JSPM's
RAJARSHI SHAHU COLLEGE OF ENGINEERING
TATHAWADE, PUNE-33
(An Autonomous Institute Affiliated to Savitribai Phule Pune University,Pune)

Department of Electronics and Telecommunication Engineering

Syllabus Structure

(2023 Pattern)

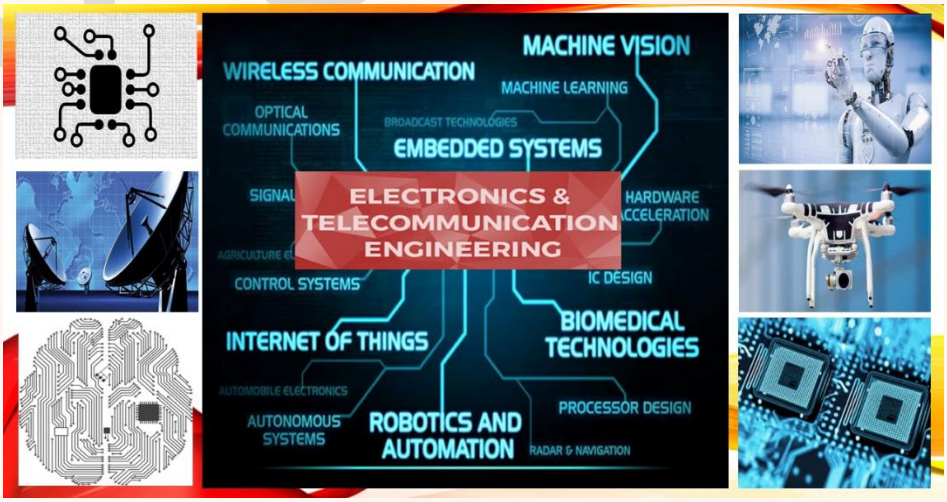
Department of Electronics and Telecommunication Engineering

Vision

"To create an educational environment to meet the challenges of modern Electronics and Telecommunication engineering industry through state of art technical knowledge and innovative approach".

Mission

- To entrust the students with fundamentals of Electronics and Telecommunication Engineering for successful carrier
- To enable students to pursue higher education, research and promote Entrepreneurship
- To serve the nation through techno-social development.



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Highlights of the Syllabus

Curriculum of Electronics and Telecommunication Engineering course is designed in consultation with

Academic Experts

Industry/Corporate Experts

Distinguished Alumni

The salient features of curriculum designed in association with **KPIT, Nayan Electronics.**

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Department of Electronics and Telecommunication Engineering

Program Outcomes (POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4).

3. Design/development of solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5).

4. Conduct investigations of complex problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

5. Modern tool usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).

6. The engineer and The world: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

7. Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9).

8. Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

9. Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

10.Project management and finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

11.Life-long learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8).

Department of Electronics and Telecommunication Engineering

Program Specific Outcomes (PSOs)

Upon successful completion of UG course in Information Technology, the students will attain following Program Specific Outcomes:

1. Graduate will demonstrate the ability to apply knowledge of Electronics and Telecommunication to identify, formulate and solve Engineering problems useful to society.
2. Graduate will demonstrate an ability to design, implement and analyze various functional elements of Electronics and Telecommunication domain, interpret data and work with multidisciplinary approach.
3. Graduate will demonstrate the analytical and managerial skills with a virtue of continued learning; carry out the professional and entrepreneurial responsibilities in Electronics and Telecommunication Engineering field considering environmental issues

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S. Y. B. Tech (Electronics & Telecommunication Engineering)
(2023 Pattern) Semester -III

Course	Course code	Course Title	Teaching Scheme				Credit	Examination Scheme				Total	Ownership
			L	T	P	Hr	C	ISE	MSE	ESE	TW		
BSC	ES2204T	Engineering Mathematics-III	3	1	-	4	4	20	30	50	50	150	Mathematics
PCC	EC2201T	Electronic Devices & Circuits	3	-	-	3	3	20	30	50	-	100	E&TC
PCC	EC2202T	Digital System Design	3	-	-	3	3	20	30	50	-	100	E&TC
PCC	EC2203T	Electrical Networks & Machines	2	-	-	2	2	20	30	50	-	100	E&TC
PCC	EC2204T	Advanced Data structures and Algorithms	3	-	-	3	3	20	30	50	-	100	E&TC
HSSM	HS2205T	Economics	2	-	-	2	2	20	30	50	-	100	Humanities
PCC	EC2201L	Electronic Devices & Circuits Lab	-	-	2	2	1	ISCE: 30		20	-	50	E&TC
PCC	EC2202L	Digital System Design Lab	-	-	2	2	1	ISCE: 30		20	-	50	E&TC
PCC	EC2204L	Advanced Data structures and Algorithms Lab	-	-	2	2	1	ISCE: 30		20	-	50	E&TC
CEP	EC2205L	Engineering Design & Innovation	-	-	4	4	2	ISCE: 60		40	-	100	E&TC
	Total		**16**	**1**	**10**	**27**	**22**					**900**	

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S. Y. B. Tech (Electronics & Telecommunication Engineering)
(2023 Pattern) Semester -IV

Course	Course code	Course Title	Teaching Scheme				Credit	Examination Scheme			Total	Ownership
			L	T	P	Hr	C	ISE	MSE	ESE		
PCC	EC2206T	Communication Systems	2	-	-	2	2	20	30	50	100	E&TC
PCC	EC2207T	Microcontrollers	3	-	-	3	3	20	30	50	100	E&TC
PCC	EC2208T	Signals and Systems	3	-	-	3	3	20	30	50	100	E&TC
MDM	ECM2201T	Multidisciplinary Minor-I	3	-	-	3	3	20	30	50	100	Other department
ESC	ES2206T	Environmental Science & Engineering	2	-	-	2	2	20	30	50	100	Humanities
PCC	EC2209T	Innovation and Entrepreneurship	2	-	-	2	2	20	30	50	100	E&TC
HSSM	HS2203T	Universal Human Values and Ethics	2	-	-	2	2	20	30	50	100	Humanities
PCC	EC2206L	Communication System Lab	-	-	2	2	1	ISCE: 30		20	50	E&TC
PCC	EC2207L	Microcontrollers Lab	-	-	2	2	1	ISCE: 30		20	50	E&TC
PCC	EC2210L	Introduction to Python and Data Science	-	-	4	4	2	ISCE: 60		40	100	E&TC
CC	EC2211L	Co-curricular Course-II	-	-	2	2	1	ISCE: 30		20	50	E&TC
	Total		**17**	**-**	**10**	**27**	**22**				**950**	

Notes:

For Theory courses: There shall be MSE, ISE and ESE. The ESE is a separate head of passing.

For Lab courses: There shall be continuous assessment (ISCE consists of ISE and MSE). The ESE is a separate head of passing.

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List of Exit Courses after completion of Semester III and IV

1. Exit option is available for students those who have earned the total 88 credits at the End of fourth Semester.
2. Student who wants to avail the exit option after second year have to earn additional 8 credits from the list of courses shown below.
3. These courses student have to complete within summer vacation after 2nd Year.
4. After fulfilment as mentioned in 1 to 3 above, Students can earn **Diploma in E&TC Engineering** and same will be issued by the Institute.

Sr. No.	Course code	Name	Credits	
1.	EX-EC2201	Digital Communication and Networking	2	Two Years UG Diploma in E&TC Engineering
2.	EX-EC2202	Electronics Servicing & Maintenance	2	
3.	EX-EC2203	An Introduction to Information Theory	2	
4.	EX-EC2204	Advanced Microcontroller	2	
5.	EX-EC2205	Introduction to semiconductor devices	2	
6.	EX-EC2206	Introduction to Adaptive Signal Processing	2	

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SEM-III

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -III
[ES2204T]: Engineering Mathematics-III

Teaching Scheme:	Credit	Examination Scheme:
TH: - 3 Hours/Week TUT: -1 Hours/Week	TH:3 TUT:1	In Sem. Evaluation :20 Marks Mid Sem. Exam :30 Marks End Sem. Exam :50 Marks.

Course Prerequisites: Differential & Integral Calculus, Taylor series, Differential equations of first order and first degree, Algebra of Complex numbers, Fourier series, Vector algebra.

Course Objective:
To familiarize the students with concepts and techniques in Ordinary differential equations, Laplace Transform, Fourier Transform and Z-Transform, Vector Calculus and functions of a Complex variable. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.

Course Outcome:
After successful completion of the course, students will able to:
CO1: Solve higher order linear differential equation using appropriate techniques for modelling and analysing electrical circuits and control systems.
CO2: Analyze Complex functions, conformal mappings, contour integration applicable to electrostatics, digital filters, signal and image processing.
CO3: Apply Integral transforms such as Laplace transform, Fourier transform and Z-Transform to solve problems related to continuous & discrete systems, signal & image processing and communication systems.
CO4: Evaluate the important concepts associated with scalar fields and vector fields such as gradient, directional derivative, divergence, curl and evaluate line, surface, and volume integrals and as appliable to electro-magnetic fields and wave theory.

Course Contents

UNIT-I	Linear Differential Equations (LDE) and Applications	07Hours
LDE of n^{th} order with constant coefficients,Complementary Function, Particular Integral,General method, Short methods, Method of variation of parameters, Cauchy's and Legendre's DE, Simultaneous and Symmetric simultaneous DE. Modeling of Electrical circuits.		
UNIT-II	**Complex Variables**	**07 Hours**
Functions of a Complex variable, Analytic functions, Cauchy-Riemann equations, Conformal mapping, Bilinear transformation, Cauchy's integral theorem, Cauchy's integral formula, Laurent's series and Residue theorem.		
UNIT-III	**Laplace Transform (LT)**	**07Hours**

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Definition of LT and Inverse LT, Properties & theorems, LT of some special functions viz. Periodic, Unit Step, Unit Impulse. Applications of LT for solving LDE.		
UNIT-IV	**Fourier Transform and Z-Transform**	**07 Hours**
Fourier Transform (FT): Complex exponential form of Fourier series, Fourier integral theorem, Fourier Sine & Cosine integrals, Fourier transform, Fourier Sine & Cosine transforms and their inverses. Z – Transform (ZT): Definition of ZT and Inverse ZT, Standard Properties, ZT of standard sequences and their inverses. Solution of difference equations.		
UNIT-V	**Vector Differential Calculus**	**07Hours**
Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.		
UNIT-VI	**Vector Integral Calculus and Applications**	**07 Hours**
Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problems in Electro-magnetic fields.		

Lab Contents

Guidelines for Assessment

Guidelines for Tutorial and Term Work:

- **Tutorial shall be engaged in batches (batch size of 22 students maximum) per division.**
- **Term work assessment shall be based on continuous assessment of six assignments (one pereach unit).**

Text Books:

T1 Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).
T2 Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).

Reference Books:

R1. Advanced Engineering Mathematics, 10e, by Erwin Kreyszig (Wiley India).
R2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
R3. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Cengage Learning).
R4. Differential Equations, 3e by S. L. Ross (Wiley India).
R5. Complex Variables and Applications, 8e, by J. W. Brown and R. V. Churchill (McGraw-Hill Inc.)
R6. Schaum's Outline of Complex Variables by Murray R. Spiegel, Seymour Lipschutz (McGraw-Hill Education)

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -III
[EC2201T]: Electronic Devices & Circuits

Teaching Scheme:	Credit	Examination Scheme:
TH: - 3 Hours/Week	TH:3	In Sem. Evaluation:20 Marks Mid Sem. Exam:30 Marks End Sem. Exam:50 Marks

Course Prerequisites: Basic electronics components such as transistor, op-amp and concept of basic circuit laws like KVL and KCL.

Course Objective:
This course emphasizes on effective knowledge of semiconductor devices – BJT, SCR, TRIAC MOSFET, IGBT and Op-Amp in the field of Electronics and telecommunication Engineering. It also gives insights on applications such as amplifiers, A-D and D-A converter and op-amp based circuits.

Course Outcome:
After successful completion of the course, students will able to:
CO1: Compare the different types of electronic devices and Analog circuits.
CO2: Explain fundamental concepts of electronic devices and Analog circuits.
CO3: Analyze the performance of different analog circuits.
CO4: Design different analog circuits using electronic devices.

Course Contents

UNIT-I	Electronic Devices	07 Hours

Construction, characteristics, ratings and applications of SCR, TRIAC, MOSFET, IGBT. Series and parallel operations of SCR's. MOSFET: Biasing and amplifier. Comparison of SCR, TRIAC, BJT, MOSFET, IGBT.

UNIT-II	Amplifiers	07 Hours

BJT small signal model – Analysis of CE amplifier, comparison of CE, CB and CC. AC coupling, Concept of frequency response. Feedback Amplifiers: - Feedback Concept, Introduction to multistage amplifier, Classification of amplifiers based on feedback topology, (Voltage, Current, Trans-conductance and Trans-resistance amplifiers), Effect of negative feedback on various performance parameters of an amplifier, Analysis of voltage series feedback amplifier, Comparison of feedback topologies.

UNIT-III	Power Amplifier	06 Hours

Classes of power amplifiers – Class A, Class B, Class AB, Class C and Class D amplifiers, Comparison of power amplifiers, Distortions in amplifiers, concept of Total Harmonic Distortion (THD), IC based power amplifier (LM380), Heat sink concept

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UNIT-IV	Op-Amp and its applications	07 Hours
Introduction of Op-amp, Internal circuit of differential amplifier, current mirror, Applications of Op-amp: Differential amplifier, Instrumentation amplifier, Precision Rectifiers, Schmitt trigger, active filters.Oscillator introduction, Condition for oscillations, phase shift – Wien Bridge, Hartley, Colpitts and Crystal oscillators using Op-amp. Signal Generators: Square wave generator, PWM generator.		
UNIT-V	**ADC and DAC**	**06 Hours**
Introduction of ADC and DAC, Need of ADC and DAC, Types of ADC, characteristics, specifications, Advantages and Disadvantages of ADC's, Detailed study of IC 0808/0809.Types of DAC, characteristics, specifications, advantages and disadvantages of each type of DAC, IC based DAC.		
UNIT-VI	**Voltage Regulators**	**06 Hours**
Introduction, Block diagram of power supply, Types of regulator, Linear regulators: Discrete component based regulator, IC based regulator, Linear (78XX, 79XX, LM317, LM337) specifications and design of regulator circuits, performance parameters. Case study: Design of variable voltage power supply.		

Text Books:

T1 T1.Millman Halkias, "Integrated Electronics-Analog and Digital Circuits and Systems", Tata McGraw Hill, 2000.

T2 Donald Neaman, "Electronic Circuit Analysis and Design",3rd Edition, Tata McGraw Hill.

T3 Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson Education second and latest edition.

T4 S. Salivahanan & Bhaaskaran, "Linear Integrated Circuits", 1st Edition, Tata McGraw Hill.

Reference Books:

R1. David A.Bell, "Electronic Devices and Circuits",5th Edition, Oxford press.

R2. R. L. Boylstad, L. Nashlesky, "Electronic Devices and circuits Theory", 9th Edition, Prentice Hall of India, 2006.

R3. D.Roy Choudhary, Shail Jain "Linear Integrated Circuits", New Age International.

R4. Soclof, "Design and Applications of Analog Integrated Circuits", PHI.

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -III
[EC2202T]: Digital System Design

Teaching Scheme:	Credit	Examination Scheme:
TH: - 03Hours/Week	TH:03	In Sem. Evaluation:20 Marks Mid Sem. Exam:30 Marks End Sem. Exam:50 Marks

Course Prerequisites: Logic gates and Boolean algebra, logical equation reduction technique, K-MAP.

Course Objective:
The course is served to acquaint the students with the fundamental principles of digital logic and various digital devices used to implement logical operations on variables. The course contents lay the foundation for further studies in VLSI design. HDL and related design approach will get explore to students with the knowledge of combinational and sequential circuits designing. The last unit is to explore PLD architectures with advanced features.

Course Outcome:

After successful completion of the course, students will able to:
CO1: List functionalities of basic logic elements in digital domain.
CO2: Identify suitable logic elements for given problem statement.
CO3: Develop combinational and sequential digital circuit.
CO4: Analyze performance of designed circuit with variations in design elements and inputs.

Course Contents

UNIT-I	Combinational Logic Design-I	07 Hours

Design flow of digital system. Digital system representation: problem statement, functional table, logical equation. Half and Full Adders, Subtractors, and Parallel Adders, 1bit, 2-bit Compactors, 4-bit, 8-bit comparator using IC 7485. Binary addition and subtraction, Half and Full Adders, Subtractors, Parallel Adders, BCD Adder using IC 7483.

UNIT-II	Combinational Logic Design-II	07 Hours

Encoder, Decoder, Code converters: Binary to Gray, vice versa, BCD to seven segments, BCD to Excess-3, 4-bit ALU, Multiplexers, De-multiplexers, combinational circuit implementation using Multiplexers (using IC74153, 74151), De-multiplexers (using IC 74138).

UNIT-III	Sequential Logic Design	07 Hours

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1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flop. Use of preset and clear terminals, Excitation table for flip flops, Conversion of flip flops, Application of flip flops: Counters, Shift registers(ring counters, twisted ring counters),Serial Adder.		
UNIT-IV	**Application of flip flops**	**07 Hours**
Asynchronous counter using 7490, MOD N, NN Asynchronous (Ripple) counters, up/down counter, Synchronous counters using 74191, MOD N UPDOWN Synchronous counter using 74191, Sequence Generators, Lock out, Clock Skew, Clock jitter. Effect on synchronous designs.		
UNIT-V	**State Machines**	**06 Hours**
Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, Sequence detector. Introduction to Algorithmic state machines - Construction of ASM chart and realization for sequential circuits.		
UNIT-VI	**Programmable Logic Devices**	**07 Hours**
Programmable logic devices: Detail architecture, Study of PROM, PAL, PLA. Software design flow. Designing combinational circuits using PLDs. General Architecture, features, specifications application of FPGA and CPLD.		

Text Books:

T1 R.P. Jain, "Modern digital electronics",4thEdition, Tata McGraw Hill Publication, 2009.

T2 Douglas L. Perry, "VHDL Programming by example" 4th edition Tata McGraw-Hill.

Reference Books:

R1. Anand Kumar, "Fundamentals of digital circuits" 4th Edition, Prentice Hall of India, 2016.

R2. John F. Wakerly, "Digital Design Principles and Practices‖", 3E, Prentice Hall.

R3. M. Morris Mano, Michael D. Ciletti ,"Digital Design: With an Introduction to the Verilog HDL, VHDL and System Verilog", , 6th Edition Pearson, 2018

R4. Lizy Kurian John ,Charles H. Roth ,"Digital System Design Using VHDL "2012.

NPTEL Video Links

Unit 1:

https://www.youtube.com/watch?v=CeD2L6KbtVM&list=PL803563859BF7ED8C

https://www.youtube.com/watch?v=sUutDs7FFeA&list=PL803563859BF7ED8C&index=3

https://www.youtube.com/watch?v=XCiLHOZsQl8&list=PL803563859BF7ED8C&index=4

https://www.youtube.com/watch?v=ygm25sqqepg&list=PL803563859BF7ED8C&index=7

https://www.youtube.com/watch?v=ygm25sqqepg&list=PL803563859BF7ED8C&index=7

https://www.youtube.com/watch?v=kgL5UaSVuro&list=PL803563859BF7ED8C&index=9

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Unit 2:
https://youtu.be/5-PI4T25OXI

Unit 3:
https://youtu.be/2ecMG_OciLo
https://youtu.be/4CRPlaBnfV0

Unit 4:
https://youtu.be/PnwYW3RWARw
https://youtu.be/Iecj9xmIfXM

Unit 5:
https://youtu.be/FZAHhQ1v7B0
https://youtu.be/O3If0Nr9to0

Unit 6:
https://youtu.be/KmrRZU3Wqp0
https://youtu.be/esY4E5shqU4

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S. Y. B. Tech (E&TC Engineering)
Academic Year- 2024-2025 Semester-III
[EC2203T]: Electrical Networks and Machines

Teaching Scheme:	Credit	Examination Scheme:
TH: - 2 Hours/Week	TH:2	In Sem. Evaluation :20 Marks Mid Sem. Exam :30 Marks End Sem. Exam :50 Marks

Course Prerequisites: Basic Electronics Engineering

Course Objective: The course aims to solve AC and DC networks with network simplification techniques. It is also focus on characteristics, features and applications areas of various types of electric motors and generators

Course Outcome:
After successful completion of the course, students will able to:
CO1: Explain the fundamental concept of different Theorem circuits and Machines
CO2: Solve the different Electrical Networks
CO3: Analyze the performance parameters of Networks and Machines

Course Contents

UNIT-I	Network : AC and DC Analysis	08 Hours

AC and DC analysis: Mesh, Super mesh, Node and Super Node analysis. Source transformation and source shifting. Network Theorems: Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems.

UNIT-II	Two Port Network Parameters and Functions	07 Hours

Terminal characteristics of network: Z, Y, h, ABCD Parameters; Reciprocity and Symmetry conditions, Applications of the parameters. Standard Functions of two port network using Laplace Transform.

UNIT-III	Graph Theory and Transient Analysis	07 Hours

Network graph, tree, co-tree and loops. Incidence matrix, tie-set and cut-set matrix. Initial conditions, source free RL and RC Circuits, properties of exponential response, Driven RL and RC circuits, Natural and forced response of RL and RC circuits. Transient analysis of series RLC circuit.

UNIT-IV	AC and DC Machines	08 Hours

Construction, working principal of DC generator, its types and EMF equation. Working principal of DC Motors, types of DC motor, Characteristics of DC shunt and series motors, Single phase induction motor: Construction, working principle, types and applications, Three phase Induction motors: construction, working principle, and types, slip and its effect on rotor parameters, Stepper motor:

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Types, construction, working principle, control circuit, different modes of operation. Construction, working principle of Universal motors and Servo motors.
Text Books: T1 Ravish Kumar Sing, Network Analysis and synthesis, , Tata McGraw Hill publication July 2017. T2 D Roy Choudhury, Networks and Systems, New Age International Publishers T3 B. L. Thereja, "Electrical Technology Volume 1 & 2", S Chand Publication, Fourth Edition. T4 Abhijit Chakrabarti & SudiptaDebnath, "Electrical Machines",TataMcGraw-Hill Publication
Reference Books: R1. John D. Ryder, Network Lines and Fields by, PHI. R2. M. E. Van Valkenburg, Network Analysis, PHI / Pearson Education, 3rd Edition. Reprint 2002. R3. Franklin F. Kuo, Network analysis and Synthesis, Wiley International Edition. R4. B. Somanahan Nair and S.R. Deepa, "Network analysis and Synthesis "Elsevier, 2012. R5. A.E. Fitzgerald, Charles Kingsley & Jr. Stephen D. Umans, "Electrical Machinery", Tata R6. McGraw-Hill Publication 6th Edition. R7. I. J Nazareth & D.P Kothari, "Electrical Machines", Tata McGraw-Hill Publication 4th Edition. R8. Ned Mohan, "Electric Machines and Drives": A first course, Wiley.

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -III
[EC2204T]: Advanced Data Structures and Algorithms

Teaching Scheme:	Credit	Examination Scheme:
TH: - 03 hours/Week	TH:03	In Sem. Evaluation :20 Marks Mid Sem. Exam:30 Marks End Sem. Exam:50 Marks

Course Prerequisites: Introduction to Computer Programming, Fundamentals of Data Structure.

Course Objective:

This course will provide insights of advanced data structures and algorithms from which students will able to handle massive data by various algorithms and solve the problems using linear and non-linear data structures.

Course Outcome:

After successful completion of the course, students will able to:

CO1: Define the syntax of programming language
CO2: Describe the functionalities of various data structures.
CO3: Develop programs to perform operations on data structures for given task.
CO4: Examine the data structure programs for successful completion of operation.

Course Contents

UNIT-I	Introduction to C++ and Algorithms	07 Hours

Introduction to C++: Variables, Constants, Flow of control, Functions, Arrays, Strings, Pointer, Classes, Memory management. Algorithm Specification: Introduction to the algorithm, Algorithm Design, Analyzing an algorithm, Algorithm Design Approach, Pseudo code Conventions

UNIT-II	Sorting Algorithms	07 Hours

Types of sorting-Internal and external sorting, General sort concepts order, stability, number of passes, Sorting Algorithms: Merge Sort, Quick sort, Radix sort, Bucket sort, Heap sort, Shell sort.

UNIT-III	Linked List	07 Hours

Concept of linked organization, comparison of sequential organization with linked organization, singly linked list, stack using linked list, queue using linked list, doubly linked list, circular linked list. Representation and manipulations of polynomials using linked lists.

UNIT-IV	Efficient Binary Trees	07 Hours

Binary Search Trees (BST): Basic Concepts, BST operations, Threaded Binary Tree, AVL Trees, M-way Search Trees, B-Trees, B+ Trees, Red-black Tree, Splay Tree.

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UNIT-V	Graph	07 Hours
Graph theory, traversing a graph, Topological sorting, Spanning trees, Minimum Spanning tree, Kruskal's Algorithm, Prim's Algorithm, Dijkstra's Shortest Path Algorithm, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall's Algorithm.		
UNIT-VI	**Hashing**	**07 Hours**
General Idea, Hash Function, Separate Chaining, Hash Tables without linked lists: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Hash Tables in the Standard Library, Universal Hashing, Extendible Hashing.		

Text Books:

T1 Horowitz, Sahani, Dinesh Mehata, —Fundamentals of Data Structures in C++, Galgotia Publisher, ISBN: 8175152788, 9788175152786.

T2 M Folk, B Zoellick, G. Riccardi, —File Structures, Pearson Education, ISBN:81-7758-37-5

T3 Peter Brass, —Advanced Data Structures, Cambridge University Press, ISBN: 978-1-107-43982-5

Reference Books:

R1. A. Aho, J. Hopcroft, J. Ulman, —Data Structures and Algorithms‖, Pearson Education, 1998, ISBN-0-201-43578-0.

R2. Michael J. Folk, —File Structures an Object Oriented Approach with C++, Pearson Education, ISBN: 81-7758-373-5.

R3. Sartaj Sahani, —Data Structures, Algorithms and Applications in C++, Second Edition, University Press, ISBN:81-7371522 X.

R4. G A V Pai, —Data Structures and Algorithms, The McGraw-Hill Companies, ISBN - 9780070667266.

R5. Goodrich, Tamassia, Goldwasser, —Data Structures and Algorithms in Java, Wiley Publication, ISBN: 9788126551903.

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester - III
[HS2205T]: Economics

Teaching Scheme:	Credit	Examination Scheme:
TH: - 02 Hours/Week	TH:02	In Sem. Evaluation:20 Marks Mid Sem. Exam:30 Marks End Sem. Exam:50 Marks

Course Objective:

To provide students with a foundational understanding of economics, focusing on both micro and Macro aspects. Students will learn essential concepts such as the basic economic problem, demand and supply Concepts, cost analysis, and market structures including their different features. To analyze how individual firms and economies operate, make informed decisions, and assess the Impact of different market forces.

Course Outcome:

After successful completion of the course, students will able to:

CO1: Record the core principles of economics, including the basic economic problem and the nature of firms.

CO2: Apply the laws of demand and supply to analyze changes in equilibrium and interpret real-world market situations.

CO3: Calculate and interpret various cost concepts such as fixed, variable, total, and marginal costs, and break-even using graphical and algebraic methods for decision-making.

CO4: Evaluate different market structures and their role in price and output determination under various competition scenarios.

Course Contents

UNIT-1	Basic Concept of Economics	06 Hours
Introduction to Economics, Basic Economic Problem, Circular Flow of Economics (Two Three and Four Sector Model),Nature of the Firm- Rationale, Micro and Macro Economics and their interdependence on each other, Difference between Micro and Macro Economics		
UNIT-II	**Theory of Demand and Supply Analysis**	**08 Hours**
Law of Demand: Meaning and determinants, Demand schedule, Demand curve: Movement and shift in demand , Exceptions to the law of demand;, Law of Supply: Meaning and determinants, Supply schedule, Supply curve: Movement and shift in supply, Exceptions to the law of supply		
UNIT-III	**Cost Analysis**	**08 Hours**
Concepts of Cost:- fixed cost, variable cost, total cost, average cost, marginal cost, opportunity cost, Break even analysis, Graphic Method and Algebraic method (Numerical from BEP)		

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UNIT-IV	Forms of Market and Price Determination	08 Hours
Market-Meaning and Classification, Meaning-Characteristics and Market Equilibrium -, Perfect Competition, Monopoly, Price Discrimination, Monopolistic Competition, Selling cost and excess capacity, Oligopoly market		

Text Books:

T1 Economic Analysis of Business Decision – Dr Meenakshi Duggal

T2 Introductory Microeconomics and Macroeconomics, T.R. Jain and Dr V.K. Ohri

T3 Managerial Economics – D.N. Dwivedi

Reference Books:

R1. Intermediate Microeconomics: A Modern Approach, Hal R, Varian.

R2. Principles of Macroeconomics, N. Gregory Mankiw.

R3. Jhingan, M.L. – *Microeconomic Theory* – Vrinda Publications.

R4. H. L. Ahuja (2019) Advanced Economic Theory Microeconomic Analysis – S. Chand Publication, New Delhi

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -III
[EC2201L]: Electronic Devices & Circuits Lab

Teaching Scheme: PR: -2 Hours/Week	Credit PR:1	Examination Scheme: Lab Evaluation:50 Marks

Course Prerequisites: Basic electronics components such as transistor, op-amp and concept of basic circuit laws like KVL and KCL.

Course Objective:
This course emphasizes on effective knowledge of semiconductor devices – BJT, SCR, TRIAC MOSFET, IGBT and Op-Amp in the field of Electronics and telecommunication Engineering. It also gives insights on applications such as amplifiers, A-D and D-A converter and op-amp based circuits.

Lab Outcome:
After successful completion of the lab, students will able to:
LO1: Demonstrate V-I characteristics of electronic devices.
LO2: Simulate analog circuits and verify the performance parameters.
LO3: Implement analog circuits using electronic devices
LO4: Design analog circuit

Lab Contents

Guidelines for Assessment

- Total marks assigned are 50.
- Continuous assessment will be carried out based on attendance, lab performance, and timely submission of lab file for 20 Marks, Mid semester examination 10 Marks on Viva Voce or Viva Voce + Micro project or Viva Voce + any one practical performance on the practical up to mid semester.
- Final practical examination for specific practical and oral examination will be conducted for 20 Marks.

List of Experiments

1	Plot the V-I characteristics of SCR and measure latching current, holding current.
2	Design and verify performance parameters of single stage CE amplifier.(Ri, Ro and Av)
3	Simulate frequency response of single stage BJT amplifier and find the bandwidth
4	Implement class AB power amplifier and calculate conversion efficiency. Observe crossover distortion.
5	Design and simulate LC or RC oscillator for given specifications and verify it's performance.
6	Design Schmitt Trigger for given specification and plot Hysteresis. Verify V_{LT} and V_{UT}.
7	Simulate and test precision half & full wave rectifier. Draw the waveforms at different test

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	points.
8	Implement DAC and verify the parameters
9	Design square wave generator for given specifications. Draw the waveforms at different test points.
10	Design variable voltage regulator for given specifications using LM317. Calculate load and line regulation.
List of Experiments for self study	
1	Simulate MOSFET/ CMOS Inverter
2	Simulate single stage MOSFET Amplifier in CS configuration and verify DC operating point
3	Simulate Differential amplifier
4	Simulate instrumentation amplifier
5	Simulate active filters

Text Books:

T1 MillmanHalkias, "Integrated Electronics-Analog and Digital Circuits and Systems", Tata McGrawHill, 2000.

T2 Donald Neaman, "Electronic Circuit Analysis and Design",3rdEdition, Tata McGraw Hill. T3.

T3 Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson Education second and latest edition.

T4 S. Salivahanan &Bhaaskaran, "Linear Integrated Circuits", 1st Edition, Tata McGrawHill.

Reference Books:

R1. David A.Bell,"ElectronicDevicesandCircuits",5thEdition, Oxford press.

R2. R. L. Boylstad, L. Nashlesky, "Electronic Devices and circuits Theory", 9thEdition, Prentice Hall of India, 2006.

R3. D.Roy Choudhary, Shail Jain "Linear Integrated Circuits", New Age International.

R4. Soclof, "Design and Applications of Analog Integrated Circuits", PHI.

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -III
[EC2202L]: Digital System Design Lab

Teaching Scheme: PR: -02 Hours/Week	Credit PR:01	Examination Scheme: LAB Evaluation:50 Marks

Course Prerequisites: Logic gates and Boolean algebra.

Course Objective:
The course is served to acquaint the students with the fundamental principles of digital logic and various digital devices used to implement logical operations on variables. The course contents lay the foundation for further studies in VLSI design. HDL and related design approach will get explore to students with the knowledge of combinational and sequential circuits designing.The last unit is to explore PLD architectures with advanced features.

Lab Outcome:

After successful completion of the lab, students will able to:
LO1: Implement combinational circuit using application specific IC.
LO2: Implement synchronous and asynchronous counters using counter IC.
LO3: Implement sequential circuits using universal shift register IC.
LO4: Implement combinational and sequential circuit using simulator (DELDSIM)

Lab Contents

Guidelines for Assessment

- Total marks assigned are 50.
- Continuous assessment will be carried out based on attendance, lab performance, and timely submission of lab file for 20 Marks, Mid semester examination 10 Marks on Viva Voce or Viva Voce + Micro project or Viva Voce + any one practical performance on the practical up to mid semester.
- Final practical examination for specific practical and oral examination will be conducted for 20 Marks.

List of Experiments (All are compulsory):

1	Implement the 1digit BCD adder using IC74LS83.
2	Implement 8:1 MUX using IC-74LS153 (Refer Data-Sheet).
3	A] Implement the given 4 variable combinational function using IC74LS151. B]Implement Full Adder and Subtractor function using IC74LS153.
4	Implement 3 bit Gray to Binary/Binary to Grayfunction using IC - 74LS138.

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5	Implement full adder /Subtractor using IC - 74LS138.
6	Implement 5 bit, 8-bit Comparator using IC-74LS85.
7	Implement MOD-N Synchronous counter using D F/F IC 74LS75 . (Using Simulator)
8	Implement MOD-N and MOD-NN Asynchronous Counter using IC 74LS90 .
9	Implement MOD-N up , down Synchronous counter using IC 74LS191.
8	Implement 4 -bit Ring Counter/ Twisted ring Counter using IC -74HC194/IC74LS95 (Use right shift/left shift).
10	Implement Pulse train generator using IC -74HC194/IC74LS95 (Use right shift/left shift).
11	Implement sequence detector using F/F IC and basic gates and draw Timing diagram.(Using Simulator)

Text Books:

T1 R.P. Jain, "Modern digital electronics",4thEdition, Tata McGraw Hill Publication, 2009.

T2 Douglas L. Perry, "VHDL Programming by example" 4th edition Tata McGraw-Hill.

Reference Books:

R1. Anand Kumar, "Fundamentals of digital circuits" 4th Edition, Prentice Hall of India, 2016.

R2. John F. Wakerly, "Digital Design Principles and Practices‖", 3E, Prentice Hall.

R3. M. Morris Mano, Michael D. Ciletti ,"Digital Design: With an Introduction to the Verilog HDL, VHDL and System Verilog", , 6th Edition Pearson, 2018

R4. Lizy Kurian John ,Charles H. Roth ,"Digital System Design Using VHDL "2012.

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -III
[EC2204L]: Advanced Data Structures and Algorithms Lab

Teaching Scheme:	Credit	Examination Scheme:
PR: - 02 hours/Week	PR:01	Lab Evaluation :50 Marks

Course Prerequisites: Students must have the awareness of fundamentals C programming like variables, data types and libraries.

Course Objective:

To understand various data structure algorithms. To develop sorting algorithms. To implement applications of linked list.To implement B-tree operations. To develop applications using graph.To apply knowledge of hashing functions.

Lab Outcome:

After successful completion of the course, students will able to:

LO1: Identify the appropriate data structure for solving problems.
LO2: Apply the knowledge of advanced data structure algorithms.
LO3: Analyze the time and space complexity of algorithms implemented during lab sessions.

Lab Contents

Guidelines for Assessment

- Total marks assigned are 50.
- Continuous assessment will be carried out based on attendance, lab performance, and timely submission of lab file for 20 Marks, Mid semester examination 10 Marks on Viva Voce or Viva Voce + Micro project or Viva Voce + any one practical performance on the practical up to mid semester.
- Final practical examination for specific practical and oral examination will be conducted for 20 Marks.

List of Experiments

Group A: Perform Any 8 experiments from group-A.

1	Write programs to demonstrate the fundamentals of C++.
2	Develop Merge and Quick sort algorithms to sort a given list of integers in ascending order.
3	Create a singly linked list with options: a. Insert (at front, at end, in the middle), b. Delete (at front, at end, in the middle), c. Display, d. Search.
4	Implement Stack and Queue using Linked Lists.
5	Demonstrate full AVL tree insert function for handling a number of insertions.

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6	Develop operations of B-Trees like create, insert, search and traversal.
7	Implement the program to find the minimum spanning tree of a graph using the Prim's or Kruskal's algorithm.
8	Apply Dijkstra's algorithm to find shortest path.
9	Implement Bellman-Ford Algorithm.
10	Write a program for hash functions and associated algorithms.
11	Apply linked list concept for polynomial addition.
Group B: Compulsory	
1	Design, develop and demonstrate case study using advanced data structure algorithms.

Text Books:

T1 Horowitz, Sahani, Dinesh Mehata, —Fundamentals of Data Structures in C++, Galgotia Publisher, ISBN: 8175152788, 9788175152786.

T2 M Folk, B Zoellick, G. Riccardi, —File Structures, Pearson Education, ISBN:81-7758-37-5

T3 Peter Brass, —Advanced Data Structures, Cambridge University Press, ISBN: 978-1-107-43982-5

Reference Books:

R1. A. Aho, J. Hopcroft, J. Ulman, —Data Structures and Algorithms‖, Pearson Education, 1998, ISBN-0-201-43578-0.

R2. Michael J. Folk, —File Structures an Object Oriented Approach with C++, Pearson Education, ISBN: 81-7758-373-5.

R3. Sartaj Sahani, —Data Structures, Algorithms and Applications in C++, Second Edition, University Press, ISBN:81-7371522 X.

R4. G A V Pai, —Data Structures and Algorithms, The McGraw-Hill Companies, ISBN - 9780070667266.

R5. Goodrich, Tamassia, Goldwasser, —Data Structures and Algorithms in Java, Wiley Publication, ISBN: 9788126551903.

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -III
[EC2205L]: Engineering Design and Innovation

Teaching Scheme: PR: -02 Hours/Week	Credit PR:02	Examination Scheme Lab Evaluation:100 Marks

Course Objective:

The objective of this course is to learn about modern tools and the building blocks for engineering creativity and innovation. The students will learn to use rapid prototyping (3D printer), microcontrollers (and its programming), sensors, actuators, possibly their interfacing with smart phones, controlling motors and mechanical components etc. Using these tools, the students will build toys such as drone, aircraft, car, boat, submarine, train, robots etc.

Course Outcome:

After successful completion of the course, students will able to:

CO1: To learn about modern tools and the building blocks for engineering creativity and innovation, such as rapid prototyping (3D printer), microcontrollers (and its programming), sensors, actuators, possibly their interfacing with smartphones, controlling motors and mechanical components etc.

CO2: To use the above tools, and build toys such as drone, aircraft, car, boat, submarine, train, robots etc.

Course Contents

UNIT-I	Introduction to market structure	06 Hours
Introduction to markets and prices; Producers, consumers, and competitive markets; Market structure and competitive strategy. Goods and financial markets, labor markets, Unemployment, Inflation, Economic growth, Technological progress, and growth.		
UNIT-II	**Electronic Tools and components**	**09 Hours**
CAD tools for electronics: PCB design (Proteus/Eagle), 3D enclosure design (Tinker cad). Microcontroller prototyping: Arduino, ESP32, Raspberry Pi (selection criteria). Use of sensors, actuators, displays, and communication modules (Bluetooth, Wi-Fi, Zigbee).		
UNIT-III	**Fundamentals of Product Design**	**06 Hours**
Design principles: reliability, usability, simplicity, cost, energy efficiency. System-level vs. component-level design. Engineering constraints: cost, weight, size, safety, sustainability		
UNIT-IV	**Project**	**21 Hours**
The students will work on a design and fabrication project combining the above mechanical, electrical and computing components. Importance of teamwork in engineering projects. Roles and responsibilities in project groups. Basics of project planning. Technical documentation & report writing. Presentation and pitching skills for innovative ideas. Students (in teams of 3–4). Identify a real-world problem. Apply design thinking methodology. Develop and test a working prototype using		

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hardware/software tools. Prepare a project report and present prototype demonstration.	
Guidelines for Assessment	
• **Lab Evaluation**	**:100 Marks**
Induvial Contribution	: 10 Marks
Team Work	: 10 Marks
Presentation	: 20 Marks
Design thinking	: 20 Marks
Prototype and Implementation	: 20 Marks
Report writing	: 20 Marks
Text Books: T1. Paul Scherz and Simon Monk, "Practical Electronics for Inventors," McGraw-Hill Education TAB, 4th Ed., 2016.	

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SEM-IV

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Academic Year – 2024-2025 Semester -IV
[EC2206T]: Communication Systems

Teaching Scheme:	Credit	Examination Scheme:
TH: - 02 Hours/Week	TH:02	In Sem. Evaluation :20 Marks Mid Sem. Exam:30 Marks End Sem. Exam:50 Marks

Course Prerequisites: Signals and Systems, Basic Electronics Engineering.

Course Objective:
This course provides an introduction to the theory, practice and methods of analog and digital modulation. Student will learn Digital baseband and Pass-band modulation techniques.

Course Outcome:
After successful completion of the course, students will able to:
CO1: Describe principles and applications of Digital communication system.
CO2: Compare Baseband modulation techniques
CO3: Analyze performance of Digital pass-band modulation techniques
CO4: Explore Spread Spectrum Techniques in Digital Communication

Course Contents

UNIT-I	Introduction to Digital Communication System.	05 Hours
Introduction to Digital Communication System, Block Diagram of Digital Communication System, Bandwidth Requirement of Digital Modulation. Comparison between Analog and Digital Communication System, Advantages and Disadvantages of Digital Communication System, Application of Digital Communication System.		
UNIT-II	**Digital Transmission of Analog Signal**	**05 Hours**
Sampling theorem, Proof of Sampling Theorem, Sampling types, Aliasing, Aperture Effect, Quantization, QuantizationTypes, PCM Generation, Commanding, Delta Modulation, ADM.		
UNIT-III	**Baseband Digital Transmissions**	**05 Hours**
Digital Multiplexing, TDM, FDM, Multiplexers and Hierarchies, Data Multiplexers, Data formats and their Spectra, Synchronization, Bit synchronization, Frame Synchronization.		
UNIT-IV	**Digital Modulation Techniques**	**05 Hours**
ASK, FSK, PSK, QPSK, QAM, MSK Generation and Detection Methods.		
UNIT-V	**Pass-band Digital Transmission**	**05 Hours**
Pass band Transmission Model, Signal Space Diagram, Generation and Detection, Error Probability		

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Derivation and Power Spectral of coherent BPSK, Optimum Filter, Matched Filter.		
UNIT-VI	**Spread Spectrum Techniques**	**05 Hours**
Need of SS signal, Model of spread spectrum digital communication system, Direct sequence spread spectrum with coherent BPSK, FHSS and its Types.		

Text Books:

T1 Louis E Frenzel, "Principles of Electronic Communication Systems", Tata McGraw Hill Publications, Third Edition.
T2 Taub Schilling, "Principles of Communication Systems", Tata McGraw Hill Fourth Edition.
T3 Simon Haykin, "Digital Communication Systems", John Wiley&Sons, Fourth Edition.
T4 B. Sklar and P.K. Ray, Digital Communication: Fundamentals and Applications, 2/e, Pearson Education, 2003.

Reference Books:

R1. Dennis Roddy &Coolen, "Electronic Communication", Tata McGraw Hill Publications.
R2. Wayne Tomasi, "Electronic Communication Systems", Fourth Edition.
R3. Carlson, "Communication Systems", McGraw-Hill, Fourth Edition.
R4. B P Lathi, Zhi Ding "Modern Analog and Digital Communication System", Oxford University Press, Fourth Edition.
R5. P Ramkrishna Rao, Digital Communication, McGraw-Hill Publication.

NPTEL video links:

https://nptel.ac.in/courses/117105143

https://nptel.ac.in/courses/108102120

https://youtu.be/WmK7wLOWI7U

Vlab: https://ssl-iitg.vlabs.ac.in/Sampling%20and%20signal%20reconstruction(Theory).html

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -IV
[EC2207T]: Microcontrollers

Teaching Scheme:	Credit	Examination Scheme:
TH: - 03 Hours/Week	TH:03	In Sem. Evaluation :20 Marks Mid Sem. Exam:30Marks End Sem. Exam:50 Marks

Course Prerequisites: Students must have the awareness of Digital Circuits, Programming Language using C, Architecture of 8051 Microcontroller.

Course Objective:

This course provides an introduction to PIC Microcontroller and their interfacing with different peripheral devices. The objective of this course is to analyze the basic concepts and programming of PIC18F458 Microcontroller.

Course Outcome:

After successful completion of the course, students will able to:

CO1: Summaries all functions of microcontrollers

CO2: Describe various aspects of microcontroller-based system such as architecture, addressing modes, instruction sets etc

CO3: Design user interface module for Microcontroller based system.

CO4: Analyze the performance of developed microcontroller based system for real time application.

Course Contents

UNIT-I	Introduction to Microcontroller	07 Hours

Microprocessor and Microcontroller comparison, advantages and applications of Harvard and Von Neumann architecture, RISC and CISC comparison. Definition of embedded system and its characteristics, Role of microcontroller in embedded System. Limitation of 8 bit microcontrollers, I2C, SPI protocols, Software and hardware tools for development of microcontroller based system such as assembler, compiler, IDE, Emulators, debugger.

UNIT-II	PIC Microcontrollers Architecture	06 Hours

Overview of the PIC18 Family, Architectural block diagram,PIC18 Configuration Registers. WREG Register, File Register, access Bank. Status Register, Program Counter,Memory organization, I/O Ports,Power managed modes, Reset configuration.

UNIT-III	PIC 18 Instruction set and Programming	06 Hours

Addressing modes, Assembler directive- ORG, DB, EQU, END, LIST, SET, Instruction Sets: Data Transfer instructions, Logical&Arithmetic Instructions, Branching, call, Time delay, Bank switching, Subroutines, Bit related instructions. PIC programming, I/O Port Programming.

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UNIT-IV	PIC18 Timer, Serial Port and Interrupt	07 Hours
Programming Timers 0, 1, 2 and 3, Counter Programming, Basics of Serial Communication, PIC18 connection to RS232, PIC18 Serial Port Programming, PIC18 Interrupts, Interrupt Programming for Timer, External Hardware, Serial communication.		
UNIT-V	**Special Hardware features and Programming**	**07 Hours**
Timers required for CCP Applications, CCP module in PIC 18 microcontroller, Applications of CCP mode Generation of waveform using Compare mode of CCP module. Period measurement of a unknown signal using Capture mode in CCP module, Speed control of DC motor using PWM mode of CCP module.		
UNIT-VI	**Interfacing with real world**	**07 Hours**
LCD Interfacing, Keyboard Interfacing, ADC Characteristics, ADC Programming in the PIC18, DAC Interfacing, Interfacing of Temperature Sensor,Ultrasonic sensor, PIR sensor , Stepper Motor Interfacing, DC Motor interfacing and PWM, Relays		

Text Books:

T1 Mohmad-ali-mazidi, Roline D. Mckinlay,"PIC microcontroller and Embedded Systems", Pearson.

T2 Mohmad John B. Peatman, "Design with PIC Micro-controllers", Pearson Education Asia, Low Price Edition, 2005 d..

Reference Books:

R1. Han-Way Huang, " PIC microcontroller: an introduction to softrware and hardware interfacing", Cengage Learning.

R2. Micheal Predko, " Progamming and Customizing the PIC Microcontroller", McGraw-Hill publications.

R3. MICROCHIP PIC 18 Data Sheet: www.microchip.com.

NPTEL video links:

UNIT 1:

Embedded System Introduction :https://nptel.ac.in/courses/108102045
RISC and CISC Architecture :https://archive.nptel.ac.in/courses/106/105/106105163/

UNIT 2:

Introduction to PIC microcontrollers, Architecture and pipelining, program memory considerations :https://nptel.ac.in/courses/108102045

UNIT 3:

Addressing modes, CPU registers, Instruction set, simple operations:https://nptel.ac.in/courses/108102045

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -IV
[EC2208T]: Signals and Systems

Teaching Scheme:	Credit	Examination Scheme:
TH: - 3 Hours/Week	TH:3	In Sem. Evaluation :20 Marks Mid Sem. Exam:30 Marks End Sem. Exam:50 Marks

Course Prerequisites: Engineering Mathematics

Course Objective:
This course helps to understand the basic signals, different signal operations, classification of signals and systems in different categories. Students will find the response of the system by using convolution. Frequency domain analysis of signals will be done. Students will learn the basic concepts of probability and random variables.

Course Outcome:
After successful completion of the course, students will able to:
CO1: Describe CT-DT signals and systems.
CO2: Discuss Time-domain analysis of signals and systems.
CO3: Determine frequency domain analysis of signals.
CO4: Analyze signals and systems by using appropriate mathematical tools.

Course Contents

UNIT-I	Fundamentals of Signals	07 Hours

Definition of signal, Sampling of analog signals, sampling theorem, Continuous time and discrete time signal, Classification of signals as even, odd, periodic and non-periodic, deterministic and non-deterministic, energy and power, elementary signals like exponential, sine, impulse, step, ramp, rectangular, triangular, signum, sinc, operations on signals- amplitude scaling, addition, multiplication, time scaling, time shifting and time folding.

UNIT-II	Fundamentals of Systems	07 Hours

Definition of system, Input-output relation, Impulse response of an LTI system, Classification of systems based on input output relations, Classification of systems based on impulse response, computation of convolution sum, computation of convolution integral using graphical method for unit step to unit step, unit step to exponential, unit step to rectangular, exponential to exponential and rectangular to rectangular only. Properties of convolution, system interconnection.

UNIT-III	Fourier series and Fourier transform of Discrete time signals	07 Hours

Fourier series of Discrete time signals (DTFS), frequency spectrum of periodic discrete time signal, properties of DTFS. Fourier transform of Discrete time signals (DTFT), frequency spectrum of discrete

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time signals, inverse DTFT, properties of DTFT, DTFT of periodic discrete time signals, analysis of LTI discrete time system using DTFT, transfer function of LTI discrete time system in frequency domain, response of LTI discrete time system using DTFT, frequency response of LTI discrete time system.

UNIT-IV	Discrete Fourier Transform	07 Hours

Definition, Frequency domain sampling, DFT, Properties of DFT, circular convolution, linear convolution, FFT, decimation in time and decimation in frequency using Radix-2 FFT algorithm, Linear filtering using overlap add and overlap save method

UNIT-V	Correlation, Energy Spectral Density, Power spectral density	07 Hours

Introduction, Correlation and correlogram, the correlation function: conceptual basis, energy signals, power signals, Autocorrelation: Relation to signal energy and signal power, properties of autocorrelation, cross correlation: properties of cross correlation, correlation and the Fourier series, Energy Spectral Density: Definition and derivation of Energy Spectral Density, effects of systems on ESD, the ESD concept, Relation of ESD to Autocorrelation, Power spectral density: Definition and derivation of Power Spectral Density, effects of systems on PSD, the PSD concept, Relation of PSD to Autocorrelation.

UNIT-VI	Probability and Random Signals	07 Hours

Probability: Introduction, Sample Space and Events, the Notion and Axioms of Probability, Equally Likely Events, Conditional Probability, Total Probability, Independent Events. Random Variables: Introduction , Random Variables , Distribution Functions , Discrete Random Variables and Probability Mass Functions ,Continuous Random Variables and Probability Density Functions,Statistical averages, Some Special Distributions, Conditional Distributions.

Text Books:

T1 M.J. Roberts “Signals and Systems: Analysis Using Transform Methods & MATLAB 2nd Edition”, Tata McGraw Hill.

T2 A NagoorKani, “ Signals and Systems”, McGraw HillEducation

T3 Hwei P. Hsu, “Theory and Problems of Probability, Random Variables, and Random Processes”, Schaum's Outline series, McGraw- Hill.

T4 John G. Proakis, Dimitris G. Manolakis, “Digital Signal Processing: Principles, algorithms and applications”, Fourth edition, Pearson Prentice Hall.

Reference Books:

R1. Ramesh Babu and Anandnatarajan, “Signals and Systems,” FifthEdition, Scitech Publication.

R2. Simon Haykins and Barry Van Veen, “Signals and Systems”, 2nd Edition, Wiley India.

R3. Shaila D. Apte, “Signals and Systems-principles and applications”, Cambridge University press, 2016.

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -IV
[ES2206T]: Environmental Science and Engineering

Teaching Scheme:	Credit	Examination Scheme:
TH: - 02 Hours/Week	TH:02	In Sem. Evaluation :20 Marks Mid Sem. Exam:30 Marks End Sem. Exam:50 Marks

Course Objective:
To understand renewable, non-renewable energy, alternate energy, nonconventional energy resources. To understand concept of sustainable development. To understand causes and different methods for controlling air pollution. To understand importance of disaster management.

Course Outcome:
After successful completion of the course, students will able to:
CO1: To recall environmental concepts including energy resources, impact of pollution
CO2: Describe alternative energy resources, significance of sustainable development and strategies for disaster management.
CO3: Interpret the impact of energy resource, sustainable development, disaster management plan on environment on environment and human being

Course Contents

UNIT-I	Energy Resources	06 Hours

Sources of energy and their classification: Renewable and non-renewable energy sources, Use of alternate energy sources: Power alcohol and BiodieselHydrogen as a future fuel. Utilization of solar in space heating and water heating. Conversion of solar energy into electricity. Biomass energy resources. Fuel cell (H2-O2) and Polymer Electrolyte Membrane FuelCell (PEM).

UNIT-II	Introduction to Sustainable Development	06 Hours

Need and concept of sustainability. Social, environmental, and economic sustainability concept. Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges, and strategies for SDGs. Introduction to environmental impact analysis (EIA)- Historical background, Elements of EIA process. Participants in EIA process. Design of EIA. Pollution control and management; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Ecolabeling/ Ecomark scheme Environmental Audit for sustainable development. Eco labelling of Environment Friendly –Products.

UNIT-III	Air Pollution Science and Engineering	06 Hours

Composition and structure of atmosphere. Classification of air pollutants and their effects, acid rain, photochemical smog and particulates. Sources, Characteristics, and biochemical effects of some

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important air pollutants. Effects of air pollutants on man and his environment. Air quality standards and monitoring. Atmospheric sampling and analysis. Methods and equipment used to control gaseous pollutants and industrial effluents. Air quality management; Indoor air pollution.		
UNIT-IV	**Disaster Management**	**06 Hours**
Basic Concepts of Disaster Management: Introduction, necessity of studying Disaster Management (DM); Types of disasters. Vulnerability. Disaster Risk, Assessing Disaster Risk and ways of minimizing disaster risk. Disaster Risk Management (DRM) plan. Natural Hazards Risk management.		
Guidelines for Assessment		
Assessment is a continuous assessment based on submission of the assignments, timely completion, attendance and understanding.		
List of Experiments		
1	Presentation on Fuel Cell	
2	Case study on Sustainable Development	
3	Assignment on Air Pollution	
4	Case study on Disaster Management	
Text Books: T1 A Text book of Environmental Chemistry and Pollution Control – S.S.Dara		
Reference Books: R1. Environmental Pollution: Monitoring and Control-S.M. Khopkar R2. Sustainability Engineering concepts, design and case studies-Allen ,D.T and ShonnardD.R		

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester –IV
[EC2209T]: Innovation and Entrepreneurship

Teaching Scheme:	Credit	Examination Scheme:
TH: - 2 Hours/Week	TH: 2	In Sem. Evaluation: 20 Marks Mid Sem. Exam: 30 Marks End Sem. Exam:50 Marks

Course Prerequisites:

Course Objectives:

- To understand an entrepreneur through case studies of successful entrepreneurs.
- To select the appropriate Product or Service for a business and Innovate in Global Thrust Areas.
- To understand the pain areas of an entrepreneur and study site selection, market survey, production, Finance, Costing and applied management in Business.
- To understand Business model Canvas and prepare Project Report for the selected business.

Course Outcome:

After successful completion of the course, students will able to:

CO1: Understand entrepreneurship and identify product or service for the business.

CO2: Understand Innovation and Ideate in Global Thrust Areas like Agriculture and food processing,

CO3: Automation, Environment, Health care, Energy, AI & ML.

CO4: Apply the knowledge to start Business (Micro / Small Enterprise)

CO5: Apply the Registration process of an enterprise / Startup.

Course Contents

UNIT-I	To understand Entrepreneur	06 Hours
Who is an Entrepreneur? Case Studies of Successful Entrepreneurs. Business Opportunity Identification. Case study of any two products or services.		
UNIT-II	**Innovation**	**06 Hours**
What is Innovation? Innovation Principles to Ideate. Idea Generation in global Thrust areas.		
UNIT-III	**Procedure for Investment**	**07 Hours**
Planning a Micro, Small Enterprise. Whom to contact for what. Market Survey tools. Return on Investment, Pay back Period, Break Even Analysis, Basics of Costing.		
UNIT-IV	**Registration of Startup**	**07 Hours**

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Business Model Canvas. Startup potential in India. Udyam Registration on Ministry of MSME online. Startup India Registration on Startup India portal.
Text Books: T1. The Dynamics of Entrepreneurship Development and Management by Vasant Desai Himalaya Publishing House. T2. A Manual for Entrepreneurs by Dr. Dinesh Awasthi, Entrepreneurship Development Institute of India, Ahmedabad. T3. Introduction to Entrepreneurship by Dr Santosh Kumar Sahu, Bookscape Publication.
Reference Books: R1. Entrepreneurship 11th Edition by Robert Michael P.,Peters Dean A.,Shephers Sabyasachi Sinha, Publication MC Graw Hill India R2. Project Management and Entrepreneurship by Dr. Vasant Desai, Himalaya Publishing House.

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester-IV
[HS2203T]: Universal Human Values and Ethics

Teaching Scheme:	Credit	Examination Scheme:
TH: - 02 Hours/Week	TH:02	In Sem. Evaluation :20 Marks Mid Sem. Exam:30 Marks End Sem. Exam :50 Marks

Course Objective:

The objective of the course is fourfold:

1. To help students to distinguish between values and skills and understand the need, basic guidelines, content, and process of value education.
2. To help students to initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students to understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.

Course Outcome:

After successful completion of the course, students will able to:

CO1: Distinguish between skills and values through value education.

CO2: Distinguish between self and body with program to nurture body with self- regulation.

CO3: Recognize the value of harmonious relationship based on naturally accepting values in human – human relationship.

CO4: Describe harmony in society and nature.

Course Contents

UNIT-I	Introduction to value education	06 Hours
Understanding value education, self-exploration as the process for value education, happiness and prosperity, right understanding, relationship and physical facility, happiness and prosperity–current scenario, method to fulfill the basic human aspiration.		
UNIT-II	**Harmony in Human being**	**06 Hours**
Understanding human being as a coexistence of the self and body, understanding the needs of self and body, the body as an instrument of the self, understanding activities of self, understanding harmony in the self, understanding the harmony in self with body, programs to fulfill the self-regulation and health.		
UNIT-III	**Harmony in Family and society**	**06 Hours**
Harmony in family-a basic unit of human interaction, Human—human relationship, values in relationships, understanding harmony in the society and vision for universal human order.		
UNIT-IV	**Harmony in Nature**	**06 Hours**

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Understanding the harmony in society and nature, understanding the four orders of nature, realizing existence as co- existence at all levels.
Guidelines for Assessment
In semester evaluation shall be based on continuous assessment based on timely submission of assignments.
Text Books: T1 Human values and Professional Ethics by RRGaur, RSangal, GPBagaria, Excel Books, New Delhi, 2010 T2 JeevanVidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
Reference Books: R1. ManavVyavharDarshan, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,2001

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -IV
[EC2206L]: Communication Systems Lab

Teaching Scheme:	Credit	Examination Scheme:
PR: - 02 Hours/Week	PR:01	Lab Evaluation:50 Marks

Course Prerequisites: Signals and Systems, Basic Electronics Engineering.

Course Objective:
This course provides an introduction to the theory, practice and methods of analog and digital modulation. Student will learn Digital baseband and Pass-band modulation techniques.

Course Outcome:
After successful completion of the course, students will able to:
LO1: Demonstrate and verify sampling theorem.
LO2: Implement PCM & DM.
LO3: Analyze FSK, PSK schemes.
LO4: Analyze DS-SS PSK modulation and demodulation.

Lab Contents

Guidelines for Assessment

- Total marks assigned are 50.
- Continuous assessment will be carried out based on attendance, lab performance, and timely submission of lab file for 20 Marks, Mid semester examination 10 Marks on Viva Voce or Viva Voce + Micro project or Viva Voce + any one practical performance on the practical up to mid semester.
- Final practical examination for specific practical and oral examination will be conducted for 20 Marks.

List of Experiments

Perform Any 8 experiments

1	To verify of sampling theorem.
2	To perform and analyze modulation and demodulation of PCM.
3	To perform and analyze modulation and demodulation of DM.
4	To perform and analyze modulation and demodulation of ADM.
5	To demonstrate modulation and demodulation of BPSK.
6	To demonstrate modulation and demodulation of FSK.
7	To demonstrate modulation and demodulation of QPSK.
8	To study and analyze data formats
9	Simulate program to implement PCM/ DM/PAM system.

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Text Books:

T1 Louis E Frenzel, "Principles of Electronic Communication Systems", Tata McGraw Hill
a. Publications, Third Edition.

T2 Taub Schilling, "Principles of Communication Systems", Tata McGraw Hill Fourth Edition.

T3 Simon Haykin, "Digital Communication Systems", John Wiley&Sons, Fourth Edition.

T4 B. Sklar and P.K. Ray, Digital Communication: Fundamentals and Applications, 2/e, Pearson
a. Education, 2003.

Reference Books:

R2. Dennis Roddy &Coolen, "Electronic Communication", Tata McGraw Hill Publications.

R3. Wayne Tomasi, "Electronic Communication Systems", Fourth Edition.

R4. Carlson, "Communication Systems", McGraw-Hill, Fourth Edition.

R5. B P Lathi, Zhi Ding "Modern Analog and Digital Communication System", Oxford University Press, Fourth Edition.

R6. P Ramkrishna Rao, Digital Communication, McGraw-Hill Publication.

NPTEL video links:

https://nptel.ac.in/courses/117105143

https://nptel.ac.in/courses/108102120

https://youtu.be/WmK7wLOWI7U

Vlab: https://ssl-iitg.vlabs.ac.in/Sampling%20and%20signal%20reconstruction(Theory).html

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -IV
[EC2207L]: Microcontrollers Lab

Teaching Scheme:	Credit	Examination Scheme:
PR: - 02 Hours/Week	PR:01	Lab Evaluation :50 Marks

Course Prerequisites: Students must have the awareness of Digital Circuits, Programming Language using C, Architecture of 8051 Microcontroller.

Course Objective:
This course provides an introduction to PIC Microcontroller and their interfacing with different peripheral devices. The objective of this course is to analyze the basic concepts and programming of PIC18F458 Microcontroller.

Lab Outcome:
After successful completion of the lab, students will able to:
LO1: Demonstrate the interfacing of LED, LCD, Key matrix, Seven Segment Display and Sensor with PIC18 Microcontroller.
LO2: Analyze the working of ADC.
LO3: Demonstrate the working of DC Motor and Stepper Motor.
LO4: Analyze the working of Timer.

Lab Contents

Guidelines for Assessment

- Total marks assigned are 50.
- Continuous assessment will be carried out based on attendance, lab performance, and timely submission of lab file for 20 Marks, Mid semester examination 10 Marks on Viva Voce or Viva Voce + Micro project or Viva Voce + any one practical performance on the practical up to mid semester.
- Final practical examination for specific practical and oral examination will be conducted for 20 Marks.

List of Experiments

Group A: Perform Any 8 experiments.

1	Write Embedded C program to implement LED interfacing with PIC microcontroller.
2	Write Embedded C program to implement LCD interfacing with PIC microcontroller.
3	Embedded C program to implement interfacing of seven segment display with PIC microcontroller
4	Embedded C program to implement interfacing of key Matrix with PIC microcontroller .

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5	Embedded C program to implement interfacing ADC of with PIC microcontroller .
6	Write Embedded C program to implement stepper motor interfacing with PIC microcontroller .
7	Write Embedded C program to implement delay using Timers.
8	Embedded C program to implement interfacing of LM 35 Sensor .
9	Write a program to perform arithmetic operation using MPLAB .
10	Embedded C program to implement interfacing of DC Motor with PIC microcontroller.
11	Write Embedded C program to implement concept of I^2C protocol.

Text Books:

T1 Mohmad-ali-mazidi, Roline D. Mckinlay,"PIC microcontroller and Embedded Systems", Pearson.

T2 Mohmad John B. Peatman, "Design with PIC Micro-controllers", Pearson Education Asia, Low Price Edition, 2005 d..

Reference Books:

R1. Han-Way Huang, " PIC microcontroller: an introduction to softrware and hardware interfacing", Cengage Learning.

R2. Micheal Predko, " Progamming and Customizing the PIC Microcontroller", McGraw-Hill publications.

R3. MICROCHIP PIC 18 Data Sheet: www.microchip.com.

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T. Y. B. Tech (E & TC Engineering)
Academic Year – 2024-2025 Semester -IV
[EC2210L]: Introduction to Python & Data science

Teaching Scheme: PR: -4 Hours/Week	Credit PR: 02	Examination Scheme: Lab Evaluation:100 Marks

Course Prerequisites: Computer fundamentals, Programming concepts like variables, data types, functions, etc.

Course Objective: To make students understand the basics of python programming and apply the knowledge gained to solve the computational problems.

Lab Outcome:
After successful completion of the course, students will able to:
LO1: Experiment the use of built-in data structures and sequences in data slicing.
LO2: Demonstrate the high-order functions and functional programming.
LO3: Analyze statistical data using computational tools.
LO4: Apply data manipulation and visualization for making data driven inferences and decisions.

Lab Contents

Guidelines for Assessment

- Total marks assigned are 100.
- Continuous assessment will be carried out based on attendance, lab performance, and timely submission of lab file for 40 Marks, Mid semester examination 20 Marks on Viva Voce or Viva Voce + Micro project or Viva Voce + any one practical performance on the practical up to mid semester.
- Final practical examination for specific practical and oral examination will be conducted for 40 Marks.

List of Laboratory Experiments

1	Demonstrate a) Different numeric data types and b) To perform different Arithmetic Operations on numbers in Python
2	Demonstrate working with lists in Python.
3	Demonstrate working with tuples in Python.
4	Demonstrate working with dictionaries in Python.
	Demonstrate working sets in Python.
5	Demonstrate a) arrays b) array indexing such as slicing, integer array indexing and Boolean array indexing along with their basic operations in NumPy.
6	Demonstrate working of if else/for Loops in Python.
7	Compute summary statistics such as mean, median, mode, standard deviation, correlation and variance of the given different types of data.

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8	Create user-defined functions with different types of function arguments.
9	Demonstrate File manipulations- open, close, read, write, append and copy from one file to another.
10	Create Pandas Series and Data Frame from various inputs.
11	Import any CSV file to Pandas Data Frame and perform the following: (a) Visualize the first and last 10 records. (b) Get the shape, index and column details. (c) Select/Delete the records (rows)/columns based on conditions. (d) Perform ranking and sorting operations. (e) Do required statistical operations on the given columns. (f) Find the count and uniqueness of the given categorical values. (g) Rename single/multiple columns
12	Import any CSV file to Pandas Data Frame and perform the following: a) Handle missing data by detecting and dropping/ filling missing values. b) Transform data using apply () and map () method. c) Detect and filter outliers. d) Perform Vectorized String operations on Pandas Series. e) Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.
13	Demonstrate Regression analysis with residual plots on a given data set.
14	Design a mini project using Python & data science concepts.
15	Demonstrate a) Different numeric data types and b) To perform different Arithmetic Operations on numbers in Python

Text Books:

T1 Charles Severance, "Python for Everybody: Exploring Data in Python 3", 2nd Edition, Elliott Hauser, Sue Blumenberg, ISBN 9781530051120, 1530051126

T2 Allen Downey, "Think Python How to Think Like a Computer Scientist", 2ndEdition, ISBN 9781491939420, 1491939427

Reference Books:

R1. Wes McKinney—Python for Data Analysis, ISBN: 9781449319793, 1449319793. O'Reilly Media.

R2. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010

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S. Y. B. Tech (E&TC Engineering)
Academic Year – 2024-2025 Semester -IV
[EC2211L]: Co-curricular Course-II

Teaching Scheme:	Credit	Examination Scheme:
PR: - 02 Hours/Week	PR:01	Lab Evaluation:50 Marks

Course Objective:
To provide students the opportunity to better explore their interests and to groom overall personality, apart from academic ability.

Course Outcome:
Students will be able to
CO1: Broaden students' breadth of knowledge and horizons.
CO2: Stimulate out of the box thinking, self-reflection, and self-understanding to promote their individual growth.
CO3: Build solid foundation for "Whole Person Education" which will nurture and foster the holistic development

Course Contents

List of Extra curricular activities:

Leadership Work and Positions
Sports and Athletic Participation
Academic Clubs and Teams/ Professional student chapters
Artistic and Creative Pursuits
Volunteering and Community Service
Internships

Rules & Regulations:

- All the first year students should enroll in one of the Extra-Curricular Activities
- Students opting for Sports / Games / Yoga / Martial Arts / Dance can continue the same activity in the I/II/III/IV/V/VI/VII/VIII semester or can choose another activity
- Every week, any day last 2 hours are given for Cocurricular activity.
- Minimum of 50% attendance is required for these activities.
- In-charge faculty coordinator monitor the students and take the attendance.
- At the end of the year the attendance is submitted to the Attendance Committee and finally to the Exam Section.
- Students are given grades credits in the final memorandum.
-

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Guideline for grading Co/Extra-Curricular Activity

- RSCOE shall organized various competitions through its various clubs (governed by either by Student Affairs pr Department) during the semester and academic year.
- All UG students shall choose at least ONE activity/event from the group of Co-curricular and Extra-curricular activities happening on campus or off campus during the semester. The student shall take active part in the activity, take part in competitions, and earn grade points.
- On registering for a particular activity, the performance of a student shall be continuously monitored by the Faculty-in-charge.

RSCOE plans club activities into three categories.

1. Art Club
2. Technical Club
3. Sports and Games
4. SWAYAM

- Art club include various clubs related to liberal arts, music, performing arts etc.
- Technical club include chapters of professional societies like SAE,ASRAE,ISHRAE,CSI,RSI,IEEE, ISTE, IET, Department Associations, Shashwat (socio-technical club),Rotaract, ASCE,ICI etc.
- National Service Scheme (NSS) and Similar activities such as Unnat Bharat, Social Work, Blood donation etc.
- SWAYAM portal offers some self-paced courses related with YOGA such as Physical Activity (YOGA) (योग) or approved by Dean concern.
- Participation in competitions, winning prizes, representing institute on state, national and international level etc shall get weightage as mentioned in the Annexure I and rubrics for same ids designed
- All competition to which Academic credit is concerned, shall have set of guidelines and rubrics defined by the department or Student Affair or concern faculty in charges.
- Few examples of Competition/Activity and is given in Annexure II

Annexure I: Assessment Rubrics:

Table A Rubrics for Assessment for Clubs Sports and cultural events(@UG Level)

		Clubs/Activity				Marks*	Grade point	Letter Grade
	• **Art clubs** • **Technical Clubs** • **Sports** • **Any other competition/activity defined by institute/ department.**	**NSS/NCC/Unnat Bharat Abhiyan**	**Participation in events outside of the institutes**	**SWAYAM Courses(only4 week course approved Dean concern)**	**Leadership & Management of clubs/activities/ Student Professional Societies/Institute Festival & Technical Events Etc**			

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Achievement level	I Prize winner, II Prize Winner, III winner	Best NSS/NCC Volunteer Awardee (State/National level) / Participation in Republic Day Parade Camp/International Youth Exchange Programme, Supported by certification	I Prize winner, II Prize Winner, III Prize Winner	As reflected in grade sheet	Top level management	50-45	10	O
	Active Participation (High)	Active Participation (High)	Selection in such events supported By certification		Middle level management	40-35	9	A+
						35-30	8	A
	Active Participation (Medium)	Active Participation (Medium)			Lower-level management	30-25	7	B+
						25-20	6	B
	Active Participation (low)	Active Participation (low)				20-15	5	C
						12	4	P
	Not participate	Not participate	-		-	0	0	F

*Various clubs different marking system, however, it can be scaled down to 50 and assign credit accordingly.

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