Shirpur Education Society's

R. C. Patel Institute of Technology, Shirpur

An Autonomous Institute

Affiliated to DBATU, Lonere (M.S.),

Approved By AICTE, New Delhi and Govt. of Maharashtra

(DTE: EN - 5172)

Accredited by NAAC 'A' Grade, Bangalore.

Course Curriculum Structure

Electronics & Telecommunication Engineering

Second Year B. Tech

Batch: 2022-2026

With Effect from Academic Year 2023-24

Shahada Road, Near Nimzari Naka, Shirpur, Maharashtra 425405

www.rcpit.ac.in

Semester-III (w.e.f. Academic Year 2023-2024)														
Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit
							Continuous Assessment (CA)				ESE		
				L	T	P	TA	TT1	TT2	Best of (TT1 & TT2)			
							A			B	C	A+B+C	
1	BS	22BSET3010T	Engineering Mathematics-III	3	1	--	20	15	15	15	65	100	4
2	PC	22PCET3020T	Electronics Circuit Design	3	--	--	20	15	15	15	65	100	3
3	PCL	22PCET3020L	Electronics Circuit Design Lab	--	--	2	25	--	--	--	25	50	1
4	PC	22PCET3030T	Digital System Design	3	--	--	20	15	15	15	65	100	3
5	PCL	22PCET3030L	Digital System Design Laboratory	--	--	2	25	--	--	--	25	50	1
6	PC	22PCET3040T	Signals and Systems	3	1	--	20	15	15	15	65	100	4
7	PCL	22PCET3050L	Electrical Network Analysis and Synthesis Laboratory	--	--	2	25	--	--	--	25	50	1
8	ESL	22ESET3060L	Python Programming Laboratory	--	--	2	25	--	--	--	25	50	1
9	HM	22HMET3070T	Universal Human Values	2	--	--	20	15	15	15	65	100	2
10	PJ	22PJET3080L	Semester Project-I	--	--	2	25	--	--	--	25	50	1
			Total	**14**	**2**	**10**	**225**	--	--	**75**	**450**	**750**	**21**

BS: Basic Science, **PC:** Program Core, **PCL:** Program Core laboratory, **PJ:** Project, **HM:** Humanities, **TA:** Teachers Assessment, **TT1:** Term Test-1, **TT2:** Term Test-2

E & TC Department R.C.P.I.T. OFFICE SEAL SHIRPUR

Prepared By	Checked By	BOS Chairman	Dean Academics	COE	Director
Narendra L. Lokhande	Dr. Prashant G. Patil	Prof.Dr. Vijay S. Patil	Prof.Dr. Pramod J. Deore	Prof.S.P. Shukla	Prof.Dr. J.B. Patil

Dean, Academics
R. C. Patel Institute of Technology
Shirpur, Dist: Dhule (MS)

Controller of Examination
R. C. Patel Institute of Technology
Shirpur Dist: Dhule (MS)

DIRECTOR
Patel Institute of Technology
Shirpur Dist Dhule (MS)

Semester-IV (w.e.f. Academic Year 2023-2024)													
Sr. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credit
							Continuous Assessment (CA)				ESE		
				L	T	P	TA	TT1	TT2	Best of (TT1 & TT2)			
							A			B	C	A+B+C	
1	BS	22BSET4010T	Engineering Mathematics-IV	3	1	--	20	15	15	15	65	100	4
2	PC	22PCET4020T	Integrated Circuits	3	--	--	20	15	15	15	65	100	3
3	PCL	22PCET4020L	Integrated Circuits Laboratory	--	--	2	25	--	--	--	25	50	1
4	PC	22PCET4030T	Electromagnetic and Wave Propagation	3	1	--	20	15	15	15	65	100	4
5	PC	22PCET4040T	Microcontroller & Applications-I	3	--	--	20	15	15	15	65	100	3
6	PCL	22PCET4040L	Microcontroller & Applications-I Laboratory	--	--	2	25	--	--	--	25	50	1
7	ES	22ESET4050L	Data Analytics Laboratory	--	--	2	25	--	--	--	25	50	1
8	ES	22ESET4060L	Database Management System Laboratory	--	--	2	25	--	--	--	25	50	1
9	MC	22MCET4070T	Constitution of India	2	--	--	--	--	--	--	--	--	Audit
10	PJ	22PJET4080L	Semester Project-II	--	--	2	25	--	--	--	25	50	1
11	HM	22HMET4090L	Employability Skill Development Program -I	--	--	2	50	--	--	--	--	50	1
			Total	**14**	**2**	**12**	**255**	--	--	**60**	**385**	**700**	**20**

BS: Basic Science, **PC:** Program Core, **PCL:** Program Core laboratory, **ES:** Engineering Science **PJ:** Project, **MC:** Mandatory Course **HM:** Humanities, **TA:** Teachers Assessment **TT1:** Term Test-1, **TT2:** Term Test-2

E & TC Department R.C.P.I.T. OFFICE SEAL SHIRPUR

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Shirpur Dist Dhule (MS)

DIRECTOR
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Shirpur Dist Dhule (MS)

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-III
Engineering Mathematics-III (22BSET3010T)	

Prerequisite:

- Mathematics-I
- Mathematics-II

Course Objectives:

- To build the strong foundation in Mathematics of learner needed for the field of Electronics and Telecommunication Engineering.
- To provide learner with mathematics fundamentals necessary to formulate, solve and analyses complex engineering problems.
- To prepare student to apply reasoning informed by the contextual knowledge to engineering practice.
- To prepare learner to work as part of teams on multi-disciplinary projects.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply the knowledge of Laplace transform and its properties to evaluate specific kind of integrals.	L3	Apply
CO2	Apply knowledge of Inverse Laplace transform to solve ordinary simultaneous differential equations.	L3	Apply
CO3	Follow Fourier series expansion of functions which satisfy Dirichlet conditions and Fourier transform.	L3	Apply
CO4	Demonstrate an ability to use vector algebra and vector calculus.	L5	Evaluate
CO5	Apply the knowledge of analytic functions to obtain functions, conformal mapping, bilinear transformations.	L3	Apply

Engineering Mathematics- III (22BSET3010T)

COURSE CONTENTS

Unit-I **Laplace Transform** **7 Hrs.**

Laplace Transform (LT): D Laplace Transform (LT) of Standard Functions: Definition of Laplace transform, Condition of Existence of Laplace transform, Laplace transform of eat, sin(at),cos(at), sinh (at),cosh(at),tn ,Properties of Laplace Transform, Linearity, first shifting theorem, second shifting theorem, effect of multiplication by tn, effect of division by t, Laplace Transform of derivatives and integrals, change of scale, convolution theorem, Evaluation of integrals using Laplace transform.

Unit-II **Inverse Laplace Transform & its applications** **9 Hrs.**

Partial fraction method, Method of convolution, Laplace inverse by derivative, Heaviside unit step function, Dirac-delta function, Laplace transform of Periodic function Applications of Laplace Trans-form: Solution of ordinary differential equations, Solving RLC circuit differential equation of first order and second order with boundary condition using Laplace transform (framing of differential equation is not included).

Unit-III **Fourier Series** **10 Hrs.**

Introduction- Orthogonal and orthonormal set of functions, Introduction of Dirichlets conditions, Euler's formulae. Fourier Series of Functions- Exponential, trigonometric functions of any period 2L, Even and odd functions, half range sine and cosine series. Complex form of Fourier series, Fourier Integral, Fourier Transform, Fourier sine and cosine Transform, Inverse Fourier Transform

Unit-IV **Vector Algebra, Vector Differentiation & Vector Integral** **9 Hrs.**

Vector differentiation, Gradient of scalar point function, Divergence and Curl of vector point function, Properties: Solenoidal and irrotational vector fields, conservative vector field, Vector Integral: Greens theorem in a plane, Gauss divergence theorem and Stokes theorem.

Unit-V **Complex Variable** **7 Hrs.**

Analytic Function: Necessary and sufficient conditions (No Proof), Cauchy Riemann equation Cartesian form (No Proof) Cauchy Riemann Equation in polar form (with Proof), Milne Thomson Method and its application, Harmonic function, orthogonal trajectories, Mapping: Conformal mapping, Bi-linear transformations, cross ratio, fixed points.

Text Books

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication, 43rd Edition, 2020.

2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc-Graw Hill Publication, 6th Edition, 2018.

Reference Books

3. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Limited, 10th Edition,2015.
4. Wylie and Barret, Advanced Engineering Mathematics, Tata Mc-Graw Hill, 6th Edition, 1995.
5. Dennis G. Zill Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett Pub-lishers, 1st Edition, 2009.

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-III
Electronics Circuit Design (22PCET3020T)	
Electronic Circuit Design - Laboratory (22PCET3020L)	

Pre-requisite:

- Basic Electrical Engineering & Digital Electronics
- Electrical Networks
- Physics

Course Objectives:

- To understand operation of semiconductor devices.
- To understand DC analysis and AC models of semiconductor devices.
- To apply concepts for the design of Amplifiers.
- To verify the theoretical concepts through laboratory and simulation experiments.
- To implement mini projects based on concept of electronics circuit concepts.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Analyze and design BJT biasing circuits and apply small-signal models to assess amplifier performance and stability.	L4	Analyze
CO2	Design and evaluate amplifier circuits and analyze the characteristics of Power Electronic devices such as SCR, DIAC, and TRIAC.	L5	Evaluate
CO3	Explain the construction, operation, characteristics, and applications of MOSFETs as amplifiers and switches.	L2	Understand
CO4	Evaluate frequency response to understand behaviour of Electronics circuits.	L5	Evaluate

Electronics Circuit Design (22PCET3020T)

COURSE CONTENTS

Unit-I **DC analysis of common BJT circuits** **6 Hrs.**

Analysis and design of voltage divider bias, stability factor analysis, Small Signal Mid Frequency Models: Hybrid-pi model, early effect, h-parameter model.

Unit-II **Small Signal Amplifier Analysis** **10 Hrs.**

Graphical analysis to evaluate parameters, small signal analysis of Common Emitter configurations using hybrid-pi model. Darlington emitter follower (CC-CC). Low frequency and high frequency response amplifier. Design of single stage CE amplifier, Power Devices: Construction, Operation, and V-I Characteristics of Silicon Controlled Rectifier (SCR), DIAC, and Triac

Unit-III **Introduction to MOSFET** **10 Hrs.**

Introduction to MOSFET: MOSFET Symbol, Types of MOSFET-Depletion and Enhancement type MOSFET (N channel and P channel), Construction, Operation, and V-I characteristics of MOSFET. MOSFET biasing, MOSFET as a switch, MOSFET as amplifier.

Unit-IV **Power Amplifiers** **8 Hrs.**

Introduction to power amplifier, Need of power amplifier and Harmonic distortion, Power efficiency of class A, B, AB and C amplifier.

Unit-V **Feedback Amplifiers and Oscillators** **8 Hrs.**

Concept of negative Feedback, voltage / current, series, Shunt feedback. Positive feedback, Introduction to oscillator: Operation of oscillator, Types of Transistor oscillators. RC oscillators: Phase shift and Wein bridge. LC oscillators: Hartley, Colpitts and Clapp. Tuned Oscillators: Twin-T oscillator and crystal oscillator.

Electronic Circuit Design - Laboratory (22PCET3020L)

List of Laboratory Experiments: (Any Eight)

1. BJT Biasing.
2. Single stage Common Emitter Amplifier
3. Frequency Response of RC Coupled Common Emitter amplifier.
4. Single Stage Common Source (CS) Amplifier using MOSFET.
5. Darlington Emitter Follower
6. SCR Characteristics
7. Complementary symmetry Class B Push Pull Power amplifier
8. Negative Feedback Amplifier
9. RC Phase Shift Oscillator
10. LC Oscillator.

Text Books

1. Jacob Millman, Christos Halkias and Chetan Parikh, Electronic Devices and Circuits (SIE), McGraw Hill Education, 4th Edition, 2015.
2. D. A. Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill, 3rd Edition, 2006.

Reference Books

1. Jacob Millman, Christos Halkias and Chetan Parikh, Integrated Electronics Analog and Digital Circuit and Systems, McGraw Hill Education, 2nd Edition, 2017.
2. A. Mottershead, Electronic Devices and Circuits: An Introduction, Prentice Hall India Learning Private Limited, 2022.
3. S. Sedra, K. C. Smith, and A. N. Chandorkar, Microelectronic Circuits Theory and Applications, International Version, Oxford International Students, 7th Edition, 2017
4. David A. Bell, Electronic devices and circuits, Oxford University higher education, 5th Edition, 2008
5. Boylestad and Nashelesky, Electronic Devices and Circuits Theory, Pearson Education,11th Edition, 2013.
6. J B. Gupta, Electronic Devices and Circuits, Katson Education Series, 6th Edition, 2016.

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-III
Digital System Design (22PCET3030T)	
Digital System Design Laboratory (22PCET3030L)	

Pre-requisite

- Basic Electrical Engineering
- Digital Electronics

Course Objectives:

- To introduce different digital codes and their conversions.
- To introduce methods for minimizing logical expressions.
- To outline the formal procedure to design combinational logic circuits.
- To introduce flip flops and outline the formal procedure to sequential circuits.
- To illustrate concept of programmable devices

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain different signed number representation and signed binary arithmetic.	L2	Understand
CO2	Minimize logic expressions using various reduction techniques.	L4	Analyze
CO3	Design combinational logic circuits using logic gates and implement the circuit by carrying out required investigations and debugging techniques.	L5	Evaluate
CO4	Design flip-flops using logic gates and use them to realize different sequential circuits and implement the circuit by carrying out required investigations and debugging techniques.	L5	Evaluate
CO5	Classify different programmable logic devices (PLD) and design combinational circuits using PLD.	L5	Evaluate

Digital System Design (22PCET3030T)

COURSE CONTENTS

Unit-I **Signed Binary Numbers** **4 Hrs.**

Signed-Magnitude representation, Ones complement representation and Twos complement representation, Binary Arithmetic: Ones complement Addition and Subtraction, Twos complement Addition and Subtraction.

Unit-II **Minimization Techniques** **12 Hrs.**

Implementations of Logic Functions using basic and universal gates. Boolean postulates and laws, De-Morgans Theorem, Standard Representations of Logic Functions: Boolean expression Minterm, Maxterm, Sum of Products (SOP), Product of Sums (POS), Minimization of Boolean expressions: Karnaugh map Minimization (up to four variables), Minimizing Sum of Products, Simplifying Products of Sums, Quine-Mc Cluskey method of minimization, don't care conditions

Unit-III **Design of Combinational Logic** **12 Hrs.**

Introduction to combinational logic, Code converter: Binary Coded Decimal (BCD), Excess-3, Gray code, Binary Code, Arithmetic Circuits: Half- Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder, Parallel Adder/Subtractor, BCD adder, Look ahead carry generator; Multiplexer, Multiplexer tree, De-multiplexer Decoders, Implementation of SOP and POS using Multiplexer De-multiplexer/Decoder

Unit-IV **Sequential Logic Design** **10 Hrs.**

Introduction to sequential logic, Flip- Flop: SR, JK, D, T. Preset & Clear, Truth Tables and Excitation tables, Conversion from one type to another type of Flip Flop, Shift Registers: SISO, SIPO, PISO, PIPO, Bi-directional, Counters: Asynchronous counter, Synchronous counter, Ring counters, Johnson Counter, Modulus of the counter. State Machines: Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Sequence detector.

Unit-V **Programmable Logic Devices** **4 Hrs.**

Programmable logic devices: Architecture of PROM, PAL, PLA, designing combinational circuits using PLDs. General architecture of FPGA and CPLD.

Digital System Design Laboratory (22PCET3030L)

List of Laboratory Experiments: (Any Eight)

1. Verify different logic gates
2. Simplification of Boolean functions.
3. Verify Universal gates and design EXOR and EXNOR gates using Universal gates.
4. Implement Half adder, Full adder, Half Subtractor and Full subtractor circuits.
5. Implement BCD adder using four-bit binary adder IC-7483.
6. Flip flops conversion JK to D, JK to T and D to TFF.
7. Implement logic equations using Multiplexer.
8. Design synchronous MOD N counter using IC-7490.
9. Verify encoder and decoder operations.
10. Implement digital circuits to perform binary to gray and gray to binary operations.
11. Verify truth table of different types of flip flops.
12. Verify different counter operations.

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

Reference Books

1. Morris Mano, Michael D. Ciletti, Digital Design, Pearson Education, 4th Edition (2008).
2. Thomas L. Floyd, Digital Fundamentals, Pearson Hall, 11th Global Edition (2015).
3. Mandal, Digital Electronics Principles and Applications, McGraw Hill Education, 1st Edition (2010).
4. Ronald J. Tocci, Neal S. Widmer, Digital Systems Principles and Applications, 8th Edition, PHI (2003)
5. Donald P. Leach, Albert Paul Malvino, Gautam Saha, Digital Principles and Applications, The McGraw Hill, 7th Edition (2011).

Text Books

1. John F. Wakerly, Digital Design Principles and Practices, Pearson Education, 4th Edition (2008).
2. R. P. Jain, Modern Digital Electronics, Tata McGraw Hill Education, 3rd Edition (2003).

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-III
Signals and Systems (22PCET3040T)	

Pre-requisite

- Mathematics-I

Course Objectives:

- To introduce students, the concept and theory of signals and systems needed in electronics and telecommunication engineering fields.
- To introduce students to the basic idea of signal and system analysis and its characterization in time and frequency domain.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Classify, and perform mathematical operations on various types of signals and systems.	L4	Analyze
CO2	Determine the impulse response and analyse LTI systems in time domain using convolution integral and convolution sum.	L3	Apply
CO3	Analyze the effect of frequency transformation of signals and systems in continuous and discrete time domain.	L4	Analyze
CO4	Apply the concepts of Signals and Systems in different areas of Telecommunication.	L3	Apply

Signals and Systems (22PCET3040T)

COURSE CONTENTS

Unit-I Classification of Signals and Systems 10 Hrs.

Introduction to signals: Definition, sampling theorem, sampling of continuous time signals, Nyquist Criterion, concept of aliasing, concept of digital frequency. Continuous and discrete time representation of elementary signals: exponential, sine, step, impulse, ramp, rectangular, triangular, signum, sinc, operations on signals (shift, invert, scale), Classification of signals: Continuous and discrete time, deterministic and non-deterministic, periodic and aperiodic, symmetric (even) and asymmetric (odd), energy and power, causal and anti-causal signal,

Introduction to systems: Definition, Classification of systems: Static and dynamic, time variant and time invariant, linear and nonlinear, causal and non-causal, stable and unstable systems, Invertible and Non-Invertible Systems.

Unit-II Continuous Time and Discrete Time Linear Time Invariant (LTI) Systems 10 Hrs.

Response of Continuous Time LTI System: Representation of systems using differential equation, Impulse response and convolution integral, properties of convolution, signal responses to CT-LTI system, system stability Impulse, step and, system stability, Response of Discrete Time-LTI System: Representation of systems using difference equation, Impulse response characterization and convolution sum, Properties of convolution summation, Impulse response of DT-LTI system and its properties, step response, system stability,

Correlation and spectral Density: Auto-correlation, cross-correlation, analogy between correlation and convolution, definition of power spectral density (PSD) and Energy spectral density (ESD), relation of ESD and PSD with auto-correlation.

Unit-III Analysis of Continuous Time Signals and Systems 12 Hrs.

Trigonometric and exponential Fourier series representation of CT signals, Gibb's phenomenon, Fourier Transform (FT): Fourier Transform and Inverse Fourier Transform of a-periodic continuous and discrete time signals and systems, limitations of CT/DT Fourier Transform and need for Laplace / Z Transform,

Laplace Transform (LT): Review of unilateral and bilateral Laplace Transform, properties, inverse of Laplace Transform, concept of Region of Convergence (ROC), poles and zeros, relation between continuous time Fourier Transform and Laplace Transform.

Unit-IV Analysis of Discrete Time Signals and Systems 10 Hrs.

Introduction and Need of Z Transform, Definition of unilateral and bilateral Z Transform, Z Transform of finite and infinite duration sequences, Properties, Inverse Z Transform, Relation

between discrete time Fourier Transform and Z Transform, Z Transform of standard signals, ROC for ZT, Plotting poles and zeros of transfer function. Analysis of discrete time LTI systems using Z-Transform: Transfer Function, Causality and stability of systems, Relation between Laplace Transform and Z Transform. Realization structures: Direct form I, Direct form II, Cascade and parallel forms.

Signals & Systems Tutorial (Any Eight)

1. Perform classification of Signals and Systems.
2. Perform mathematical operations in Signals and Systems.
3. Plot various types of Continuous Time Signals.
4. Implement sampling and reconstruction of Continuous Signals.
5. Plot various types of Discrete Time Signals and perform various operations on Unit Step Signals.
6. Analysis of Continuous Time Signals.
7. Analyze Linear Time Invariant (LTI) Continuous Time Systems.
8. Analysis of Discrete Time Signals.
9. Analyze Linear Time Invariant (LTI) Discrete Time System.
10. Perform convolution of Discrete Time Signals.

Reference Books

1. Ramesh Babu P. and Ananda Natarajan, Signals and Systems, 5th Revised Edition, 2022.
2. Simon Haykin, Barry Van Veen, Signals and Systems, John Wiley Sons, 2nd Edition, 2021.

Text Books

1. Hwei. P Hsu, Signals and Systems, Tata McGraw Hill, 3rd Edition, 2010.
2. V. Krishnaveni, A.Rajeshwari, Signals and Systems, Wiley-India, 1st Edition, 2012.
3. A. Nagoor Kani, Signals and Systems, McGraw Hill India, 1st Edition, 2018.

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-III
Electrical Network Analysis and Synthesis Laboratory (22PCET3050L)	

Pre-requisite

- Basic Electrical Engineering

Course Objectives:

- To analyse the circuits in time and frequency domains.
- To synthesize passive network by various methods.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply the knowledge in analyzing circuits by using network theorems.	L3	Apply
CO2	Analyze the various parameters of two port networks.	L4	Analyze
CO3	Synthesis of network using passive elements.	L5	Evaluate

Electrical Network Analysis and Synthesis Laboratory (22PCET3050L)

COURSE CONTENTS

List of Laboratory Experiments: (Minimum 8)

1. Verification of Thevenin's Theorem.
2. Verification of Superposition Theorem.
3. Verification of Maximum Power Transfer Theorem.
4. Determine driving point impedance of given two-port network.
5. Determine transfer impedance of given two-port network.
6. To study RLC series resonance circuit and determine the resonance frequency, bandwidth, and Q-factor.
7. To study RLC parallel resonance circuit and determine the resonance frequency, bandwidth, and Q-factor.
8. Determine Z-parameter of networks connected in series.
9. Determine Y-parameter of networks connected in parallel.
10. Determine transmission (ABCD-parameter) of networks connected in cascaded form.
11. Design constant K low-pass filter. Also plot the frequency response. Determine the cut-off frequency practically and compare with the design value.
12. Design constant K high-pass filter. Also plot the frequency response. Determine the cut-off frequency practically and compare with the design value.
13. Design m-derived low-pass filter. Also plot the frequency response. Determine the cut-off frequency practically and compare with the design value.
14. Design a symmetrical T-attenuator to give an attenuation of 40 dB to work into a load of 600 Ω impedance.

Reference Books

1. A. Chakrabarti, Circuit Theory, Dhanpat Rai & Co., 6th Edition, 2019.
2. Smarajit Ghosh, Network Theory Analysis & Synthesis, PHI Learning, 3rd Edition, 2019.
3. D. Roy Choudhury, Networks and Systems, New Age International, 4th Edition, 2019.

Text Books

1. Franklin F. Kuo, Network Analysis and Synthesis, Wiley, 2nd Edition, 1966.
2. M. E. Van Valkenburg, Network Analysis, Prentice-Hall of India, 26th Indian Reprint, 2000.
3. Ravish Singh, Circuit Theory and Networks, Tata McGraw-Hill Education, 2nd Edition, 2016.

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-III
Python Programming Laboratory (22ESET3060L)	

Prerequisite:

- Fundamentals of Programming
- Basic Mathematics

Course Objectives:

- Python programming basics, Functions in Python and files handling.
- GUI Programming and Databases operations in Python.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe the various data types, dictionaries and regular expressions in Python.	L2	Understand
CO2	Describe different control statements, conditional statements and functions in Python.	L2	Understand
CO3	Realize and encapsulate different File handling and exception handling operations using Python.	L3	Apply
CO4	Design GUI, estimate different database operations and array handling in Python.	L4	Analyze

Python Programming Laboratory (22ESET3060L)

COURSE CONTENTS

Unit-I **Introduction to Python** **6 Hrs.**

History of Python, Data types & Regular expression Basic Data types identifiers, Basic Data types, Integer Data Type, Float and Complex Data Type, Mathematical Functions, String Data Types, String Manipulation Functions, String Slices Basic Data Types Collections Lists: Working with Lists, Basic Operations, Sorting, Count & Append, List Comprehension Dictionary: Definition, Update dictionary, Dictionary Comprehension Sets, Tuples and Frozen Sets Conversion of List to Dictionary Regular Expressions: Match function, Search Function, Modifiers, Patterns.

List of suggested Practical's: (Any three)

1. To read a number n and print patterns
2. Program to map a list into a dictionary and vice versa.
3. Program to study list and dictionary comprehension.
4. To implement different string manipulation functions.
5. To count the number of letters/ vowels/ consonants in a string or a list or a dictionary.

Unit-II **Control statements and Functions in Python** **6 Hrs.**

While, for, Nested loops. Use of Continue, Pass and Break statement. Range function Conditional Statements: if, else, elif, nested if and Switch Case Statements Function arguments pass by value and reference, Recursive Functions.

List of suggested Practical's: (Any three) Use of the control statements to implement

1. Factorial of a number.
2. Palindrome of number or a string.
3. Fibonacci series.
4. Sine and Cosine series.
5. Pythagoras triplets.

Unit-III **Files Directories & Flow control** **6 Hrs.**

Making and List directories, Changing directory, List files in directories. File & Directory manipulation, File functions, File object attributes, close () method, opening a binary file, File Attributes, read (read fixed size) readline () tell (). Read data from keyboard. File handling: Opening and closing file, Reading and writing files. Exception Handling, Except Clause, User defined Exceptions.

List of suggested Practical's: (Any three) Use of the control statements to implement

1. Open a file and read the contents of a file and print.

2. Open a file and write to a file (overwrite and append).
3. Open a file and count the characters present in the file.
4. Program to demonstrate Exception Handling.
5. Splitting of lines by file handling.

Unit-IV **Python Database** **4 Hrs.**

Introduction, Connections and executing queries, Transactions and handling errors, Introduction to GUI programming.

List of suggested Practical's: (Any three) Use of the control statements to implement

1. Install MySQLdb.
2. Establish database connection.
3. Creating database table.
4. Use of Insert/Read/Update operations in database.

Unit-V **Python Libraries** **4 Hrs.**

Working with numpy, constructing numpy arrays, Printing arrays, Arithmetic operations on matrix, Slicing Arrays, Random number generation. Working with Matplotlib, and pandas: Installation and implementation

List of suggested Practical's: (Any three) Use of the control statements to implement

1. Data visualization with matplotlib.
2. Array manipulation/strings/indexing/slicing and other numpy library functions.
3. Histogram using matplotlib.
4. Statistical functions in numpy.
5. Any one tool kits to extend python matplotlib functionality.

Unit-VI **Data Science Using Python** **2 Hrs.**

Data Frame, Creating Data Frame from .csv files, python dictionaries, Python List of Tuples, Operation on Data Frames, Data Visualization: Bar Graph, Histogram, Pie Chart creation and Creation of Line Graphs.

List of suggested Practical's: (Any Two) Use of the control statements to implement

1. Create and visualize a Data Frame
2. Generating outliers in the data
3. Calculation of statistical parameters: Mean, Median and Mode of data.
4. Creation and interpretation of box plots.
5. Interpret the features of a given data frame using histogram, pie charts and line graphs.

Reference Books

1. Reema Thareja, Python Programming: Using Problem Solving Approach, Oxford University Press India, 2nd Edition, 2023.

2. R. Nageswara Rao, Core Python Programming, 3rd Edition Dreamtech Press, 2021.

Text Books

1. Johannes Ernesti, Peter Kaiser, Python 3: The Comprehensive Guide to Hands-On Python Programming, Rheinwerk Computing,1st Edition, 2022.

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-III
Universal Human Values (22HMET3070T)	

Course Objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, Society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, Family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Define and list the basic concepts of self-awareness, surroundings (family, society, nature), and human relationships.	L1	Remember
CO2	Become sensitive to their commitment towards what they have understood (human values, human	L4	Analyze
CO3	Apply what they have learnt to their own self in different day-to-day settings in real life; at least a beginning would be made in this direction.	L3	Apply

Universal Human Values (22HMET3070T)

COURSE CONTENTS

Unit-I Introduction: Need, Basic Guidelines, Content and Process for Value Education Introduction to the Constitution of India **5 Hrs.**

Purpose and motivation for the course. Self-Exploration what is it? - Its content and process; Natural Acceptance and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Unit-II Understanding Harmony in the Human Being **6 Hrs.**

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Under- standing the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I am being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of 'I' with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health.

Unit-III Understanding Harmony in the Family and Society: Harmony in Human-Human Relationship. **6 Hrs.**

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order-from family to world family.

Unit-IV Understanding Harmony in the Nature and Existence: Whole existence as Coexistence **5 Hrs.**

Understanding the harmony in the Nature 19. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all pervasive space. Holistic

perception of harmony at all levels of existence.

Unit-V Implications of the above Holistic Understanding of Harmony on Professional Ethics **6 Hrs.**

Natural acceptance of human values 23. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

1. Ability to utilize the professional competence for augmenting universal human order,
2. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems.
3. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems.

Strategy for transition from the present state to Universal Human Order:

4. At the level of individual: as socially and ecologically responsible engineers, technologists, and managers,
5. At the level of society: as mutually enriching institutions and organizations.

Text Books

1. R. R. Gaur, R. Sangal, G. P. Bagaria, Human Values and Professional Ethics by Excel Books, New Delhi, 2010.

Reference Books

1. A Nagaraj, Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. A.N. Tripathi, Human Values, New Age International Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi, The Story of My Experiments with Truth.
5. E. F Schumacher, Small is Beautiful.
6. Cecile Andrews, Slow is Beautiful.
7. J C Kumarappa, Economy of Permanence.
8. Pandit Sunderlal, Bharat Mein Angreji Raj.
9. Dharampal, Rediscovering India.
10. Mohandas K. Gandhi, Hind Swaraj or Indian Home Rule.
11. Maulana Abdul Kalam Azad, India Wins Freedom.
12. Romain Rolland, Vivekananda (English).
13. Romain Rolland, Gandhi (English).

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-III
Semester Project- I (22PJET3080L)	

Course Objectives:

- Students are expected to design, simulate/implement a project based on the knowledge acquired from current semester subjects.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Analyze a survey of several available literatures in the preferred field of study.	L4	Analyze
CO2	Describe various/alternate approaches to complete a project.	L2	Understand
CO3	Apply a collaborative project environment by interacting and dividing project work among team members.	L3	Apply
CO4	Use technical communication skills to present project work in the form of a technical report/paper.	L3	Apply
CO5	Apply teamwork and project management skills to plan, execute, and manage the research study.	L3	Apply

Semester Project:

The purpose of introducing semester project at second year level is to provide exposure to students with a variety of projects based on the knowledge acquired from the semester subjects. This activity is supposed to enrich their academic experience and bring enough maturity in student while selecting the project. Students should take this as an opportunity to develop skills in implementation, presentation and discussion of technical ideas/topics. Therefore, proper attention shall be paid to the content of semester project report which is being submitted in partial fulfilment of the requirements of the Second Year and it is imperative that a standard format be prescribed for the report.

Each student shall work on project approved by departmental committee approved by the Head of Department, a group of 03 to 05 students (max allowed: 5 students in extraordinary cases, subject to the approval of the department committee and the Head of the department) shall be allotted for each Semester Project. Each group shall submit at least 3 topics for the Semester Project. The departmental committee shall finalize one topic for every group. Semester Project Title or Theme should be based on knowledge acquired during semester.

The project work shall involve sufficient work so that students get acquainted with different aspects of knowledge acquired from semester subjects.

Student is expected to:

- Select appropriate project title based on acquired knowledge from current semester subjects.
- Maintain Log Book of weekly work done (please see attached log book format Table 1).
- Report weekly to the project guide along with log book.

Table 1: Log Book Format

Sr. No	Week (Start Date: End Date)	Work Done	Sign of Guide	Sign of Coordinator
1				
2				

Assessment Criteria:

- At the end of the semester, after confirmation by the project guide, each project group will submit project completion report in prescribed format for assessment to the departmental committee (including project guide).
- Assessment of the project (at the end of the semester) will be done by the departmental committee (including project guide).

Prescribed project report guidelines:

Size of report shall be of minimum 25 pages. Project Report should include appropriate content for:

- Introduction
- Literature Survey
- Related Theory
- Implementation details
- Project Outcomes
- Conclusion
- References

Assessment criteria for the departmental committee (including project guide) for Continuous Assessment:

Guide will monitor weekly progress and marks allocation will be as per Table 2.

Table 2: Continuous Assessment Sheet

Sr No	Exam Seat No	Name of Student	Student Attendance	Log Book Maintain	Literature Review	Depth of Understanding	Report	Total
			5	5	5	5	5	25

Assessment criteria for the departmental committee (including project guide) for End Semester Exam:

Departmental committee (including project guide) will evaluate project as per Table 3.

Each group shall present/publish a paper based on the semester project in reputed/peer reviewed Conference/Journal/Techfest/Magazine/ before the end of the semester.

Table 3: Evaluation Sheet

Sr No	Exam Seat No	Name of Student	Project Selection	Design/ Simulation/ Logic	PCB/ hardware/ programming	Result Verification	Presentation	Total
			5	5	5	5	5	25

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-IV
Engineering Mathematics - IV (22BSET4010T)	

Prerequisite:

- Mathematics-I
- Mathematics-II
- Mathematics-III

Course Objectives:

- To build the strong foundation in Mathematics of learner needed for the field of Electronics and Telecommunication Engineering learner would be able:
  1. To understand the concept of Random Variables.
  2. To test the hypothesis of samples.
  3. To apply the concepts of Linear Algebra.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply theory of probability in identifying and solving relevant problems.	L3	Apply
CO2	Differentiate random variables through the use of cumulative distribution function (CDF), probability density function (PDF), probability mass function (PMF) as well as joint, marginal and conditional CDF, PDF and PMF.	L4	Analyze
CO3	Apply sampling distributions and hypothesis testing techniques using Z, t, and Chi-square tests to draw valid statistical inferences.	L3	Apply
CO3	Apply and analyze concepts of vector spaces, linear transformations, rank, and inner product spaces, including Gram-Schmidt orthogonalization, to solve linear algebra problems.	L3	Apply
CO5	Apply theory of Eigen systems to principal component analysis.	L3	Apply

Engineering Mathematics - IV (22BSET4010T)

COURSE CONTENTS

Unit-I **Introduction to Probability and Random Variable** **9 Hrs.**

Conditional probability, Joint probability, Bayes theorem, Independence of events, Definition of Random Variable. Discrete and Continuous random variables, probability mass function, probability density function, probability distribution function, Expectation, Variance and Moments of random Variable, Binomial, Poisson and Normal (Gaussian) distributions.

Unit-II **Operations on One and Multiple Random Variable** **8 Hrs.**

Functions of a random variable and their distribution and density functions, Pairs of random variables, Joint CDF, Joint PDF, Independence, Conditional CDF and PDF, Conditional Expectation, One function of two random variables, two functions of two random variables; joint moments, joint characteristic function, covariance, and correlation-independent, uncorrelated and orthogonal random variables.

Unit-III **Sampling Theory and Distribution** **4 Hrs.**

Central limit theorem and its significance, Sampling distribution: Population distribution, parameter and statistics, Z distribution, Student's t-distribution, Chi-square distribution.

Unit-IV **Test of Hypothesis** **6 Hrs.**

Hypothesis testing: Test of significance, null and alternative hypothesis, type I and type II error, factors affecting Type II error, probability of Type II error, power of test, p Value, critical region, level of significance. One tailed and Two Tailed Test, Large sample (Z-Test)-Test of significance of Mean of the sample and test of significance difference of means of two samples, small sample (t-Test)-Test of significance of Mean of the sample and test of significance difference of means of two samples (dependent and independent), Chi-square test: Test of goodness of fit and independence of attributes, contingency table.

Unit-V **Basics of Linear Algebra** **6 Hrs.**

Vector Spaces, Subspaces, Span, Basis, Dimension, Rank, Linear transformations, Rank nullity theorem, Inner Product Space, Gram Schmidt Orthogonalization Process.

Unit-VI **Matrix Theory** **9 Hrs.**

Eigenvalues and Eigenvectors, properties of Eigenvalues and Eigenvectors, Cayley- Hamilton theorem, Examples based on verification of Cayley-Hamilton theorem, Similarity of matrices, Diagonalization of matrices, Function of square matrix, Quadratic forms over real field, Reduction of quadratic form to a diagonal, canonical form, Rank, index and signature of quadratic form, class value of quadratic forms, definite, Semi-definite and indefinite.

Reference Books

1. Papoulis and S. Unnikrishnan Pillai, Probability, Random Variables and Stochastic Processes, 4th Edition 2017, McGraw Hill.
2. Seymour Lipschitz and Marc Lipson, Schaum's Outline of Linear Algebra, McGraw Hill Publication, 3th Edition, 2017.
3. S. C. Gupta and V. K. Kapoor, Fundamental of Mathematical Statistics, Sultan Chand and Sons, 12th Edition 2020.

Text Books

1. T. Veerarajan, Probability, Statistics and Random Processes, McGraw Hill, 3rd Edition 2017.
2. Gareth Williams, Linear Algebra with Application, Jones and Bartlett, 9th Edition, 2017.

Tutorial:

List of Tutorials: (Any Eight)

1. Conditional probability and Bayes theorem.
2. Random variable
3. Binomial, Poisson, and Normal distribution
4. Function of one random variable.
5. One function of two random variables and two function of two random variables.
6. Central Limit Theorem and Sampling distribution.
7. Test of hypothesis (parametric)
8. Test of hypothesis (non-parametric).
9. Linear algebra.
10. Eigen system.
11. Quadratic forms.

Minimum 08 tutorials from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-IV
Integrated Circuits (22PCET4020T)	
Integrated Circuits Laboratory (22PCET4020L)	

Prerequisite:

- Electronic Devices & Circuits
- Network Theory / Circuit Analysis
- Basic Electrical Engineering

Course Objectives:

- To understand the concepts, and working principle of integrated circuits.
- To design and analyze different circuits as well as systems for various applications using integrated circuits.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe the physical operation of integrated circuits using Op-Amps.	L2	Understand
CO2	Analyze linear and non-linear Op-Amp applications.	L4	Analyze
CO3	Design various applications using Op-Amps, Timers, and special ICs.	L6	Create
CO4	Implement different types of applications using various Analog ICs	L3	Apply

Integrated Circuits (22PCET4020T)

COURSE CONTENTS

Unit-I **Introduction to Operational Amplifiers** **10 Hrs.**

Block diagram of Op-Amp, analysis of basic differential amplifier circuit configurations using MOS-FETs, MOSFET differential amplifier with active load, effect of swamping resistor, current mirror circuit, current sources using MOSFETs (Widlar current source, and Wilson current source), voltage sources and references, DC level shifters, Op-Amp symbol and terminals, ideal Op-Amp and practical Op-Amp characteristics, Op-Amp parameters, open loop and closed loop configurations.

Unit-II **Applications of Operational Amplifier** **10 Hrs.**

Amplifiers: Inverting, non-inverting, buffer, summing, difference, integrator, differentiator, current, instrumentation, log and antilog, Active Filters: First and second order active LPF and HPF, switched capacitor filters; Converters: Current to voltage, voltage to current, Comparators: Inverting comparator, non-inverting comparator, zero crossing detector, window detector, peak detector, sample and hold circuit, Schmitt trigger, Waveform generator: Square wave generator, triangular wave generator; Precision rectifier: Half wave and full wave.

Unit-III **Analog to Digital and Digital to Analog Converters** **8 Hrs.**

Performance parameters of ADC, single ramp ADC, ADC using DAC, dual slope ADC, successive approximation ADC, flash ADC, Performance parameters of DAC, binary weighted register DAC, R/2R ladder DAC, inverted R/2R ladder DAC.

Unit-IV **Special Purpose Integrated Circuits** **6 Hrs.**

IC 555(timer): Functional block diagram, working, design of Astable and Monostable multivibrator using Timer 555, application of IC 555 as pulse position modulator; IC 566 (VCO): Functional block diagram, working and application as frequency modulator; IC 565 (PLL): Functional block diagram, working and application as FSK demodulator.

Unit-V **Voltage Regulators** **8 Hrs.**

Three terminal regulators: Functional block diagram, working and design of three terminal fixed (78XX, 79XX series) and three terminal adjustable (LM 317, LM 337) voltage regulators; General purpose voltage regulator: Functional block diagram, working and design of general purpose 723 (LVLC, LVHC, HVLC and HVHC) with current limit and current fold-back protection.

Integrated Circuits Laboratory (22PCET4020L)

List of Laboratory Experiments: (Any Eight)

1. Design Inverting and Non-inverting amplifier using Op-Amp (IC 741).
2. Design Integrator and Differentiator using Op-Amp (IC 741.
3. Design Summing /Difference amplifier using Op-Amp (IC 741).
4. Second Order Low Pass filter using Op-Amp (IC 741).
5. Design Square wave and Triangular wave generator using Op-Amp (IC 741).
6. Design Schmitt trigger using Op-amp (IC 741).
7. Design Half wave and Full Wave Precision Rectifier using Op-Amp (IC 741).
8. Design R-2R Ladder DAC using Op-Amp (IC 741).
9. Design Astable Multivibrator using IC 555.
10. Design Voltage Regulator using IC 723.
11. To perform AC and DC analysis of MOSFET based differential amplifier using Spice Tool.
12. Instrumentation Amplifier using Spice Tool.

Minimum 08 experiments from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Reference Books

1. Sergio Franco, Design with Operational Amplifier's and Analog Integrated Circuits, Tata McGraw Hill, 4rd Edition 2015.
2. R. F. Coughlin and F. F. Driscoll, Operation Amplifiers and Linear Integrated Circuits, Prentice Hall, 6rd Edition 2000.
3. David A. Bell, Operation Amplifiers and Linear Integrated Circuits, Oxford University Press, 3th Edition 2011.
4. Millman Halkias, Integrated Electronics, McGraw-Hill Electrical and Electronic Engineering, 1th Edition 2001. Series

Text Books

1. Ramakant A. Gayakwad, Op-Amps and Linear Integrated Circuits, Pearson Prentice Hall, 4th Edition.
2. D. Roy Choudhury and S. B. Jain, Linear Integrated Circuits, New Age International Publishers, 4nd Edition 2018.

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-IV
Electromagnetic Wave Propagation (22PCET4030T)	

Prerequisite:

- Mathematics for Telecommunication Engineering
- Electrical Network Analysis and Synthesis.

Course Objectives:

- To learn concept of static and time varying electromagnetic fields.
- To solve problems related to EM fields using Vectors and Partial differential equations.
- To learn Electromagnetic radiation and propagation in space and within transmission lines.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Compute electric and magnetic fields for symmetrical charge and current configurations using basic principles of electromagnetics.	L3	Apply
CO2	Analyze the coupling between electric and magnetic fields through Faraday's law, displacement current, and Maxwell's equations.	L4	Analyze
CO3	Characterize wave polarization and wave propagation in different media.	L4	Analyze
CO4	Determine transmission-line parameters at various operating frequencies.	L3	Apply

Electromagnetic Wave Propagation (22PCET4030T)

COURSE CONTENTS

Unit-I Coordinate system transformation and vector calculus 5 Hrs.

Cartesian, cylindrical and spherical coordinate, Differential length, area and volume, line surface and volume integrals, Del Operator, Gradient of scalar, Divergence of a vector and Divergence Theorem, Curl of a Vector and Stokes Theorem, Laplacian of a scalar.

Unit-II Electrostatics 8 Hrs.

Coulomb's Law, Gauss's Law and its applications, Electric Potential, Relationship between E and V, Electric Dipole and flux lines, Convection and Conduction Currents, Electric Boundary Conditions, Poisson's and Laplace's Equations, Uniqueness Theorem, General Procedure for solving Poisson's or Laplace's Equations.

Unit-III Magneto statics 8 Hrs.

Biot-Savart's Law, Ampere's Circuital Law and its applications, Magnetic Flux density, Maxwell's equations for Static Fields, Magnetic Scalar and Vector potentials, Magnetic boundary conditions.

Unit-IV Time varying Fields 8 Hrs.

Faraday's Law, Transformer and Motional Electromotive Forces, Displacement Current Maxwell's equations in point form and integral form, Boundary conditions for time varying field, magnetic vector potential, Time harmonic fields.

Unit-V Transmission Lines 6 Hrs.

Parameters, Transmission line equations, Input impedance, reflection coefficient, Standing wave ratio.

Unit-VI Electromagnetic Wave Propagation 7 Hrs.

Derivation of Wave equation and its solution, Wave Propagation in lossy dielectrics, Plane waves in loss less dielectrics, free space and good conductors, Power and Poynting Vector, Reflection of a Plane wave at normal incidence and oblique incidence. Modes of Wave Propagation- Ground Wave Propagation, Sky Wave Propagation, Space Wave Propagation.

Text Books

1. William H. Hayt and John A Buck, Engineering Electromagnetics, Tata McGraw-Hill Publishing Company Limited, 9th Edition 2020.
2. Matthew N. O. Sadiku, S. V. Kulkarni, Principles of electromagnetics, Oxford University Press, 6th Edition 2015.

Reference Books

1. Edward C. Jordan, Keth G. Balmin, Electromagnetic Waves Radiating Systems, Pearson Publications,2nd Edition, 2015.
2. Reinhold Ludwig, Pavel Bretchko, RF Circuit Design Theory and Applications, Pearson, Publications, 2nd Edition, 2011.
3. R. K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill, 1st Edition, 2018.

List of Tutorials (Any Seven)

1. Numericals on Electrostatics.
2. Numericals on Electric Boundary conditions.
3. Numericals on Poisson's and Laplace's Equations.
4. Numericals on Magneto statics.
5. Numericals on Vector Potentials.
6. Numericals on Time varying fields.
7. Numericals on Maxwell Equations.
8. Transmission line impedance calculations.
9. Transmission line impedance calculations.
10. Numericals on Wave Propagation in different material.
11. Numericals on Normal and Oblique incidence.
12. Sky and Space wave propagation.

Minimum 08 Tutorials from the above suggested list or any other experiment based on syllabus will be included, which would help the learner to apply the concept learnt.

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-IV
Microcontroller & Applications-I (22PCET4040T)	
Microcontroller & Applications-I Laboratory (22PCET4040L)	

Prerequisite:

- Digital Electronics
- Basic Electronics

Course Objectives:

- To develop background knowledge and core expertise in microcontrollers.
- To understand peripheral devices and their interfacing to microcontrollers.
- To write programs for microcontrollers and their applications in Assembly language.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain different functionalities and architecture of 8051 microcontrollers	L2	Understand
CO2	Explain different hardware components and use relevant software for programming of microcontroller-based development system.	L3	Apply
CO3	Write assembly language programs for microcontroller based systems using instruction set.	L3	Apply
CO4	Interface different input/output devices with microcontroller for various applications.	L3	Apply

Microcontroller & Applications-I (22PCET4040T)

COURSE CONTENTS

Unit-I **Introduction to Microcomputer System** **8 Hrs.**

Block diagram of microprocessor-based system: CPU, I/O Devices, Clock, Memory, Concept of Ad-dress, Data and Control Bus and Tristate logic, Need of Assembly Language and its Comparison with higher level languages, Need of Assembler and Compiler and their comparison.

Unit-II **8051 Microcontroller** **10 Hrs.**

Features, architecture and pin configurations, CPU timing, Input / Output ports, Memory organization, Counters and timers, Interrupts, Serial Communication.

Unit-III **8051 Programming** **10 Hrs.**

Instruction set, addressing mode, Assembler Directives Programs related to: arithmetic, logical, delay, input, output, timer, counters, port, serial communication, and interrupts.

Unit-IV **Memory interfacing with 8051** **8 Hrs.**

RAM, ROM, EPROM and Memory mapping.

Unit-V **Interfacing and Applications** **6 Hrs.**

Interfacing of Display: LED, Seven Segment display, and LCD, DC Motor, Stepper motor, Relay and UART.

Microcontroller & Applications-I Laboratory (22PCET4040L)

List of Laboratory Experiments: (Any Eight)

1. To find smallest and largest number from given data string using 8051.
2. To perform addition, subtraction, multiplication division of 8-bit numbers.
3. To exchange data blocks using 8051.
4. To arrange data series in ascending descending order.
5. To find even and odd numbers from data string.
6. To blink LED and generate various pattern using 8051.
7. To interface 7-segment display with 8051.
8. To display the message on LCD using 8051.
9. To transfer and receive data serially using 8051.
10. To generate waveform using 8051.
11. To measure pulse width using 8051.
12. To interface temperature sensor and display room temperature on display.
13. To interface DC motor using 8051.
14. To interface relay and turn ON/OFF the bulb using 8051.

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept. Laboratory work shall consist of minimum 8 experiments and one mini project.

Reference Books

1. C. Kenneth J. Ayala and D. V. Gadre, The 8051 Microcontroller Embedded system Using assembly C, Cengage Learning Publication, 1st Edition, 2010.
2. I. Scott Mackenzie, Raphael C. W. Phan, The 8051 Microcontroller, Pearson International Publication, 4th Edition 2007.
3. Ajay Deshmukh, Microcontrollers, Tata McGraw Hill Publication, 2nd Edition 2006.

Text Books

1. M. A. Mazidi, J. G. Mazidi and R. D. Mckinlay, The 8051 Microcontroller Embedded systems, Pearson Education India, 1st Edition, 2007.
2. Lyla Das, Embedded Systems: An Integrated Approach, Pearson Publication, 1st Edition, 2012.

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-IV
Data Analytics Laboratory (22ESET4050L)	

Pre-requisite

- Basic knowledge of programming concepts (variables, data types, operators)
- Basic exposure to C programming / any procedural language

Course Objectives:

- Basics of data modelling.
- Data processing techniques.
- Supervised learning methods.
- Unsupervised learning methods.
- Dimensionality Reduction.
- Ensemble methods.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Perform data cleaning and transformations on a given dataset.	L3	Apply
CO2	Perform data modelling using regression and classification methods.	L3	Apply
CO3	Apply dimensionality reduction on high dimensional datasets.	L3	Apply
CO4	Apply the concepts of Neural Network on non-linear datasets.	L3	Apply
CO5	Apply ensemble techniques for imbalance datasets.	L3	Apply
CO6	Apply clustering techniques for unsupervised datasets.	L3	Apply

Data Analytics Laboratory (22ESET4050L)

COURSE CONTENTS

List of Laboratory Experiments: (Minimum Eight)

1. Analysis of different types of datasets.
2. Plotting of probability distribution using different dataset.
3. Plotting and visualization of dataset using different types of graphs.
4. Different types data cleaning methods.
5. Implementation of logistic regression model for predictive analysis.
6. Implementation of linear regression model for predictive analysis.
7. Implement PCA on dataset with high dimensionality and perform prediction using KNN.
8. Implement clustering methods on unsupervised dataset.
9. Hypothesis testing for given dataset.
10. ANOVA technique using dataset.

Reference Books

1. Alvaro Fuentes, Hands-On Predictive Analytics with Python: Master the Complete Predictive Analytics Process, from Problem Definition to Model Deployment, Packt Publishing, 2nd Edition 2019.
2. Ai Publishing, Data Pre-processing with Python for Absolute Beginners: Step-by-Step Guide with Hands-on Projects and Exercises, Apex Persuasion 2020.

Text Books

1. Max Kuhu & Kjell Johnson, Applied Predictive Modelling, Springer Publication,1st Edition.
2. Olson, David L., Wu, Desheng, Predictive Data Mining Models, Springer,1st Edition 2020.

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-IV
Database Management System Laboratory (22ESET4060L)	

Prerequisite:

- Programming Fundamentals (C / C++)
- Data Structures & Algorithms

Course Objectives:

- Learn and practice data modelling using the entity-relationship and developing database designs.
- Understand the use of Structured Query Language (SQL) and learn SQL syntax.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply ER Modelling concepts to develop ER diagrams and implement database schema using SQL and appropriate software.	L3	Apply
CO2	Write basic SQL queries to apply constraints, insert rows, do basic operations like alter, update and delete, to use basic aggregate functions and retrieve information from databases.	L5	Evaluate
CO3	Perform normalization on tables by analyzing functional dependencies.	L2	Understand
CO4	Write SQL queries to make joins and views on table.	L2	Understand
CO5	Perform nested queries and triggers.	L2	Understand

Database Management System Laboratory (22ESET4060L)

COURSE CONTENTS

Unit-I **Introduction to databases** **2 Hrs.**

Characteristics of databases, Users of Database system, Database architecture, Data abstraction, Different data models.

Unit-II **The Entity-Relationship (ER) Model** **4 Hrs.**

Types of entities and Attributes, Keys, Relationship constraints: Cardinality and Participation.

Unit-III **Relational Database** **6 Hrs.**

Relational schema and concept of keys, Mapping ER model to Relational Model, Constraints, types of constrains, Integrity constraints, Normalization 1NF,2NF,3NF, BCNF.

Unit-IV **SQL** **8 Hrs.**

DDL & DML commands, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, Views in SQL, aggregate functions, nested sub queries, JOINTS, Triggers.

List of Laboratory Experiments (Minimum 08 Experiments) Experiments are be based on theory topics given below

1. Design an Entity-Relationship (ER) model according to the requirement of organization.
2. Convert the designed ER model to a Relational Database. Create this database in MySQL/SQL Server (any other suitable software) with required tables. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write SQL statements for inserting rows and perform ALTER, UPDATE and DELETE.
4. Perform aggregate functions.
5. Identify dependencies in a table and accordingly convert it to 1NF, 2NF, 3NF and BCNF.
6. Perform SELECT statement for retrieval of data from Database.
7. Perform various JOIN operations on Tables.
8. Create views and access data from it using SQL statements.
9. Perform queries for triggers.
10. Perform Nested queries.
11. Mini Project.

Reference Books

1. Peter Rob, Carlos Coronel, Database Systems Design, Implementation and Management, 8th Edition Cengage Learning, 2007.
2. P.S. Deshpande, SQL and PL/SQL for Oracle 11g Black Book, Dreamtech Press,

2011.

3. Mark L. Gillenson, Paulraj Ponniah, Introduction to Database Management, Wiley, 2008.

Text Books

1. A Silberschatz, H Korth, S Sudarshan, Database System and Concepts, McGraw Hill, 7th Edition, 2019.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database System, Person Publication, 7th Edition, 2017.

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-IV
Constitution of India (22MCET4070T)	

Course Objectives:

- To provide basic information about Indian constitution.
- To identify individual role and ethical responsibility towards society.
- To understand human rights and its implications.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the historical background, philosophy, and salient features of the Indian Constitution.	L2	Understand
CO2	Interpret the fundamental rights, duties, and directive principles enshrined in the Constitution for responsible citizenship.	L2	Understand
CO3	Describe the structure, roles, and functions of the legislative, executive, and judiciary branches of government.	L2	Understand
CO4	Analyze the federal structure, centre state relations, and constitutional provisions for governance and emergency powers.	L4	Analyze
CO5	Apply constitutional principles to contemporary socio-political and legal issues, fostering ethical and democratic values.	L3	Apply

Constitution of India (22MCET4070T)

COURSE CONTENTS

Unit-I **Introduction to the Constitution of India** **2 Hrs.**

The Making of the Constitution and Salient features of the Constitution. Preamble to the Indian Constitution, Fundamental Rights & its limitations.

Unit-II **Directive Principles of State Policy** **3 Hrs.**

Relevance of Directive Principles, State Policy Fundamental Duties. Union Executives-President, Prime Minister, Parliament, Supreme Court of India.

Unit-III **State Executives** **3 Hrs.**

Governor, Chief Minister, State Legislature High Court of State. Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th & 91st Amendments.

Unit-IV **Special Provisions** **3 Hrs.**

For SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions. Human Rights: Meaning and Definitions, Legislation Specific Themes in Human Rights, Working of National Human Rights Commission in India Powers and functions of Municipalities, Panchyats and Co-Operative Societies.

Unit-V **Scope & Aims of Engineering Ethics** **3 Hrs.**

Responsibility of Engineers Impediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering.

Reference Books

1. M.V. Pylee, An Introduction to Constitution of India, Vikas Publishing, 2002.
2. M. Govindarajan, S. Natarajan, V. S. Senthilkumar, Engineering Ethics, Prentice Hall of India Pvt. Ltd. New Delhi, 2004.
3. Brij Kishore Sharma, Introduction to the Constitution of India, PHI New Delhi, 2011.
4. Latest Publications of Indian Institute of Human Rights, New Delhi.

Text Books

1. Durga Das Basu: Introduction to the Constitution on India, (Students Edn.) Prentice Hall EEE, 19th / 20th Edition, 2001.
2. Charles E. Haries, Michael S Pritchard and Michael J. Robins, Engineering Ethics, Thompson Asia, 2003-08-05.

Website Resources

1. www.nptel.ac.in
2. www.hnlu.ac.in
3. www.nspe.org
4. www.preservearticles.com

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-IV
Semester Project- II (22PJET4080L)	

Course Objectives:

- Students are expected to design, simulate/implement a project based on the knowledge acquired from current semester subjects.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Analyze a survey of several available literatures in the preferred field of study.	L4	Analyze
CO2	Describe various/alternate approaches to complete a project.	L2	Understand
CO3	Apply a collaborative project environment by interacting and dividing project work among team members.	L3	Apply
CO4	Use technical communication skills to present project work in the form of a technical report/paper.	L3	Apply
CO5	Apply teamwork and project management skills to plan, execute, and manage the research study.	L3	Apply

Semester Project:

The purpose of introducing semester project at second year level is to provide exposure to students with a variety of projects based on the knowledge acquired from the semester subjects. This activity is supposed to enrich their academic experience and bring enough maturity in student while selecting the project. Students should take this as an opportunity to develop skills in implementation, presentation and discussion of technical ideas/topics. Therefore, proper attention shall be paid to the content of semester project report which is being submitted in partial fulfilment of the requirements of the Second Year and it is imperative that a standard format be prescribed for the report.

Each student shall work on project approved by departmental committee approved by the Head of Department, a group of 03 to 05 students (max allowed: 5 students in extraordinary cases, subject to the approval of the department committee and the Head of the department) shall be allotted for each Semester Project. Each group shall submit at least 3 topics for the Semester Project. The departmental committee shall finalize one topic for every group. Semester Project Title or Theme should be based on knowledge acquired during semester.

The project work shall involve sufficient work so that students get acquainted with different aspects of knowledge acquired from semester subjects.

Student is expected to:

- Select appropriate project title based on acquired knowledge from current semester subjects.
- Maintain Log Book of weekly work done (please see attached log book format Table 1).
- Report weekly to the project guide along with log book.

Table 1: Log Book Format

Sr. No	Week (Start Date: End Date)	Work Done	Sign of Guide	Sign of Coordinator
1				
2				

Assessment Criteria:

- At the end of the semester, after confirmation by the project guide, each project group will submit project completion report in prescribed format for assessment to the departmental committee (including project guide).
- Assessment of the project (at the end of the semester) will be done by the departmental committee (including project guide).

Prescribed project report guidelines:

Size of report shall be of minimum 25 pages. Project Report should include appropriate content for:

- Introduction
- Literature Survey
- Related Theory
- Implementation details
- Project Outcomes
- Conclusion
- References

Assessment criteria for the departmental committee (including project guide) for Continuous Assessment:

Guide will monitor weekly progress and marks allocation will be as per Table 2.

Table 2: Continuous Assessment Sheet

Sr No	Exam Seat No	Name of Student	Student Attendance	Log Book Maintain	Literature Review	Depth of Understanding	Report	Total
			5	5	5	5	5	25

Assessment criteria for the departmental committee (including project guide) for End Semester Exam:

Departmental committee (including project guide) will evaluate project as per Table 3.

Each group shall present/publish a paper based on the semester project in reputed/peer reviewed Conference/Journal/Techfest/Magazine/ before the end of the semester.

Table 3: Evaluation Sheet

Sr No	Exam Seat No	Name of Student	Project Selection	Design/ Simulation/ Logic	PCB/ hardware/ programming	Result Verification	Presentation	Total
			5	5	5	5	5	25

Program: Electronics and Telecommunication Engineering	S.Y.B. Tech
	Sem-IV
Employability Skill Development Program - I (22HMET4090L)	

Pre-requisite:

- Basic Mathematics
- Basic knowledge of C programming

Course Objectives:

- To enhance the problem-solving skills.
- To improve the basic mathematical skills for solving real life examples.
- Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems.
- Demonstrate an understanding of computer programming language concepts.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the basic concepts of Quantitative Ability, including profit, loss, time, work, and geometry.	L2	Understand
CO2	Demonstrate the concepts of Quantitative Ability for problem solving.	L3	Apply
CO3	Demonstrate the concept of Variables and Functions through examples	L3	Apply
CO4	Demonstrate the concept of Multithreading and String Handling.	L3	Apply
CO5	Explain the fundamentals of Object-Oriented	L2	Understand
CO6	Describe the concepts of Distributed Database.	L2	Understand

Employability Skill Development Program - I (22HMET4090L)

COURSE CONTENTS

Unit-I **Aptitude** **6 Hrs**

Quantitative Aptitude: Algebra, Profit and Loss, Average & Allegation / Mixture, Time and Work, Geometry Mensuration, Numbers, Percentage, Permutation and Combination, Probability, Ratios & Proportion, Time and Distance. Reasoning: Analytical, Puzzles, Blood relationship, Data Interpretation, Data sufficiency.

Unit-II **Fundamental of Programming** **4 Hrs**

Variables: Local variables, Global variables, global keyword, Rules of Identities Functions : Introduction, Prototype, Classification of functions, No arguments and No return values, With arguments and With return values No arguments and With return values : With arguments and No return values, Recursion, Argument type functions, Default arguments functions, Required arguments functions, Keyword arguments functions, Variable arguments function Operators : Arithmetic Operators, Relational operators, Logical operators, Bitwise operators, Shift operators.

Unit-III **Statements** **5 Hrs**

Control Statements : Conditional Control Statements, if, if-else, if-elif-else, nested-if, Loop Control Statements, While, For Branching Statements: Break, Continue, pass, return, exit Exception Handling: Introduction, The need of exception handling, Getting exceptions, Default exception handler, Handling exception, Try, Except Try with multiple except blocks: Handling exceptions using Exception class, Finally, block, Releasing resources using Finally block, Raise, Creating a user exception class, Raise exception manually, Exceptions based application

Unit-IV **Multithreading** **5 Hrs**

Multithreading: Introduction, Multitasking, Multitasking v/s Multithreading, threading module, Thread class introduction, creating thread, the life cycle of a thread, Single-threaded application, multi-threaded application, Sleep () method. Sleep () v/s run (), Join () v/s Sleep (), Multiple custom threads creation, the execution time of single-threaded application, The execution time of multi- threaded application, Synchronization of threads.

Inner classes: Basic syntax of inner class, Advantages of Inner classes, Access class level members of inner classes, Access object level members of inner classes, Local inner classes, Complex inner classes, Accessing data of inner classes.

Regular expressions: re module, Match(), Search(), find() etc, and actual projects web scrapping Mail extraction: Date extraction, Mobile number extraction, Vehicle number

extraction, zoom chat analysis Expressions using operators and symbols: Split string into characters, Split string into words, Lambda expressions String handling using regex: Introduction to Strings, Indexing and Slicing, Special operators in String handling, Old style String formatting, String library methods, Quotes and Escape characters in a String representation, String Immutability, Logical programs using Strings.

Unit-V Object Oriented Programming 6 Hrs

Object Oriented Programming: Introduction to OOPs, Classes, Objects, Structure to OOP application, Contexts of OOP application, Class level members, Object level members, self-variable, Constructor and Initialization of object.

Access modifiers: Private, Protected, Public, Program codes. Encapsulation Rules, Implementation, Abstraction, Polymorphism Inheritance Introduction, Types of Inheritance, Single inheritance, multi-Level inheritance, Method overriding, Object initialization using constructor, Multiple inheritances, Hierarchical inheritance, Method overriding in multi-level inheritance

Reference Books

1. Dr. R S Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publication.
2. M. G. Venkateshmurthy, Programming Techniques through C, Pearson Publication.
3. Behrouz Forouzan, A Computer Science Structure Programming Approaches using C, Cengage Learning.
4. Yashwant Kanetkar, Let Us C, BPB Publication.