D Y PATIL
COLLEGE of
ENGINEERING & TECHNOLOGY
(AN AUTONOMOUS INSTITUTE)
KASABA BAWADA, KOLHAPUR

D. Y.Patil College of Engineering and Technology,

Kasaba Bawada

(An Autonomous Institute)

NBA Accredited

NAAC Accredited with 'A' Grade

Structure & Syllabus of

Second Year B. Tech in Electronics & Telecommunication Engineering

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Department of Electronics & Telecommunication Engineering

2023-24

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	Practica	Credits		Type	Max. Marks	Min. for Passing	
1	201ETL201	BSC	Applied Mathematics	3	1		4	100	ISE MSE ESE	20 30 50	20 20	40
2	201ETL202	PCC	Electronics Circuits Analysis and Design - I	3			3	100	ISE MSE ESE	20 30 50	20 20	40
3	201ETL203	PCC	Analog and Digital Communication	3			3	100	ISE MSE ESE	20 30 50	20 20	40
4	201ETL204	PCC	Data structures and algorithms	3			3	100	ISE MSE ESE	20 30 50	20 20	40
5	201ETL205	PCC	Network Analysis	3	1		4	100	ISE MSE ESE	20 30 50	20 20	40
6	201ETP206	PCC - LC	Electronics Circuits Analysis and Design – I-Lab			2	1	50	ISE ESE POE	25 25	10 10	20
7	201ETP207	PCC - LC	Analog and Digital Communication Lab			2	1	50	ISE ESE POE	25 25	10 10	20
8	201ETP208	PCC - LC	Data structures and algorithms Lab			2	1	50	ISE ESE POE	25 25	10 10	20
9	201ETP209	ESC-LC	Electronics workshop practice			2	1	25	ISE	25	10	10
10	201ETL210	MC	Environment studies	2	Non-Credit Mandatory Course with 50 marks ESE							
TOTAL				17	2	8	21	675		675		
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 MSE ESE	20 30 50	20 20	40
12	201ETL212	PCC	Digital System Design using Verilog	3			3	100	ISE MSE ESE	20 30 50	20 20	40
13	201ETL213	PCC	Signals and Systems	3	1		4	100	ISE MSE ESE	20 30 50	20 20	40
14	201ETL214	PCC	Instrumentation & Control system	3	1		4	100	ISE MSE ESE	20 30 50	20 20	40
15	201ETL215	PCC	Linear Integrated circuit	3			3	100	ISE MSE ESE	20 30 50	20 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 ESE POE	25 25	10 10	20
18	201ETP218	PCC -LC	Linear Integrated circuit			2	1	50	ISE ESE POE	25 25	10 10	20
19	201ETP219	PROJ	Mini-Project-I -Lab			2	1	50	ISE ESE POE	25 25	10 10	20
20	201ETL220	MC	Financial Management	2	Non Credit Mandatory Course with 50 marks ESE							
TOTAL				17	2	8	21	675		675		
Total Contact Hours				**27**								

1. **ISE: In Semester Evaluation, MSE: Mid Semester Examination, ESE: End Semester Examination**
2. **Note 1: Tutorials and practical shall be conducted in batches with batch strength not exceeding 25 students.**
3. **Note 2: ISE 1 and ISE 2 will be of 10 marks each (Out of these two one must be activity based)**
4. **Note 3 : MSE will be conducted for 30 marks**
5. **Note 4 : ESE will be conducted for 50 marks**

Summer Internship: The students are expected to undergo 4 to 6 weeks internship in the industry and work on the relevant areas assigned by the industry. The work done should be monitored and evaluated by the concerned industry expert based on the report prepared by the student. The department has to assign one faculty mentor, who has to communicate with the industry and monitor the entire internship related work periodically,

- The weightage of evaluation will be as under.
    - Industry Expert/ Supervisor: 70%
    - Department & Faculty Mentor: 30 % (includes presentation & submission of report to the department at the beginning of the subsequent semester)

- The Internship can be availed by the students during the summer vacations after completion of sem IV or VI.
- The credits of the internship will be considered in Sem VII.
- The industry expert/ Supervisor is excepted to assign the work worth minimum 100-200 hrs for 4 to 6 weeks duration & should monitor & evaluate periodically.
- At the completion of the internship work, the student is expected to prepare a report on the work done & get certificate from the industry expert.

Coursee assessment:

The course assessment is to be done on the basis of ISE **(**In Semester Evaluation), MSE (Mid Semester Examination) and ESE (End Semester Examination). The weightage of components are as follows.

ISE	MSE	ESE
20%	30%	50%

1) ISE (Theory) 20 marks

ISE-1 and ISE-2 can be done by using following modes

1) Online test (on Moodle)
2) Surprise test
3) Open book exam
4) Active learning method as per OBE requirement
5) Self-learning topic
6) Case study
7) Demonstrations
8) Seminars
9) Assignments
10) Self Study

ISE (Lab) 20 marks: Lab assessment is to be done using continuous assessment method in which faculty has to Evaluate student's performance based upon defined rubrics only and shown to the students

2) MSE will be conducted for 30 marks.

3) ESE (End Semester Examinations)50 marks:-ESE will be conducted on entire syllabus for 100 marks for 3 hours duration and converted to 50 marks

*** Environment studies, Financial Management & Industrial Marketing (Non-Credit Mandatory Course):**

1. Self-study course
2. Course will be assessed by conducting objective type examination for 50 marks for which criteria for passing is 40% (20 marks).

3. Result of student will be declared only if student passes this course.

S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

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:

201.1	Solve Linear Differential Equations & use for Eletronics & Telecommunication related problems
201.2	Apply knowledge of vector differentiation to find curl and divergence of vector fields
201.3	Describe the statistical data numerically by using Lines of regression
201.4	Solve problems in Probability theory using Binomial, Poisson and Normal Distribution.
201.5	Use Laplace transforms to solve Linear Differential Equations

201.6	Express periodic functions into the Fourier series

Prerequisite:	Knowledge of Differentiation and Integration , Basic Probability theory

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (Pos)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
201.1	3	3											1	1	L3
201.2	3	2											1	1	L3
201.3	2	2											1	1	L2
201.4	2	2											1	1	L3
201.5	3	3											1	1	L3
201.6	3	2											1	1	L2

Contents	**Hours**
Unit-1 : Linear Differential Equations (LDE) and its Applications 1.1 Linear Differential equations with constant coefficients 1.2 Rules to find complementary function 1.3 Methods to find particular Integral (e^{ax}, sin ax or cos ax, x^m, $e^{ax}x^m$, $e^{ax}sinax$ or $e^{ax}cosax$) 1.4 Applications of LDE with constant coefficients to Electrical engineering	7

Unit-2 : Vector Differential Calculus 2.1 Differentiation of vectors 2.2 Gradient of scalar point function 2.3 Divergence of vector point function 2.4 Curl of a vector point function 2.5 Irrotational, Solenoidal and Scalar potential function of a vector field	7
Unit-3 –: Correlation and Regression 3.1 Introduction 3.2 Mean, Standard Deviation and Variance 3.3 Karl Pearson's Coefficient of Correlaion 3.4 Lines of regression of y on x 3.5 Lines of regression of x on y	7
Unit-4 -: Probability Distribution 4.1 Random variables 4.2 Discrete Probability distribution 4.3 Continuous probability distribution 4.4 Binomial Distribution 4.5 Poisson Distribution 4.6 Normal Distribution	7
Unit-5 -: Laplace Transform and its Applications 5.1 Laplace transform of elementary functions 5.2 Properties of Laplace transforms (First Shifting , Change of scale property , Multiplication & Division by t) 5.3 Inverse Laplace transforms by Partial Fractions & Convolution theorem 5.4 Solution of LDE with constant coefficients using Laplace transform	7

Unit-6-: Fourier Series 6.1 Introduction 6.2 Dirichlet's conditions 6.3.Euler's formulae 6.4 Change of interval 6.5 Expansions of odd and even functions. 6.6 Half range series	7

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),
    a. New Delhi, 7 th Edition 2007
4. B.V.Ramana, Higher Engineering Mathematics, Tata M/c Graw-Hill Publication.

List of Tutorials

Sr. No	Tutorial	Unit
1	Linear Differential Equations-I	I
2	Linear Differential Equations-II	I
3	Applications Linear Differential Equations	I
4	Vector Differential Calculus-I	II
5	Vector Differential Calculus-II	II
6	Correlation and Regression-I	III
7	Correlation and Regression-II	III
8	Probability Distribution-I	IV
9	Probability Distribution-II	IV
10	Laplace Transform and its Applications	V
11	Inverse Laplace Transform-I	V
12	Inverse Laplace Transform-II	V
13	Fourier Series- Change of Interval	VI
14	Fourier Series- Odd & Even Functions	VI
15	Fourier Series-Half range series	VI

Note: Batch wise tutorials should be conducted.

S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

Course Title: Electronics Circuits Analysis & 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. Diodes, BJT& JFET

Course Outcomes (COs):

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

202.1	Analyse and Design unregulated & regulated DC Power supply.
202.2	Analyse and Design IC regulators
202.3	Apply the knowledge electronic component basics to linear & non-linear Wave

	shaping Circuits
202.4	Analyse and Design biasing circuits of Bipolar Junction Transistor & Field Effect Transistor

Prerequisite:	Physics, Fundamentals of Electrical & Electronics Engg.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	PSO 1	PSO 2	BTL
202.1	2	2	1										2	2	L4
202.2	2	2	1										2	2	L4
202.3	2	2	1										2	2	L3
202.3	2	2	1										2	2	L4

Course Content

Content	**Hrs**
Unit 1 – Unregulated Power Supplies **Rectifiers:** Half, Full and Bridge Rectifier, Analysis for different parameters: Vdc, Idc, PIV, TUF, efficiency, ripple factor, regulation, Form Factor, Regulation. **Filters:** Need of filters, Analysis for ripplefactor of Capacitor, Inductor, LC, CLC	7

filters. Design of unregulated power supply with filter.	
Unit 2 –Voltage Regulators Need of voltage regulator, Stabilization factors, Analysis of Shunt regulator, (using Zener diode & BJT), Emitter follower, Series voltage regulator with Pre- regulator & Overload protection circuit.	7
Unit 3 - IC Voltage Regulators IC Voltage Regulators:- Study and design of regulators using IC's:78XX, 79XX, LM723, LM317, Switching regulator: Introduction to Switched Mode Power Supply (SMPS), Design of DC Power supply using 78XX	7
Unit 4:Analysis of Wave Shaping Circuits **RC Circuits:-** High pass as a differentiator, Low pass as integrator, Low Pass & High Pass (square & step response). **Clipping circuits:-**Classification, construction, working & Transfer characteristics of clipper circuits. **Clamping circuits:-** Classification, construction, working clamping circuits.	7
Unit5: Bipolar Junction Transistor & Biasing **Bipolar Junction Transistor:** Construction, Operation, Common Base Configuration, Transistor Amplifying Action, Common Emitter Configuration, Common Collector Configuration, Transistor specifications, Heat Sinking. **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.	7
Unit6: Field Effect Transistor& Biasing **Field Effect Transistor:** *n*-Channel JFET, Characteristics of *n* – Channel JFET, *p* – Channel JFET, JFET Parameters, FET Voltage Amplification. **FET Biasing:** DC Load Line, Analysis of Fixed Voltage Bias Circuit, Self-Bias Circuit, Potential Divider Bias	7

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

S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

Course Title : Analog & 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

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:

203.1	Explain different modulation schemes
203.2	Explain different demodulation schemes
203.3	Describe different types of noise and their Classification

203.4	Understand the baseband transmission and Reception.

Prerequisite:	**E**lectronic circuit Analysis & Design

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	PSO 1	PSO 2	BTL
203.1	3	1	1										1	1	L3
203.2	3	1	1										2	2	L3
203.3	3	1	1										1	1	L3
203.4	3	1	1			1							2	2	L2

Contents	**Hours**
Unit 1. Amplitude Modulation & Demodulation 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	8

Unit 2. Angle Modulation 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.	7
Unit 3. Digital transmission of analog signals Introduction, Shannon's theorem of information, Sampling theorem, Classification of Pulse Modulation, Study of Pulse Code Modulation- Uniform & Non uniform quantization, DPCM, Delta Modulation.	7
Unit 4. Noise Noise sources and types. Quantization noise, Signal to quantization noise ratio. Influence of noise on PCM.	6
Unit 5. Baseband transmission & reception Line codes: Unipolar, Bipolar, NRZ, RZ, RZ-AMI, Manchester Baseband pulse Shaping, M-array Signalling, eye diagram, Optimum Receivers-Matched Filters, Correlation receivers	6
Unit 6. Baseband modulation techniques ASK, FSK, PSK, DPSK, QPSK, & QAM. Coherent, Non- Coherent Detection. Comparison of modulation techniques based on Baud rate, BER, Power Spectral density. DSSS.	8

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 Hill Publication.
4) Louis E. Frenzel, "Principals of electronic communication system", IIIrd Ed., TMH Pub.

S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

Course Title: Data Structures & Algorithms	
Course Code: 201ETL204	**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 includes the basic foundations of data structures and algorithms. Data structure is a subject of primary importance in Information and Communication Technology. Efficient problem solving needs the application of appropriate data structure during program development. This course covers concepts of various data structures like array, stack, queue, list, tree and graph. Additionally, the course includes idea of sorting and searching.

Course Objectives:

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 will be able to:

204.1	**Compare** different data structures and **choose** a data structure for an application.
204.2	**Apply** the Algorithms to Add, delete, sort, and search for data structures like Array, linked list, Stack and Queue
204.3	**Analyze** algorithms and determine their time complexity.
204.4	**Explain** the concept of trees, graphs and **compare** different searching techniques.

Prerequisite:	Basics of C programming language

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
204.1	2	2	2	2		2	-	-	-	-	-	-	2	2	L2
204.2	3	2	2	3		3	-	-	-	-	-	-	2	3	L3
204.3	2	2	2	2		2	-	-	-	-	-	-	2	2	L4
204.4	3	3	3	3		2	-	-	-	-	-	-	2	2	L2

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.	5
Unit 2: Arrays: Introduction of linear arrays: representation of linear array in memory, traversing linear arrays, inserting & deleting. Sorting: bubble sort & quick sort and Insertion sort. Searching: linear search & binary search. Two-dimensional Arrays ,Multidimensional arrays: matrices and sparse matrices. Pointers: pointer arrays.	7
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.	7
Unit 4: Stacks & Queues: Introduction to stacks, stack as an Abstract Data type , representation through Arrays & linked lists ,Applications of stacks: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion , stacks & recursion, Queue as an abstract data type representation, circular, double ended, priority queues, application of queues	7
Unit 5: Trees: 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.	8
Unit 6: Graphs and Hashing: 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.	8

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)

S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

Course Title: Network Analysis	
Course Code: 201ETL205	**Semester : III**
Teaching Scheme : L-T-P :3-0-1	**Credit: 4**
Evaluation Scheme : ISE + MSE Marks : 20 + 30	**ESE Marks : 50**

Course Description: This course is aimed to study & analyse different types of basic circuits & filters.

Course Objectives:

1	To learn a number of powerful engineering circuit analysis techniques such as nodal analysis, mesh analysis, theorems, source transformation and several methods of simplifying networks.
2	To understand S-domain techniques (Laplace transform) to analyze the behaviour of linear circuits.
3	To learn the concept of resonance, calculate the resonant frequency, quality factor and bandwidth of RLC circuit.
4	To analyze various types of simple two-port circuits and filters .

Course Outcomes (COs):

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

205.1	Apply the knowledge of basic circuital laws and simplify the dc and ac networks using reduction techniques.
205.2	Apply the knowledge of basic circuit law to simplify the networks using network theorems.

205.3	Analyze the series and parallel resonant circuits.
205.4	Determine the various parameters such as Z, Y, ABCD & h parameters of the two port network
205.5	Apply the knowledge of network functions for one port & two port networks and determine stability
205.6	Design different kinds of two port networks filter circuits.

Prerequisite:	Basic Electrical Technology

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	PSO 1	PSO 2	BTL
205.1	3	2	2	1											L3
205.2	3	2	2	2											L3
205.3	3	2	1	1											L4
205.4	3	2	1	1											L2
205.5	3	2	1	1											L3
205.6	3	2	2	2										2	L4

Content	Hrs
Unit 1 – Network Fundamentals: Network Elements & its types, Energy sources, KVL & KCL, series & parallel connection of passive elements(R,L,C) , Combination of energy sources ,Current Division & Voltage division, source transformation ,Star- Delta transformation, Mesh & Super mesh analysis, Node & super node analysis	7
Unit 2 - Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem, Duality Theorem, Millman's Theorem	7
Unit 3- Resonance : Definition, Types: series & parallel resonance, Series resonance-resonant frequency, variation of impedance, admittance, current & voltage across L & C with respect to. Frequency, Effect of resistance on frequency response, Selectivity, B.W. &Quality factor. Parallel resonance–Anti resonance circuit, Resonant frequency for a tank circuit, variation of impedance &admittance with frequency, Selectivity, Quality factor. & B.W.	7
Unit 4 - Two Port Network: Two port network: Z, Y, ABCD , h parameters, Interrelation of different parameters, Interconnections of port network (Series, Parallel, Cascaded, Series- Parallel)	7
Unit 5- Network Functions: Network functions for one port & two port networks, Driving point impedance and admittance of one port network, Driving point impedance & admittance function, Transfer function Concept of complex frequency, significance of poles & zeros. Restrictions on poles& zeros for transfer& drawing point's function, Stability of circuit using Routh criterion, Pole zero diagram, Time response from pole zero plot.	7
Unit 6 - Filters: Definitions, classification & characteristics of different filters, decibel & Neper. Filter fundamental such as attenuation constant (α),phase shift(β) propagation	7

constant (γ) and characteristic impedance(Zo) , Design & analysis of constant K, , band pass & band stop filters), M derived (low pass, high pass): both T & Pi sections.	

Text Book:

1 .A. Sudhakar ,Shyammohan S.Palli 'Circuit & Network – Analysis & Synthesis' IIIrd Edition – Tata McGraw Hill Publication

2. Ravish Singh, "Networks Analysis & Synthesis" Tata McGraw Hill Publication

3. A.Chakrabarti 'Circuit Theory (Analysis & Synthesis)' - IIIrd Edition DhanpatRai& co

Reference Books:

1**.** D. Roy Choudhury 'Networks & Systems' - New Age International Publisher

2. Soni Gupta 'Electrical Circuit Analysis' DhanpatRai& Co.

3. Boylestad 'Introductory Circuit Analysis – Universal book stall, New Delhi

4. M.E.VanValkenburg ' Network Analysis' – IIIrd Edition , Pearson Education / PHI

List of Tutorials

Sr. No.	Name of Tutorial	Unit No.
1	Numerical on Current Division & Voltage division, source transformation ,Star- Delta transformation	1
2	Numerical on Mesh & Super mesh analysis, Node & super node analysis	1
3	Numerical on Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem	2
4	Numerical on Reciprocity Theorem, Duality Theorem, Millman's Theorem	2
5	Numerical on Series resonance	3
6	Numerical on Parallel resonance	3
7	Numerical on Z, Y, ABCD , h parameters	4
8	Numerical on Interrelation of different parameters, Interconnections of port network	4
9	Numerical on Network functions for one port & two port networks	5
10	Numerical on Routh criterion, Pole zero diagram, Time response from pole zero plot.	5
11	Numerical on design of constant K filters	6
12	Numerical on design of m derived filters	6

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w.e.f. 2023-2024

Course Title: Electronics Circuits Analysis & Design – I Lab	
Course Code: 201ETL202	**Semester : III**
Teaching Scheme : L-T-P : 0-0-2	**Credit: 1**
Evaluation Scheme : ISE Marks : 25	**ESE 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. Diodes, BJT & JFET

Course Outcomes (COs):

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

202.1	Design unregulated and regulated power to meet the required parameters
202.2	Determine the line & load regulation of IC regulators
202.3	Observe the performance of linear & non-linear Wave shaping Circuits

202.3	Analyse the performance of biasing circuits using BJT or FET

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

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO 1**	**PSO 2**	**BTL**
202.1	2	2	1		2								2	2	L4
202.2	2	2	1		2								2	2	L4
202.3	2	2	1		2								2	2	L2
202.3	2	2	1		2								2	2	L3

Course Content

List of Experiments			
Expt. No.	**Name of Experiment**	**Type**	**Hrs.**
1	Introduction to Analog Electronics Laboratory.		
2	To design Canter tapped Full Wave Rectifier without & with filters	H/W	2
3	To design Bridge Rectifier without & with filters using simulator	S	2
4	To design Zener Shunt Regulator	H/W	2
5	To study Series Pass Regulator	S	2
6	To determine line & load regulation for fixed IC regulator i.e/ 78XXC	H/W	2
7	To determine line & load regulation for adjustable IC regulator i.e/ LM317	H/W	2
8	To study the sinusoidal frequency response and square wave response of Low Pass Filter	H/W	2
9	To study the sinusoidal frequency response and square wave response of High Pass Filter using Simulator	S	2
10	To design and observe input output variations for various Clipper Circuits	H/W	2
11	To design and observe input output variations for various Clamper Circuits using Simulator	S	2
12	To design Collector to base bias using Simulator for BJT	S	2
13	To design Voltage divider bias for BJT	H/W	2

14	To design Collector to voltage Divider bias using Simulator for FET using Simulator	S	2
15	To design Self bias for FET using Simulator	S	2

S: indicates Simulation type and H/W: indicates Hardware type

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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w.e.f. 2023-2024

Course Title : Analog & Digital Communication	
Course Code : 201ETL207	**Semester : III**
Teaching Scheme : L-T-P : 0-0-2	**Credits : 1**
Evaluation Scheme : ISE Marks : 25	**ESE 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.

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

207.1	Apply knowledge related to Analog modulation & demodulation.
207.2	Apply the theory of Digital Modulation & demodulation.

Course Articulation Matrix: Mapping of Laboratory Outcomes (LOs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	PSO 1	PSO 2	BTL
207.1	3	1			1							1	1	1	L3
207.2	3	1			1							1	2	2	L3

List of Experiments			
Expt. No.	Name of Experiment	Type	Hours
1	To study Amplitude Modulation & Demodulation	O	2
2	To study Frequency Modulation & Demodulation	O	2
3	To study DSB Modulation & Demodulation	O	2
4	To study SSB Modulation & Demodulation	O	2
5	To study Pulse Amplitude Modulation & demodulation.	O	2

6	To study signal sampling & reconstruction	O	2
7	To study PCM Transmitter & Receiver	O	2
8	To study Delta Modulation & Demodulation	O	2
9	To study Adaptive Delta Modulation & Demodulation.	O	2
10	To Study different Data Formats.	O	2
11	To study ASK	O	2
12	To study FSK	O	2
13	To study PSK	O	2
14	To study PWM technique	O	2
15	Study of quantization noise measurement.	O	2

❖ S-Study, O-Operational

References:

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 Hill Publication.
4. Louis E. Frenzel, "Principals of electronic communication system", IIIrd Ed., TMH Pub.

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

Lab Course Description:

Understanding of data structures is essential and this facilitates the understanding of the language. The practice and integration of data structure techniques is essential for programming. The knowledge of C language and data structures will be reinforced by practical exercises during the course of study.

Course Objectives: The course aims to

1	Impart the basic concepts of data structures and algorithms.
2	Introduce the concepts of array, record & pointers.
3	Understand the importance of linked lists and its applications.
4	Provide the concept of stacks, queues & it's applications.
5	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:

208.1	Compare different data structures and choose a data structure for an application.
208.2	Apply the Algorithms to Add, delete, sort, and search for data structures like Array, linked list, Stack and Queue
208.3	Analyze algorithms and determine their time complexity.
208.4	Explain the concept of trees, graphs and compare different searching techniques.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
208.1	2	2	2	2		2							2	2	L2
208.2	3	2	2	3		3							2	3	L3
208.3	2	2	2	2		2							2	2	L4
208.4	3	3	3	3		2							2	2	L2

List of Experiments		
Expt. No.	**Name of Experiment**	**Hrs.**
1	Program to Insert & Delete the Number in a 1D Array	2
2	Program on Bubble Sort	2
3	Program on Insertion Sort	2
4	Program to Perform Linear search	2
5	Program to Perform Binary search	2
6	Program to Insert the Node in Link List	2
7	Program to Delete the Node from Link List	2
8	Program to Perform Operation on Stack.	2
9	Program to Perform Operation on Queue	2
10	Program for Traversing operation of Tree	2
11	Program for Traversing operation of Graph	2
12	Program for Hash Function	2
13	Mini project based on Data structures and Algorithms	6

References:

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++”, Pearson Education 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.

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Course Title: Electronics Workshop Practice Lab	
Course Code: 201ETL209	**Semester : III**
Teaching Scheme : L-T-P : 0-0-2	**Credit: 1**
Evaluation Scheme : ISE Marks : 25	**ESE POE Marks : 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 the systems by making the use of the various tools and instruments.

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:

209.1	Illustrate the different types of Electronics tools and their application.
209.2	Analyze the working of semiconductor devices and their application.
209.3	Integrate the knowledge of basic Sensors and digital electronics.
209.4	Enable the Students to develop application-based micro-projects and estimate project cost.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	BTL
209.1	3											1	L4
209.2	3											1	L4
209.3	3	2										1	L5
209.4	3	2	1						1			1	L6

List of Experiments		
Expt. No.	**Name of Experiment**	**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.).	2
2	Testing of electronic components [Resistor, Capacitor, Diode, Transistor, UJT and JFET using multimeter.] 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.]	2
3	Familiarization/Application of testing instruments and commonly used tools. [Multimeter, Function generator, Power supply, CRO etc.] [Soldering iron, De-soldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and desoldering station etc.]	2

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

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 Arsath Natheem.
3) Fundamentals of Electrical Engineering – Bharati Dwivedi and AnurasgTripathi – Willey Precise
4) Electronics Devices and Circuit Theory- Robert L. Boylestad and Louis Nashelsky, Pearson Education Publication

Course Plan

Course Title: Environmental Studies	
Course Code: 201CEMC220	**Semester: IV**
Teaching Scheme: L-T-P : 2-0-0	**Credits: 0**
Evaluation Scheme: ISE + MSE Marks : - N.A.	**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.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfill the needs of society.

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…
C220.1	Understand the importance of ecosystem and biodiversity in view of its conservation.
C220.2	Understand the concept of hazardous waste and to promote healthier environment.
C220.3	Explain the importance of environmental management through pollution control boards.
C220.4	Propose solutions for problems related with environmental well beings through location visits and model exhibitions.

Prerequisite:	Understanding of Environmental Education course.

Course Articulation Matrix:

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

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
C220.1	-	-	-	-	-	1	3	2	-	-	-	-	-	-	2
C220.2	-	-	-	-	-	1	2	-	-	-	-	-	-	-	2
C220.3	-	-	-	-	-	1	3	-	1	1	-	-	-	-	2
C220.4	-	-	-	-	-	2	3	1	1	1	-	-	-	-	3

Course Content	Hours
Unit 1. Ecology and Biodiversity 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. Biodiversity hotspots: Western ghats, eastern Himalayas, threats to biodiversity and conservation of biodiversity, environmental ethics.	8
Unit 2. Environment and Health Air Pollution, water pollution. E-waste, waste minimization technology, Plastic waste, Population growth of the world and reduced health content of the environment, energy crisis, biofuels, Occupational health hazards, Concept of Carbon footprint.	7
Unit 3. Environmental Management 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 Visit to a local area for documentation of environmental assets-River/forest/grassland/hill/mountain OR Visit to a local polluted site-Urban/Rural/Industrial/Agricultural OR Study of common plants, insects, birds OR 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.

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Course Title: Electronics Circuits Analysis & Design – II	
Course Code: 201ETP211	**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 and analysis of electronic devices & basic circuit 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 will be able to:

211.1	Analyse the performance of amplifiers in different configuration in terms of h parameters and design single stage Amplifier
211.2	Develop the frequency response of single stage RC coupled amplifiers
211.3	Analyse & design Multistage, Feedback and Power Amplifiers
211.4	Develop fundamental knowledge of MOSFETS along with its biasing and design

Prerequisite:	Physics,EEE

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
211.1	2	2	1										2	2	L4
211.2	2	2	1										2	2	L4
211.3	2	2	1										2	2	L4
211.4	2	2	1										2	2	L4

Content	Hrs.
Unit 1 –BJT and FET Amplifiers BJT: H-Parameters, Hybrid model for transistor and their approximate model (CE, CB & CC configuration), Analysis of CE in terms of Ri, Ai, Av, Ro. Study & Design of single stage RC coupled BJT.	7
Unit 2 - Frequency Response Amplifiers **Low Frequency:** BJT (Common Emitter) Amplifier, Effect of coupling and bypass capacitors, Miller Effect, **High Frequency:** Effect of Internal Transistor Capacitances, Common Emitter	7

Hybrid πmodel, Common Emitter Short Circuit and resistive Current Gain, Gain Bandwidth Product, (Numerical are expected).	
Unit 3 - Multistage Amplifiers 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 amplifier, Analysis of direct coupled & transformer coupled Amplifier	7
Unit 4 - Feedback Amplifiers 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, Design of Voltage series feedback amplifier	7
Unit 5 -Analysis of Power Amplifiers Need of Power amplifier, classification of power amplifier, Power considerations, Distortion in power amplifiers: Phase, Frequency, amplitude/ harmonic / nonlinear 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.	7
Unit 6 – MOSFETS 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, Design of single stage CS MOSFET amplifier	7

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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Course Title: Digital System Design using Verilog	
Course Code: 201ETP212	**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:

212.1	Derive and analyze logic expressions and circuits using Boolean laws and K-map.
212.2	Analyze and Design combinational and sequential circuits
212.3	Describe architecture and internal components semiconductor memories and PLDs.
212.4	Design and simulate digital logic using Verilog HDL and EDA tools.

Prerequisite:	Number system basic

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	PSO 1	PSO 2	BTL
212.1	3	3	2											2	L3
212.2	3	2	3	2										2	L4
212.3	2		2												L2
212.4			3	2	2										L4

Course Content	**Hrs**
Unit 1 – Logic Simplification: Sum Of Products (SOP) expression, Product Of Sum (POS) expression , NAND or NOR implementation, min term and max term, simplification of boolean expressions using logic rules , truth tables and Karnaugh map - 2, 3, 4 variables K-map reduction , don't cares in K-map, Quine -McClusky minimization technique, Introduction to digital logic family such as TTL and CMOS	7
Unit 2 - Combinational logic design: Half and Full Adders, Subtractors, Parallel Adders, BCD Adder, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display ,Barrel shifter , ALU, Comparators	7
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	7

registers (SISO, SIPO, PIPO, and PISO).	
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 assignment and state reduction, Sequence detector.	7
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, Behavioral modeling in Verilog HDL, Combinational and Sequential logic circuit coding using Verilog	7
Unit 6 - Semiconductor Memories and Programmable Logic Devices **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)	7

Text Book:

1. Anand Kumar ‘Fundamentals of Digital Circuits’--. PHI
2. M. Morris Mano ‘Digital Design’-- (Third Edition),. PHI
3. 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.

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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 will be able to:

213.1	Understand classification of signals and systems and interpret time domain response of LTI systems
213.2	Analyze the spectral properties of signals using Fourier analysis.

213.3	Apply Z- transform to study discrete-time signals and systems.
213.4	Constructs the methods of realization of systems

Prerequisite:	Applied Mathematics-III

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
213.1	3	3	1	2	2	1							1	1	L2
213.2	3	3	1	2	2	1							2	1	L4
213.3	3	3	1	2	2	1							1	2	L3
213.4	3	3	2	2	2	1							1	2	L4

Content	Hrs.
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	7
Unit. 2 - Linear Time – Invariant (LTI) Systems Representation of Signals in terms of Impulses, Discrete Time LTI Systems, the	7

Convolution Sum, Continuous Time LTI Systems, the Convolution Integral. Properties of LTI Systems,	
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, **Case study:** Design of a synthetic ECG signal based on Fourier series	7
Unit 4.- Discrete Fourier Transform Discrete Time Fourier Transform , Discrete Fourier Transform , Inverse Discrete Fourier Transform(IDFT): Direct method, DFT using Twiddle factor, Properties	7
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.	7
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 Case study: Simulation of simple electrical system	7

Text Books:

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	6
12	Introduction to MATLAB	NA
13	Generation of Sine and Cosine wave using MATLAB	1
14	Generation of Square and ramp signal using MATLAB	1
15	Simulation of basic electrical system using MATLAB	6

S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

Course Title: Instrumentation & Control 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:

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:

214.1	Analyze and identify the instrument suitable for specific measurements.
214.2	Use and identify the basic principles of Transducers & Sensors.

214.3	Analyze and identify open loop & closed loop control systems.
214.4	Analyze the LTI system in time domain and frequency domain.
214.5	Test the stability of LTI system using conventional methods

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

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs), Program Specific Outcomes (PSOs)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO 1**	**PSO 2**	**BTL**
214.1	2	3	2	2	2								2		L4
214.2	2	2	2	2	2								1		L2
214.3	2	2	2	2	2								1		L4
214.4	2	2	2	2	2								1	1	L3
214.5	2	2	2	2	2								1	1	L3

Contents	Hours
Unit 1.Transducers & Sensors: Definition and Classification of Transducers & Sensors, Characteristics and Choice of Transducers, Potentiometer, Strain Gauges,RTD,Thermister,Thermocouple,LVDT,CapacitiveTransducer,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.	8
Unit 2.Virtual Instrumentation: Introduction to virtual instrumentation, Role of Software in Virtual Instrumentation, Virtual Instrumentation with Lab VIEW, Components of Lab VIEW applications.	6
Unit 3.Dual trace, Dual beam CRO and Spectrum Analyzer: Dual trace CRO block diagram, applications, differences between them,1X & 10X Probes, applications, Spectrum analyzer block diagram, applications & Wave analyzer block diagram, applications.	7
Unit 4.Introduction of Control system: Introduction to open & close loop control systems, advantages, disadvantages & applications, Transfer function concepts, Block diagram algebra, and Signal flow graphs. Illustrative examples	8
Unit 5. Time And Frequency Response Analysis: Introduction, Standard test signals, Time response of first and second order systems for standard test inputs 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: Concept of Stability in S domain, Classification of Stability, stability analysis by Hurwitz criterion and Routh array, determining range of K for stable operation. Illustrative examples.	6

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
3. Measurement Techniques', PHI, 4the/d,1987.
4. 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

6.Feed back control systems,9TH REVISED EDITION,Dr.S.D.Bhide,R.A.Barapate,,Tech.Max publications.

7.Control System engineering,Ramesh Babu,R.Ananda.Natarajan,SCITECH Publications

Reference Books:

1. Hewlett Packard, Tektronics, Advantest,Aplab,"Application Notes on Measurement".

2. BouwensA.J.,'Digital Instrumentation, McGraw-Hill, second edition

List of tutorials:

Sr. No.	Name of Tutorial	Unit No.
1	Study of transduces.	1
2	Study of sensors.	1
3	Study of Virtual Instrumentation.	2
4	Study of Virtual Instrumentation.	2
5	Study of dual trace Oscilloscope .	3
6	Study of Spectrum Analyzer, Wave 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.	5
11	Numerical on relative stability–Gain Margin and Phase Margin.	6
12	Numerical on stability analysis by Hurwitz criterion and Routh array,	4

Note: 50% Theoretical & 50% mathematical based tutorials should be conducted

S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

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:

215.1	Explain basic concept of operational amplifier with its parameters
215.2	Classify different configuration of op-amp
215.3	Identify and describe different applications of op-amp
215.4	Design and implement various filters
215.5	Analyse different waveform generator circuits
215.6	Apply knowledge of op-amp in various industrial applications

Prerequisite:	Basic knowledge of electronics components & its parameters

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

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
215.1	3	2	1	1									1		L2
215.2	2	2	1	1									1		L2
215.3	2	2	1	1									1		L2
215.4	2	2	2	1									1		L3
215.5	2	2	1	1									1		L3
215.6	2	2	2	1									1		L3

Course Content	Hrs
Unit 1 – Introduction to Operational amplifier 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.	7
Unit 2 -Op-Amp Configurations & Frequency Response Open loop configuration, closed loop configuration, Virtual ground concept, unity gain amplifier, frequency response of both configurations, Slew rate and its effect.	6
Unit 3 –Applications of Op-amp Summing Amplifier, Differential amplifier, Integrator, differentiator, Precision	8

Rectifiers, Log & Anti-log Amplifier, Comparator, Schmitt Trigger.	
Unit 4-Active Filters Introduction to active filters, analysis & design of Butterworth filters: Low Pass filter & High Pass filter (First & Second order), Band Pass filter.	7
Unit 5 - Waveform Generators Square wave generator (Astable multivibrator using Op-Amp), Triangular &Saw-tooth wave generator, RC phase shift oscillator, Wien bridge oscillator, LC oscillator.	7
Unit 6- Monolithic IC Applications IC 555 (Timer): Block diagram, Multi-vibrators and Applications. PLL - Introduction, Block diagram, IC 566 VCO , IC 565 PLL & Applications, IC 8038	7

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

S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

Course Title: Electronics Circuits Analysis & Design – II Lab.	
Course Code: 201ETP216	**Semester : IV**
Teaching Scheme : L-T-P :0-0-2	**Credit: 1**
Evaluation Scheme : ISE + MSE Marks : 25	**ESE POE: 25**

Course Description: The course includes experiments based on Transistor applications in Amplifiers. Various performance parameters are evaluated for Transistor and MOSFET.

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:

216.1	Determine the h parameters from the characteristics of CE Amplifier
216.2	Apply the knowledge of transistor to observe the frequency response of single stage Amplifier
216.3	Design various amplifiers in simulators and using hardware

216.4	Design MOSFET Amplifier and observe it's characteristics

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
216.1	2	2			1								2	2	L2
216.2	2	2			1								2	2	L3
216.3	2	2			1								2	2	L3
216.4	2	2			1								2	2	L3

List of Experiments			
Expt. No.	**Name of Experiment**	**Type Hours**	**Type Hours**
1	To determine h-parameters of single stage RC coupled amplifier from its characteristics using Simulator	S	2
2	To study frequency response of single stage RC coupled amplifier.	O	2
3	To design of single stage RC coupled Amplifier and determine	O	2

	its bandwidth from frequency response for Sinusoidal input		
4	To study the behavior of single stage RC coupled Amplifier for Square Wave input	O	2
5	To observe effect of Negative feedback on gain and Bandwidth of single stage RC coupled amplifier.	O	2
6	To design of two stage RC coupled Amplifier and determine its bandwidth from frequency response for Sinusoidal input	O	2
7	To design of direct coupled Amplifier and determine its bandwidth from frequency response for Sinusoidal input with the help of Simulator	S	2
8	To design of voltage series feedback Amplifier and determine its bandwidth from frequency response without and with feedback	O	2
9	To simulate the Class A power amplifier and calculate the efficiency	S	2
10	To simulate the Class B Complementary Symmetry Amplifier and calculate the efficiency	S	2
11	To observe and plot the characteristics of MOSFET using Simulator	O	2
12	Design Common Source MOSFET Amplifier	O	2
13	Mini project based on Transistor application	O	6

S: indicates Study type

O: Operational type

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

S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

Course Title: Digital System Design using Verilog -Lab	
Course Code: 201ETL217	**Semester : IV**
Teaching Scheme : L-T-P : 0-0-2	**Credit: 1**
Evaluation Scheme : ISE Marks : 25	**ESE 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:

217.1	Derive and analyse logic expressions and circuits using Boolean laws and K-map.
217.2	Analyse and Design combinational and sequential circuits
217.3	Describe architecture and internal components semiconductor memories and PLDs
217.4	Design and simulate digital logic using Verilog HDL and EDA tools

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Title: **Digital System Design using Verilog -Lab**	Semester: IV
Course Code: 201ETP217	Year: 2023-2024

Course Outcomes (COs) / Program Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	PSO 1	PSO 2	BTL
217.1	3	3	2											2	L3
217.2	3	2	3	2										2	L4
217.3	2		2												L2
217.4			3	2	2		1								L4

List of Experiments		
Expt. No.	**Name of Experiment**	**Hrs.**
1	To design and simulate the Verilog code for basic logic gates	2
2	To design and simulate the Verilog code for half adders, full adders	2
3	To design and simulate the Verilog code for half aubtractor, full subtractor	2
4	To design and simulate the Verilog code for Multiplexers	2
5	To design and simulate the Verilog code for De-multiplexer	2
6	To design and simulate the Verilog code for Decoder	2

7	To design and simulate the Verilog code for 4 - Bit binary to gray code converter & 4 - Bit gray to binary code converter	2
8	To design and simulate the Verilog code for Comparator	2
9	To design and simulate the Verilog code for D, T flip flops	2
10	To design and simulate the Verilog code for Binary counter	2
11	To design and simulate the Verilog code for shift register	2
12	To design and simulate the Verilog code for state machines to detect the given sequence of bits.	2
13	Varilog based Mini project	6

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.

S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

Course Title : Linear Integrated Circuits Lab.	
Course Code : 201ETP218	**Semester : IV**
Teaching Scheme : L-T-P : 0-0-2	**Credits : 1**
Evaluation Scheme : ISE Marks : 25	**ESE Marks: 50**

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 Op amp 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 & Analyse different waveform generator.

Course Outcomes (COs):

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

218.1	Analyse Parameters of operational amplifier.
218.2	Apply &Classify different configuration of op-amp
218.3	Apply knowledge of op amp & monolithic IC's for different applications.
218.4	Design and implement various filters, different waveform generator.

Prerequisite:	Basic knowledge of electronics components & Instruments.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**	BTL
218.1	3	2			1				1			1	1	1	L3
218.2	2	1			1				1			1	1	1	L2
218.3	2	1			1				1			1	1	1	L3
218.4	2	1			1				1			1	1	1	L4

	List of Experiments	**Hrs**
1.	Study and analyse Op-Amp parameter	2
2.	Inverting amplifier for DC & AC inputs	2
3.	Non-Inverting amplifier for DC & AC inputs	2
4.	Frequency Response of Inverting & Non-Inverting amplifier	2
5.	Study of op-amp as Summing, Scaling, & Averaging amplifier in Inverting & Non-Inverting Configuration	2
6.	Schmitt Trigger	2

7.	Study of Comparator	2
8.	Integrator & Differentiator	2
9.	Design active Filters	2
10.	Design & Implement Triangular & square wave generator	2
11.	Design & Implement Wein Bridge Oscillator	2
12.	Mini project based on OPAMP applications in group of 3-4 students	8

* Note: Few experiment should be performed using simulator.

Text Books:

1. Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", IInd and latest edition, Pearson Education
2. David Bell, "Operational Amplifiers and Linear IC's", IIIrd edition, Oxford University Press

Reference Books:

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

S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

Course Title: Mini project-Lab	
Course Code: 201ETL219	**Semester : IV**
Teaching Scheme :L-T-P : 0-0-2	**Credit: 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 Objectives:

1	To understand concepts of interfacing different electronics peripherals
2	Design and implement the solution using hardware / software or both
3	Design and implement the solution using hardware / software or both
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 will be able to:

219.1	Apply the fundamental concepts and working principles of electronics devices to design electronics circuits.
219.2	Analyze datasheets and select appropriate components and devices
219.3	Develop simulation using software's.
219.4	Enable the Students to develop application-based projects and estimate project cost.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
219.1	3											1	1		L2
219.2	3	1			1							1	1		L3
219.3	3	2	1		2							1	1		L2
219.4	3	2	1		2							1	1		L4

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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 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

Second Year (B.Tech.) curriculum

w.e.f. 2023-2024

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

Course Objectives:

1	Overview of Indian financial system, instruments and market
2	Basic concepts of value of money, returns and risks, corporate finance, working capital and itsmanagement
3	Knowledge about sources of finance, capital structure, dividend policy
4	Overview of Indian financial system, instruments and market
5	Basic concepts of value of money, returns and risks, corporate finance, working capital and itsmanagement
6	Knowledge about sources of finance, capital structure, dividend policy

Course Outcomes (COs):

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

220.1	Understand Indian finance system and corporate finance
220.2	Take investment, finance as well as dividend decisions
220.3	To apply the knowledge about the sources of finance, capital structure, dividend policy
220.4	To identify the system for Indian finance, instruments and market
220.5	To understand concepts of value for money, returns and risks, corporate

	finance, working capital and itsmanagement
220.6	To develop the knowledge about sources of finance, capital structure, dividend policy

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
220.1	2	2	1	1	1								1	1	L2
220.2	1	1	1	1	1								1	1	L3
220.3	2	2	1	1	1								1	1	L2
220.4	2	2	2	2	2								1	1	L4
220.5	1	1	1	1	1								2	2	L4
220.6	1	1	1	1	1								1	1	L4

Content	Hrs
Unit no.-1 **Overview of Indian Financial System** Characteristics, Components and Functions of Financial System. **Financial** Instruments — Equity Shares, Preference Shares, Bonds-Debentures, Certificates of Deposit, and Treasury Bills. **Financial Markets:** Meaning, Characteristics and Classification of Financial Markets — Capital Market, Money Market and Foreign Currency Market **Financial Institutions: Instruments:** Meaning, Characteristics and Classification of Basic Meaning, Characteristics and Classification of Financial Institutions — Commercial Banks, Investment- Merchant Banks and Stock Exchanges.	6
Unit no.-2 **Concepts of Returns and Risks:** Measurement of Historical Returns and Expected Returns of a Single Security and a Two-security Portfolio; Measurement of Historical Risk and Expected Risk of a Single Security and a Two-security Portfolio. **Time Value of Money:** Future Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Present Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Continuous Compounding andContinuous Discounting.	6
Unit no.-3 **Overview of Corporate Finance:** Objectives of Corporate Finance; Functions of Corporate Finance—Investment Decision, Financing Decision, and Dividend Decision. **Financial Ratio Analysis:** Overview of Financial Statements— Balance Sheet, Profit and Loss Account, and Cash Flow Statement; Purpose of Financial Ratio Analysis; Liquidity Ratios; Efficiency or Activity Ratios; Profitability Ratios; Capital Structure Ratios; Stock Market Ratios; Limitations of Ratio Analysis.	6

Unit no.-4 **Capital Budgeting:** Meaning and Importance of Capital Budgeting; Inputs for Capital Budgeting Decisions; Investment Appraisal Criterion—Accounting Rate of Return, Payback Period, Discounted Payback Period, Net Present Value(NPV), Profitability Index, Internal Rate of Return (IRR), and Modified Internal Rate of Return (MIRR) **Working Capital Management:** Concepts of Meaning Working Capital; Importance of Working Capital Management; Factors Affecting an Entity's Working Capital Needs; Estimation of Working Capital Requirements; Management of Inventories; Management of Receivables; and Management of Cash and Marketable Securities.	6
Unit no.-5 **Sources of Finance:** Long Term Sources—Equity, Debt, and Hybrids; Mezzanine Finance; Sources of Short Term Finance—TradeCredit, Bank Finance, Commercial Paper; Project Finance.	6
Unit no.-6 **Capital Structure:** Factors Affecting an Entity's Capital Structure; Overview of Capital Structure Theories and Approaches— Net Income Approach, Net Operating Income Approach; Traditional Approach, and Modigliani-Miller Approach. Relation between Capital Structure and Corporate Value; Concept of Optimal Capital Structure	6

Reference Books:

1. Fundamentals of Financial Management, 13th Edition (2015) by Eugene F. Brigham and Joel F. Houston; Publisher: Cengage Publications, New Delhi.
2. Analysis for Financial Management, 10th Edition (2013) by Robert C. Higgins; Publishers:McGraw Hill Education, New Delhi.
3. Indian Financial System, 9th Edition (2015) by M. Y. Khan; Publisher: McGraw HillEducation, New Delhi.
4. Financial Management, 11th Edition (2015) by I. M. Pandey; Publisher: S. Chand (G/L) &Company Limited, New Delhi.