 2 |
| 7 | To familiarise with Logic gates & its applications like Burglar alarms and buzzers, push button switches, lights on off, digital lock, Fire alarm etc. | O | 2 |
| 8 | To familiarise with Arduino, Introduction to Open Source platform, Arduino simulation software. | O | 2 |
| 9 | To familiarise with Sensors like IR Digital Sensor , Colour IR Sensor, Light Sensor ,Sound Sensor, Ultrasonic sensor, moisture sensor etc and its interfacing to Arduino. | O | 2 |
| 10 | Micro Project: - Assembling of electronic circuit/system on general purpose PCB, test and show the functioning based on above practical's. Example water level indicator using Transistor, Fire alarm, Spectrum Analyser using Transistor, Flip flop light, Infrared Motion detector etc. | O | 2 |

**Reference Books:**

1. The First Book of Electronics Workshop: Can't Beat a Practical Approach - River Publishers Series in Communications.
2. Handbook of Electronic projects, by Arsath Natheem.
3. Fundamentals of Electrical Engineering –Bharati Dwivedi and Anurasg Tripathi – Willey Precise
4. Electronics Devices and Circuit Theory- Robert L. Boylestad and Louis Nashelsky, Pearson Education Publication

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

**Course Plan**

| **Course Title: Environmental Studies** | |
|---|---|
| **Course Code: 201ETL210** | **Semester: III** |
| **Teaching Scheme: L-T-P : 2-0-0** | **Credits: Non Credit** |
| **Evaluation Scheme: ISE Marks : NA** | **ESE Marks: 50** |

**Course Description:**

Environmental Studies course enhance a student's knowledge in a variety of currently relevant topics related to environmental awareness and pollution. The course aims to identify environmental problems, come-up with suitable solutions and create awareness for a hygienic and eco-friendly environmental.

**Course Objectives:**

1. Recognize the structure and functions of ecosystems with their importance.
2. Understand the environmental and social problems with global concern.
3. Understand the importance of environmental management for its protection.
4. Acquire problem solving skills through visits to different locations, identifying the environmental problems, proposing the solution models and exhibiting to the society and government authorities.

**Course Outcomes (COs):**

| **COs** | **At the end of successful completion of course, the students will be able to…** |
|---|---|
| C210.1 | Understand the importance of ecosystem and biodiversity in view of its conservation. |
| C210.2 | Understand the concept of hazardous waste and to promote healthier environment. |
| C210.3 | Explain the importance of environmental management through pollution control boards. |
| C210.4 | Propose solutions for problems related with environmental well beings through location visits and model exhibitions. |

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

| **Prerequisite:** | Understanding of Environmental Education course. |
|---|---|

**Course Articulation Matrix:**

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

| Course Outcomes COs | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C210.1 | - | - | - | - | - | 1 | 3 | 2 | - | - | - | - | 1 | - | 2 |
| C210.2 | - | - | - | - | - | 1 | 2 | - | - | - | - | - | 1 | - | 2 |
| C210.3 | - | - | - | - | - | 1 | 3 | - | 1 | 1 | - | - | 1 | - | 2 |
| C210.4 | - | - | - | - | - | 2 | 3 | 1 | 1 | 1 | - | - | 1 | - | 3 |

| Course Content | Hours |
|---|---|
| **Unit 1. Ecology and Biodiversity**<br>Definition, types, importance and examples of ecology, types of community relationships: Symbiosis, predation and competition. Ecosystem: structure and functions, biotic and abiotic components, energy flows, ecological succession, food chain, food web & ecological pyramid, types of ecosystems, degradation of ecosystems and its impact.<br>Biodiversity hotspots: Western ghats, eastern Himalayas, threats to biodiversity and conservation of biodiversity, environmental ethics. | 8 |
| **Unit 2. Environment and Health**<br>Air Pollution, water pollution. E-waste, waste minimization technology, Plastic waste, Population growth of the world and reduced health content of the | 7 |

| | |
|---|---|
| environment, energy crisis, biofuels, Occupational health hazards, Concept of Carbon footprint. | |
| **Unit 3. Environmental Management**<br>Role of Central Pollution Control Board (CPCB) and Maharashtra Pollution Control Board (MPCB) in environmental protection of India. Concept of sustainability, ISO Certification. | 5 |
| **Unit 4. Field Work**<br>Visit to a local area for documentation of environmental assets- River/forest/grassland/hill/mountain<br>OR<br>Visit to a local polluted site-Urban/Rural/Industrial/Agricultural<br>OR<br>Study of common plants, insects, birds<br>OR<br>Study of simple ecosystems- Ponds, Lakes, Rivers, Hill slopes, etc. | 5 |

**Text Books:**

1 Trivedi R.K. and P.K Goel, Introduction to Air Pollution, Tech-science Publications.

2 Mhaskar A.K, Matter Hazardous, Techno-Science Publication.

**Reference Books:**

1 Bharucha, Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India

2 Hawkins R.E., Encyclopaedia of Indian Natural History, Bombay Natural History Society, Bombay

3 Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I &II, Environmental Media.

4 Miller T.G. Jr., Environmental Science, Wadsworth Publications Co.

5 Sharma B.K., Environmental Chemistry, Gokel Publ. House, Meerut.

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

| **Course Title: Electronics Circuits Analysis and Design - II** | |
|---|---|
| **Course Code: 201ETL211** | **Semester : IV** |
| **Teaching Scheme : L-T-P : 3-0-0** | **Credit: 3** |
| **Evaluation Scheme : ISE + MSE Marks : 20 + 30** | **ESE Marks : 50** |

**Course Description:**

This course aims to provide the basic knowledge of electronic device operation and the characteristics for various devices along with the basic designing parameters for different applications.

**Course Objectives:**

1 To develop h parameter model of amplifier along with its design

2 To study the behaviour of amplifier at various frequencies

3 To analyse & design various types of amplifiers

4 To provide the basic knowledge of MOSFET to design Amplifier

**Course Outcomes (COs):**

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

| | |
|---|---|
| C211.1 | Analyse the performance of amplifiers in different configuration in terms of h-parameters and design single stage Amplifier |
| C211.2 | To develop the frequency response of single stage RC coupled amplifiers |
| C211.3 | Analyse & design Multistage, Feedback and Power Amplifiers |
| C211.4 | To develop fundamental knowledge of MOSFETS along with its biasing and design |

| | |
|---|---|
| Prerequisite: | Physics, Fundamentals of Electrical Electronics Engg. of First Year |

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C211.1 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 2 | 2 | 4 |
| C211.2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 2 | 2 | 4 |
| C211.3 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 2 | 2 | 4 |
| C211.4 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 2 | 2 | 4 |

## Course Content

| Content | Hours |
|---|---|
| **Unit 1 –BJT and FET Amplifiers**<br>BJT: H-Parameters, Hybrid model for transistor and their approximate model (CE, CB& CC configuration), Analysis of CE, CC (emitter follower) amplifier in terms of Ri, Ai, Av, Ro. Study & Design of single stage RC coupled BJT and Common Source FET amplifier. | 6 |
| **Unit 2 - Frequency Response Amplifiers**<br>**Low Frequency**: BJT (Common Emitter) Amplifier, Effect of Internal Transistor Capacitances, Miller Effect,<br>**High Frequency**: T-Model, Common Base Short Circuit Current Gain, Hybrid π-model, Common Emitter Short Circuit and resistive Current Gain, Gain Bandwidth Product, (Numerical are expected). | 6 |
| **Unit 3 - Multistage Amplifiers**<br>Need of Cascading, Parameter evaluation such as Ri , R0, Av, Ai & Bandwidth for General Multistage Amplifier, Different Types of Coupling, (Numerical are expected) Analysis & Design of two stage RC coupled, direct coupled & | 6 |

| | |
|---|---|
| transformer coupled Amplifier | |
| **Unit4 - Feedback Amplifiers**<br>General theory of feedback, reasons for negative feedback. Types of negative feedback in transistor circuits: Voltage series, Current series, Voltage shunt, Current shunt feedback amplifiers, Darlington pair, Darlington amplifier using bootstrapping principle,(Numerical are expected) Design of Voltage series feedback amplifier | 6 |
| **Unit5 -Analysis of Power Amplifiers**<br>Need of Power amplifier, classification of power amplifier, Power considerations, Distortion in power amplifiers: Phase, Frequency, amplitude/ harmonic / non-linear distortion, amplitude distortion using three point method. Class A single ended transformer coupled amplifier& class A Push pull amplifiers analysis, Class B amplifier & class B push pull amplifier analysis, crossover distortion, class AB Pushpull amplifiers analysis Complementary symmetry power amplifier. | 6 |
| **Unit6 – MOSFETS:**<br>Construction, working and Characteristics of MOSFET, Small-Signal Equivalent Model, Analysis of Common Source (CS) and Common Drain (Source Follower) amplifier. Design of Common Source (CS) MOSFET Amplifier. | 6 |

**Text Books:**

1. Electronic devices & circuits, Allen Mottershed Prentice- Hall India
2. Electronic devices & circuits, J. Millman & C. Halkias, Tata Mc Graw Hill Publication
3. A Monograph on Electronics Design Principles N.C. Goyal & R.K. Khetan-Khanna Publishers

**Reference Books:**

1. Electronic devices & circuits, David A. Bell ,Oxford University
2. Electronic devices & circuits', Salivahanan, N Sureshkumar, Tata McGraw Hill Publication
3. Electronic devices &circuit theory, Robert L. Boylsted, Louis Nashelsky, Pearson Education

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Course Plan

| | |
|---|---|
| **Course Title: Digital System Design using Verilog** | |
| **Course Code: 201ETL212** | **Semester : IV** |
| **Teaching Scheme : L-T-P : 3-0-0** | **Credit: 3** |
| **Evaluation Scheme : ISE + MSE Marks : 20 + 30** | **ESE Marks : 50** |

**Course Description:**

Digital Systems Design Using Verilog course integrates coverage of logic design principles, Verilog as a hardware design language, and FPGA implementation to help students to learn process of designing and testing new hardware configurations.

**Course Objectives:**

1. To explain the analytical methods for combinational and sequential logic design
2. To study semiconductor memories and PLDs.
3. To develop the methodology for digital design using Verilog
4. To verify and design the digital circuit by means of Computer Aided Engineering tools which involves in programming with the help of Verilog HDL.

**Course Outcomes (COs):**

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

| | |
|---|---|
| **C212.1** | **Derive and analyse** logic expressions and circuits using Boolean laws and K-map. |
| **C212.2** | **Analyse and Design** combinational and sequential circuits |
| **C212.3** | **Describe** architecture and internal components semiconductor memories and PLDs. |
| **C212.4** | **Design** and simulate digital logic using Verilog HDL and EDA tools. |

| | |
|---|---|
| Prerequisite: | Number system basic |

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C212.1 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | 3 |
| C212.2 | 3 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - | 2 | 4 |
| C212.3 | 2 | - | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 |
| C212.4 | - | - | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | 4 |

## Course Content

| Content | Hours |
|---|---|
| **Unit 1 –Logic Simplification:** Digital Logic Gates, Universal Gates, Logic expressions, Boolean laws, Duality, De Morgan's law, Logic functions and gates Canonical forms: SOP, POS, Realization of logic expressions using K- map (2,3,4 variables), . Quine -McClusky minimization technique | 6 |
| **Unit 2 - Combinational logic design:** Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display Barrel shifter , ALU, Comparators | 6 |
| **Unit 3 –Sequential Logic Design**: Latches, flip-flops: S-R, D, JK and Master-Slave JK FF, Edge triggered FF, Flip Flop conversion, Use of preset and clear, Excitation Table and characteristic equations for flip flops, and Conversion of flip flops, Timing parameters of FF, Shift registers (SISO, SIPO, PIPO, and PISO). | 6 |
| **Unit 4 - Counters and Finite State Machines:** Counter –ripple counters ,synchronous counters , Up/down counters, Ring counters, Johnson Counter, MOD-N counter, FSM, Moore/Mealy machines, state diagram, state table, state | 6 |

| | |
|---|---|
| assignment and state reduction, Sequence detector. | |
| **Unit 5-Introduction to Verilog HDL:** Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Function Verification, Introduction to Verilog, Basic Verilog naming conventions, Verilog operators, data types, Assignment statements, control statements, Behavioural modelling in Verilog HDL, Combinational and Sequential logic circuit coding using Verilog | 6 |
| **Unit 6- Semiconductor Memories and Programmable Logic Devices**<br>**Memory devices:** ROM, PROM, EPROM, EEPROM, RAM, SRAM, DRAM, NVRAM, Programmable logic devices: PAL ,PLA,CPLD and FPGA ,Logic implementation using Programmable Devices (ROM, PLA) | 6 |

**Text Book:**

1) Anand Kumar 'Fundamentals of Digital Circuits'--. PHI
2) M. Morris Mano 'Digital Design'-- (Third Edition),. PHI
3) Fundamentals of Digital Logic with Verilog Design - Stephen Brown, Zvonkoc Vranesic, TMH,2nd Edition.
4) Zainalabdien Navabi, Verilog Digital System Design,TMH, 2nd Edition.

**Reference Books:**

1) Verilog HDL - Samir Palnitkar, 2nd Edition, Pearson Education, 2009.
2) Digital Design An Embedded Systems Approach Using VERILOG Peter J. Ashenden ELSEVIER First 2008
3) Ciletti, Michael D. Advanced digital design with the Verilog HDL. Vol.1. Upper Saddle River: Prentice Hall, 2003.
4) IEEE standard HDL based on Verilog HDL, published by IEEE

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

| **Course Title: Signals and Systems** | |
|---|---|
| **Course Code: 201ETL213** | **Semester : IV** |
| **Teaching Scheme : L-T-P : 3-1-0** | **Credit: 4** |
| **Evaluation Scheme : ISE + MSE Marks : 20 + 30** | **ESE Marks : 50** |

**Course Description:**

This is prerequisite course for Digital Signal Processing. In this course, students will learn Different signals and systems and their properties. The various mathematical tools like Fourier Transform, Discrete Fourier Transform and Z-transform will be studied to analyse the signals.

**Course Objectives:**

1. To impart the knowledge to classify signals and systems and interpret time domain response of LTI systems.
2. To expose the students about the Fourier Analysis of the spectral properties of signals
3. To aware the students for applying Z- transform to study discrete-time signals and systems
4. To impart the skill for realization of systems

**Course Outcomes (COs):**

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

| | |
|---|---|
| C213.1 | Understand classification of signals and systems and interpret time domain response of LTI systems. |
| C213.2 | Analyze the spectral properties of signals using Fourier analysis. |
| C213.3 | Apply Z- transform to study discrete-time signals and systems. |
| C213.4 | Constructs the methods of realization of systems |

| **Prerequisite**: | Applied Mathematics-III |
|---|---|

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C213.1 | 3 | 3 | 1 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 1 | 2 |
| C213.2 | 3 | 3 | 1 | 2 | 2 | 1 | - | - | - | - | - | - | 2 | 1 | 4 |
| C213.3 | 3 | 3 | 1 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 2 | 3 |
| C213.4 | 3 | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | 2 | 4 |

| Content | Hours |
|---|---|
| **Unit 1.–Introduction to Signals and Systems** Introduction and Classification of Signals and Systems. Basic types of Signals, Elementary Operations on Signals, Properties of System. | 6 |
| **Unit. 2 - Linear Time – Invariant (LTI) Systems** Representation of Signals in terms of Impulses, Discrete Time LTI Systems, the Convolution Sum, Continuous Time LTI Systems, the Convolution Integral.Properties of LTI Systems, | 6 |
| **Unit. 3 – Fourier analysis of CT and DT signals.** Signal Analysis - Discrete and Continuous, Periodic and Non-Periodic, and Synthesis in Fourier Domain, Properties of Fourier Representations,<br>**Case study:Design of a synthetic ECG signal based on Fourier series** | 6 |
| **Unit 4.- Discrete Fourier Transform:**<br>Discrete Time Fourier Transform , Discrete Fourier Transform , Inverse Discrete Fourier Transform(IDFT): Direct method, DFT using Twiddle factor, Properties | 6 |
| **Unit. 5 - Concept of Z-Transform** Z-transform of a Discrete Sequence, Region of Convergence for the Z-transform. Inverse Z-transform, Properties of Z-transform, Relation Between Z and Fourier Transform. | 6 |

## Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

| | |
|---|---|
| **Unit.6- Realization of System** Continuous time system representation by differential equation, discrete time system representation by difference equation , transfer function in Z-domain, Realization of discrete time systems by Direct from I and Direct Form II<br>**Case study: Simulation of simple electrical system** | 6 |

**Text Book:**

1. A.V. Oppenheim, A.S. Willsky, S.H. Nawab, *Signals* and *Systems*, Prentice Hall, 1997.
2. Simon Haykin, Barry Van Veen, *Signals and systems* ,Wiley, 2003

**Reference Books:**

1. B. P. Lathi, *Linear systems and signals* ,Oxford University press, 2005
2. M. J. Roberts , *Signals and systems*, Tata Macgraw Hill,2005
3. Kumar, A. A. *"Signals and Systems"*, PHI Learning Pvt. Ltd.

**List of tutorials:**

| Sr.No. | Name of Tutorial | Unit No. |
|---|---|---|
| 1 | Numerical on Properties of Signals | 1 |
| 2 | Numerical on properties on systems | 1 |
| 3 | Numerical on convolution integral and sum | 2 |
| 4 | Properties of LTI systems | 2 |
| 5 | Numerical on Fourier Transform | 3 |
| 6 | Simulation of ECG signal using MATLAB | 3 |
| 7 | Numerical on DFT | 4 |
| 8 | Numerical on IDFT | 4 |
| 9. | Numerical on ZT | 5 |
| 10 | Numerical on IZT | 5 |
| 11 | Numerical on Direct form –I and II-realization methos | 6 |
| 12 | Simulation of basic electrical system using Matlab | 6 |

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

| **Course Title: Electromagnetic Waves and Radiating System** | |
|---|---|
| **Course Code: 201ETL214** | **Semester : IV** |
| **Teaching Scheme : L-T-P : 3-1-0** | **Credit: 4** |
| **Evaluation Scheme : ISE + MSE Marks : 20 + 30** | **ESE Marks : 50** |

**Course Description:**

This course aims to provide the basic knowledge of electronic device operation and the characteristics for various devices along with the basic designing parameters for different applications.

**Course Objectives:**

1. To explain basic of Vector calculus & co-ordinate systems
2. To define & derive different laws in steady electric & magnetic fields.
3. Apply Maxwell's equations in different forms to Develop wave equations.
4. Explain the basic concepts of Antenna

**Course Outcomes (COs):**

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

| | |
|---|---|
| C214.1 | Apply the fundamentals of mathematical skills related with differential, integral and vector calculus. |
| C214.2 | Apply and analyse the concepts of steady electric & magnetic fields. |
| C214.3 | Develop field equations from understanding of Maxwell's Equations. |
| C214.4 | Extend the knowledge of basic properties of electromagnetic wave propagation for Antenna concepts |

| | |
|---|---|
| Prerequisite: | Physics, Fundamentals of Electrical Electronics Engg. |

## Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

### Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO1 | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C214.1 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 2 | 3 |
| C214.2 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 2 | 4 |
| C214.3 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 2 | 4 |
| C214.4 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 2 | 3 |

| Content | Hours |
|---|---|
| **Unit 1 –Vector Algebra**<br>Review of vector Analysis and coordinate systems, Basic vector algebra, Dot product, Cross product, curl, divergence, Gradient | 4 |
| **Unit2 - Electrostatics**<br>Coulomb's law & electric field (Numerical Expected) , field due to distributed charges (Numerical Expected), Flux density (Numerical Expected), Gauss's law, divergence theorem, Electrostatic potential, potential gradient, electric dipole, Electrostatic energy density, Boundary conditions for electrostatic field. | 7 |
| **Unit 3 - Steady Magnetic Field**<br>Biot Savarts law (Numerical Expected), Ampere's circuital law (Numerical Expected), Stoke's Theorem, Magnetic flux density & Vector magnetic potential, Current carrying conductors in magnetic fields, Torque on loop, Energy stored in magnetic field, Boundary conditions for magneto static field. | 6 |
| **Unit4 - Maxwell's Equations**<br>Inconsistency of Ampere's law, Faraday's law, Maxwell's equations for static field, time varying field & harmonically varying fields, Comparison of field & circuit theory. | 6 |

| | |
|---|---|
| **Unit 5 -Electromagnetic Waves**<br>Wave equation for free space and conducting medium, uniform plane wave equation, general solution of uniform plane wave equation, intrinsic impedance, wave equation in phasor form, wave propagation in lossless medium, propagation characteristics of EM waves in free space, conducting medium, good dielectrics and good conductors. | 6 |
| **Unit 6 -Fundamentals of Antenna**<br>Basic Antenna parameters, pattern, beam area, radiation intensity, beam efficiency, directivity, gain and resolution, antenna aperture, effective height, radio communication link, field from oscillating dipole, field zones. Linear, Elliptical and Circular polarization, Front to back ratio, Antenna impedance. | 7 |

**Text Books:**

1. John D. Kraus, "Electromagnetics", Tata Mc Graw Hill
2. William Hayt, Buck, "Engineering Electromagnetics", Tata Mc Graw Hill.

**Reference books:**

1. Sadiku, "Elements of Electromagnetics", 4th edition, Oxford University Press
2. G.S.N. Raju, "Antenna and Wave Propagation", Pearson Education
3. John D Kraus, "Antenna for all Application", 3rd edition, Tata McGraw Hill Publication

**List of tutorials:**

| Sr.No. | Name of Tutorial | Unit No. |
|---|---|---|
| 1 | Vector Calculus | 1 |
| 2 | Electric Force & Electric Field Intensity | 2 |
| 3 | Electric Flux Density, Electric Potential, Energy & Boundary Conditions | 2 |
| 4 | Magnetic Field Intensity & Magnetic Flux Density | 3 |
| 5 | Magnetic Potential, Energy & Boundary Conditions | 3 |
| 6 | Maxwell's Equations | 4 |
| 7 | Analysis of Electromagnetic Wave Equations | 5 |
| 8 | Calculus for Electromagnetic Waves in various media | 5 |
| 9. | Basics of Transmission lines & its parameters | 6 |
| 10 | Smith Chart | 6 |

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

| **Course Title: Linear Integrated Circuits** | |
|---|---|
| **Course Code: 201ETL215** | **Semester : IV** |
| **Teaching Scheme : L-T-P : 3-0-0** | **Credit: 3** |
| **Evaluation Scheme : ISE + MSE Marks : 20 + 30** | **ESE Marks : 50** |

**Course Description:**

This course aims to provide the basic knowledge of operational amplifiers, active filters, and various applications using opamp.

**Course Objectives:**

1. To study the fundamental principles of operational amplifier and its parameters
2. To Understand concepts of op-amp configurations and their frequency response
3. To Realize importance of op-amp in the various applications
4. To design different types of Active filters.
5. To Analyse and design of various waveform generators

**Course Outcomes (COs):**

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

| | |
|---|---|
| C215.1 | Explain basic concept of operational amplifier with its parameters |
| C215.2 | Classify different configuration of op-amp |
| C215.3 | Identify and describe different applications of op-amp |
| C215.4 | Design and implement various filters |
| C215.5 | Analyse different waveform generator circuits |
| C215.6 | Apply knowledge of op-amp in various industrial applications |

| **Prerequisite**: | Basic knowledge of electronics components & its parameters |
|---|---|

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C215.1 | 3 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | - | 2 |
| C215.2 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | - | 2 |
| C215.3 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | - | 2 |
| C215.4 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | - | 3 |
| C215.5 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 1 | - | 3 |
| C215.6 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | - | 3 |

| Content | Hours |
|---|---|
| **Unit 1 – Introduction to Operational amplifier**<br>Block diagram of op-amp, Dual input balanced output differential amplifier (DC & AC analysis), Op-amp equivalent circuit, voltage transfer characteristics of op amp, ideal and practical parameters of op-amp. | 6 |
| **Unit 2 -Op-Amp Configurations & Frequency Response**<br>Open loop configuration, closed loop configuration, Virtual ground concept, unity gain amplifier, frequency response of both configurations, Slew rate and its effect. | 5 |
| **Unit 3 –Applications of Op-amp**<br>Summing Amplifier, Differential amplifier, Integrator, differentiator, Precision Rectifiers, Log & Anti-log Amplifier, Comparator, Schmitt Trigger. | 7 |
| **Unit 4-Active Filters**<br>Introduction to active filters, analysis & design of Butterworth filters: Low Pass filter & High Pass filter (First & Second order), Band Pass filter, | 6 |

| | |
|---|---|
| Band Stop filter, All Pass Filter. | |
| **Unit 5 - Waveform Generators**<br>Square wave generator, Triangular &Saw-tooth wave generator, RC phase shift oscillator, Wien bridge oscillator. | 6 |
| **Unit 6- Monolithic IC Applications**<br>IC 555 (Timer): Block diagram, Multi-vibrators and Applications.<br>PLL - Introduction, Block diagram, IC 566 VCO , IC 565 PLL & Applications,<br>IC 8038 | 6 |

**Text Book:**

1. Ramakant A. Gaikwad, “Op Amps and Linear Integrated Circuits”, Pearson Education
2. David Bell, “Operational Amplifiers and Linear IC’s”, Oxford University Press

**Reference Books:**

1. Robert Coughlin, Fredric Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, Pearson Education
2. B. Somanathan Nair, “Linear Integrated Circuits- Analysis, Design & Applications”, Wiley India.
3. S. Salivahanan & Bhaskaran, “Linear Integrated Circuits”, TMH

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

| **Course Title : Electronics Circuits Analysis and Design – II - Lab** | |
|---|---|
| **Course Code : 201ETP216** | **Semester : IV** |
| **Teaching Scheme : L-T-P : 0-0-2** | **Credits : 1** |
| **Evaluation Scheme : ISE Marks : 25** | |

**Course Description:** The course includes experiments based on Transistor applications in Amplifiers. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise.

**Course Objectives:**

1. To determine h parameters from the characteristics of CE amplifier
2. To observe the behaviour of single stage amplifier at various frequencies
3. To make the students aware of the applications of electronic components such as Transistor and MOSFET
4. To develop the practical skills to study the performance of various amplifiers, their analysis & design

**Course Outcomes (COs):**

At the end of the course the student will be able to

| | |
|---|---|
| C216.1 | Determine the h parameters from the characteristics of CE Amplifier |
| C216.2 | Apply the knowledge of transistor to observe the frequency response of single stage Amplifier |
| C216.3 | Design various amplifiers in simulators and using hardware |
| C216.4 | Design MOSFET Amplifier and observe it’s characteristics |

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Course Articulation Matrix: Mapping of Laboratory Outcomes (LOs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C216.1 | 2 | 2 | - | - | 1 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| C216.2 | 2 | 2 | - | - | 1 | - | - | - | - | - | - | - | 2 | 2 | 3 |
| C216.3 | 2 | 2 | - | - | 1 | - | - | - | - | - | - | - | 2 | 2 | 3 |
| C216.4 | 2 | 2 | - | - | 1 | - | - | - | - | - | - | - | 2 | 2 | 3 |

| List of Experiments | | | |
|---|---|---|---|
| **Expt. No.** | **Name of Experiment** | **Type** | **Hours** |
| 1 | To determine h-parameters of single stage RC coupled amplifier from its characteristics using Simulator | S | 2 |
| 2 | To design of single stage RC coupled Amplifier and determine its bandwidth from frequency response for Sinusoidal input | O | 2 |
| 3 | To study the behavior of single stage RC coupled Amplifier for Square Wave input | O | 2 |
| 4 | To observe effect of Negative feedback on gain and Bandwidth of single stage RC coupled amplifier. | O | 2 |
| 5 | To design of two stage RC coupled Amplifier and determine its bandwidth from frequency response for Sinusoidal input | O | 2 |
| 6 | To design of direct coupled Amplifier and determine its bandwidth from frequency response for Sinusoidal input with the help of Simulator | S | 2 |

| | | | |
|---|---|---|---|
| 7 | To design of voltage series feedback Amplifier and determine its bandwidth from frequency response without and with feedback | O | 2 |
| 8 | To simulate the Class A power amplifier and calculate the efficiency | S | 2 |
| 9 | To simulate the Class B Complementary Symmetry Amplifier and calculate the efficiency | S | 2 |
| 10 | To observe and plot the characteristics of MOSFET using Simulator | O | 2 |
| 11 | Design Common Source MOSFET Amplifier | O | 2 |

**S: indicates Study type and O: Operational type**

**Text Books:**

1. Electronic devices & circuits, Allen Mottershed Prentice- Hall India
2. Electronic devices & circuits, J. Millman &C.Halkias, Tata McGraw Hill Publication
3. A Monograph on Electronics Design Principles N.C. Goyal & R.K. Khetan-Khanna Publishers

**Reference Books:**

1. Electronic devices & circuits,David A. Bell,Oxford University
2. Electronic devices & circuits', Salivahanan, N Sureshkumar, Tata McGraw Hill Publication
3. Electronic devices &circuit theory, Robert L. Boylsted, Louis Nashelsky, Pearson Education

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

| **Course Title: Digital System Design using Verilog -Lab** | |
|---|---|
| **Course Code: 201ETP217** | **Semester : IV** |
| **Teaching Scheme : L-T-P : 0-0-2** | **Credit: 1** |
| **Evaluation Scheme : ISE Marks : 25** | **POE Marks : 25** |

**Lab Course Description:** This lab-oriented course covers the design and simulation of digital systems using Verilog.

**Course Objectives:**

1. To explain the analytical methods for combinational and sequential logic design
2. To study semiconductor memories and PLDs.
3. To develop the methodology for digital design using Verilog
4. To verify and design the digital circuit by means of Computer Aided Engineering tools which involves in programming with the help of Verilog HDL

**Course Outcomes (COs):**

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

| | |
|---|---|
| **C217.1** | **Derive and analyse** logic expressions and circuits using Boolean laws and K-map. |
| **C217.2** | **Analyse and Design** combinational and sequential circuits |
| **C217.3** | **Describe** architecture and internal component semiconductor memories and PLDs |
| **C217.4** | **Design** and simulate digital logic using Verilog HDL and EDA tools |

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C217.1 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | 3 |
| C217.2 | 3 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - | 2 | 4 |
| C217.3 | 2 | - | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 |
| C217.4 | - | - | 3 | 2 | 2 | - | 1 | - | - | - | - | - | - | - | 4 |

| List of Experiments | | | |
|---|---|---|---|
| **Expt. No.** | **Name of Experiment** | **Type** | **Hours** |
| 1 | To design and simulate the Verilog code for basic logic gates | O | 2 |
| 2 | To design and simulate the Verilog code for half adders, full adders | O | 2 |
| 3 | To design and simulate the Verilog code for half subtractor, full subtractor | O | 2 |
| 4 | To design and simulate the Verilog code for Multiplexers | O | 2 |
| 5 | To design and simulate the Verilog code for De-multiplexer | O | 2 |
| 6 | To design and simulate the Verilog code for Decoder | O | 2 |
| 7 | To design and simulate the Verilog code for 4 - Bit binary to gray code converter & 4 - Bit gray to binary code converter | O | 2 |
| 8 | To design and simulate the Verilog code for Comparator | O | 2 |

| | | | |
|---|---|---|---|
| 9 | To design and simulate the Verilog code for D, T flip flops | O | 2 |
| 10 | To design and simulate the Verilog code for Binary counter | O | 2 |
| 11 | To design and simulate the Verilog code for shift register | O | 2 |
| 12 | To design and simulate the Verilog code for state machines to detect the given sequence of bits. | O | 2 |

**S: indicates Study type and O: Operational type**

* Minimum ten experiments should be performed to cover the entire curriculum of course.

**References:**

1) Fundamentals of Digital Logic with Verilog Design - Stephen Brown, Zvonkoc Vranesic, TMH, 2nd Edition.

2) Zainalabdien Navabi, Verliog Digital System Design, TMH, 2nd Edition.

3)Verilog HDL - Samir Palnitkar, 2nd Edition, Pearson Education, 2009.

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

| **Course Title : Linear Integrated Circuits Laboratory** | |
|---|---|
| **Course Code : 201ETP218** | **Semester : IV** |
| **Teaching Scheme : L-T-P : 0-0-2** | **Credits : 1** |
| **Evaluation Scheme : ISE Marks : 25** | **POE Marks: 25** |

**Lab Course Description:**

This lab course includes experiments based on knowledge of operational amplifiers. This course will help students to get practical exposure on actual working of Opamp for various applications and Monolithic IC applications which uses internally op amp.

**Course Objectives:**

| | |
|---|---|
| 1 | Understand the working of operational amplifier and its parameters |
| 2 | Use of Op-amps for different applications. |
| 3 | Design and implement various Active filters. |
| 4 | Design & Analyze different waveform generator. |

**Course Outcomes (COs):**

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

| | |
|---|---|
| C218.1 | Analyse Parameters of operational amplifier. |
| C218.2 | Apply &Classify different configuration of op-amp |
| C218.3 | Apply knowledge of op amp & monolithic IC's for different applications. |
| C218.4 | Design and implement various filters, different waveform generator. |

| | |
|---|---|
| Prerequisite: | Basic knowledge of electronics components& Instruments. |

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

## Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C218.1 | 3 | 2 | - | - | 1 | - | - | | 1 | - | 1 | 1 | 1 | - | 3 |
| C218.2 | 2 | 1 | - | - | 1 | - | - | | 1 | - | 1 | 1 | 1 | - | 2 |
| C218.3 | 2 | 1 | - | - | 1 | - | - | | 1 | - | 1 | 1 | 1 | - | 3 |
| C218.4 | 2 | 1 | - | - | 1 | - | - | | 1 | - | 1 | 1 | 1 | - | 4 |

| | List of Experiments | | |
|---|---|---|---|
| S.No | Name of Experiment | Type | Hours |
| 1. | Perform experiment to analyse Op-Amp parameters | S | 2 |
| 2. | Inverting amplifier for DC & AC inputs | O | 2 |
| 3. | Non-Inverting amplifier for DC & AC inputs | O | 2 |
| 4. | Frequency Response of Inverting & Non-Inverting amplifier | O | 2 |
| 5. | Observe Op-Amp in terms of Summing, Scaling, & Averaging amplifier in Inverting & Non-Inverting Configuration | S | 2 |
| 6. | Schmitt Trigger | O | 2 |
| 7. | Observe performance of Comparator | S | 2 |
| 8. | Integrator & Differentiator | O | 2 |
| 9. | Design active Filters | O | 2 |

| | | | |
|---|---|---|---|
| 10. | Design & Implement Triangular & square wave generator | O | 2 |
| 11. | Design & Implement Wien Bridge Oscillator | O | 2 |

**S: indicates Study type and O: Operational type**

*Minimum 10 experiments should be performed to cover the entire curriculum of course

* Few experiment should be performed using simulator.

* Note: One small project based on OPAMP applications in group of 3-4 students.

**Text Books:**

1. Ramakant A. Gaikwad, “Op Amps and Linear Integrated Circuits”, Pearson Education
2. David Bell, “Operational Amplifiers and Linear IC’s”, Oxford University Press

**Reference Books:**

1. Robert Coughlin, Fredric Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, PE, 2006.
2. B. Somanathan Nair, “Linear Integrated Circuits- Analysis, Design & Applications”, Wiley India. India.
3. S. Salivahanan & Bhaskaran, “Linear Integrated Circuits”, TMH

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Lab Course Plan

| | |
|---|---|
| **Course Title : Mini-Project-I** | |
| **Course Code : 201ETL219** | **Semester : IV** |
| **Teaching Scheme : L-T-P : 0-0-2** | **Credits : 1** |
| **Evaluation Scheme : ISE Marks : 25** | **POE Marks : 25** |

**Lab Course Description:** This course gives introduction of electronic hardware systems and provides hands-on training with identification, testing, assembling, dismantling, and fabrication of new electronics project .

**Course Objective:**

1. To understand concepts of interfacing different electronics peripherals

2. Design and implement the solution using hardware / software or both

3. To understand concepts of interfacing different electronics peripherals.

4. To create an interest in the field of electronic design as a prospective career option.

**Course Outcomes (COs):**

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

| | |
|---|---|
| C219.1 | Apply the fundamental concepts and working principles of electronics devices to design electronics circuits. |
| C219.2 | Analyze datasheets and select appropriate components and devices. |
| C219.3 | Develop simulation using software's. |
| C219.4 | Enable the Students to develop application-based projects and estimate project cost. |

## Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

### Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (COs) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C219.1 | 3 | - | - | - | - | - | - | - | - | - | - | 1 | 1 | - | 3 |
| C219.2 | 3 | 1 | - | - | 1 | - | - | - | - | - | - | 1 | 1 | - | 3 |
| C219.3 | 3 | 2 | 1 | - | 2 | - | - | - | - | - | - | 1 | 1 | - | 4 |
| C219.4 | 3 | 2 | 1 | - | 2 | - | - | - | 1 | 1 | - | 1 | 1 | - | 4 |

| Sr. No. | Mini project work should consist of following steps |
|---|---|
| 1 | Students should propose project ideas & finalize the project idea in consultation with guide. (Problem statement). |
| 2 | Students should submit implementation plan in the form of PERT/CPM chart. This will cover weekly activity of project report. |
| 3 | Problem definition and specification development in the form of synopsis. |
| 4 | Design of circuit with calculation & should include a) Analog part b) digital part c) Power supply d) Test strategy if firmware is required produce flow chart. |
| 5 | Simulation of design using tools like eSim, OrCAD, Matlab, etc. |
| 6 | Design calculation component selection. |
| 7 | Fabrication & assembly of PCB & enclosure. |
| 8 | Testing, Measurement of specifications& calibration. |
| 9 | Bill of Material. |
| 10 | Final Demo and Project Report. |

**References:**

1) The First Book of Electronics Workshop: Can't Beat a Practical Approach - River Publishers Series in Communications.
2) Handbook of Electronic projects, by ArsathNatheem.
3) Fundamentals of Electrical Engineering – BharatiDwivedi and AnurasgTripathi – Willey Precise
4) Electronics Devices and Circuit Theory- Robert L. Boylestad and Louis Nashelsky, Pearson Education Publication

# Department of Electronics & Telecommunication

## S.Y.B.Tech Curriculum w.e.f. 2021-2022

### Course Plan

| **Course Title: Financial Management** | |
|---|---|
| **Course Code: 201ETL220** | **Semester : IV** |
| **Teaching Scheme : L-T-P : 2-0-0** | **Credit: Non Credit** |
| **Evaluation Scheme: ISE Marks : NA** | **ESE Marks: 50** |

**Course Description:**

Financial management plays vital role in any kind of business / professionals. However it is very useful to the professional courses of all engineering branches. Financial management helps professionals to understand role and use of finance. Students will learn fundamentals of finance, as well as it's sources, utilisation and turn into liquidity forever.

**Course Objectives:**

1 To understand basic concepts of finance, it's role and management

2 To understand different sources of finance.

3 To study how to prepare different Budgets for entity

4 To study elements of cost of products.

**Course Outcomes (COs):**

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

| | |
|---|---|
| C220.1 | Use the financial management theory scientifically. |
| C220.2 | Apply budgetary control for smooth running of entity. |
| C220.3 | Explain or prepare different Budgets especially Master Budget |
| C220.4 | Determination of costing, allocation of cost and calculation. |

# Department of Electronics & Telecommunication

**S.Y.B.Tech Curriculum w.e.f. 2021-2022**

## Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

| Course Outcomes (Cos) | PO | | | | | | | | | | | | PSO | | BTL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | |
| C220 .1 | - | - | - | - | - | 1 | - | - | - | - | 1 | 1 | 1 | 1 | 2 |
| C220 .2 | - | - | - | - | - | 1 | - | - | - | - | 1 | 1 | 1 | 1 | 2 |
| C220.3 | - | - | - | - | - | 1 | - | - | - | - | 1 | 1 | 1 | 1 | 3 |
| C220. 4 | - | - | - | - | - | 1 | - | - | - | - | 1 | 1 | 1 | 1 | 2 |

## Course Content

| Content | Hours |
|---|---|
| Chapter No. 1 –Financial Management – Introduction, meaning, objective, role and functions of financial management | 2 |
| Chapter No. 2 -Importance and types of Capitals , fixed and working capital | 2 |
| Chapter No. 3 –Meaning and significance of working capital cycle, factors affecting working capital requirement. | 4 |
| Chapter No. 4 –Sources of finance – long term- medium term – short term finance to start new and existing business. | 4 |
| Chapter No. 5- Budget and budgetary control – meaning, objectives, use and limitations of budgetary control. Types of different types of budget – Master Budget. | 6 |
| Chapter No. 6 - Product costing and cost determining factors. Elements of cost, Allocation of Cost Govt financing schemes for new & old startups. Different types of taxes govt/semi govt. | 6 |

**Reference Books:**

1. Financial management – I. M. Pandey (vikas publication)
2. Financial management Theory and practice – Prasanna Chandra ( Tata McGraw hill)