Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022
'B^{++}' Grade (CGPA 2.96)

Name of the Faculty: Science & Technology

(As per New Education Policy 2020)

Subject:- Electronics & Telecommunication Engineering

Name of the Course: Second Year B. Tech (Sem.– III & IV)

(Syllabus to be implemented from-2024-25)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

S. Y. B. Tech (Electronics & Telecommunication Engineering)

NEP 2020 Compliant Curriculum With effect from 2024-2025

Semester –IV

Distribution	*Course Code*	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*			*Total*
			L	*T*	*P*		*ESE*	*ISE*	*ICA*	*OE/ POE*	
PCC	ENTPCC-04	Signals and Systems	3			03	70	30			100
PCC	ENTPCC-05	Control System	2	1		03	70	30	25		125
PCC	ENTPCC-06	Analog Integrated Circuits	3		2	04	70	30	25	25	150
SEC	ENTSEC-01	Data Structure	1		2	02			25	25	50
Economic/ Management	EM-02	Project Management and Economics	2		0	02		25	25		50
OE	OE-02	Open Elective-II	2		2	03	70	30	25		125
MDM	ENTMDM-02	MD Minor-II	2		2	03	70	30	25		125
VEC	VEC-01	Professional Ethics	1		2	02	50*		25		75
		Total	**16**	**1**	**10**	**22**	**400**	**175**	**175**	**50**	**800**
		Environmental Science	**1**				**40**	**10**			**50**

***VEC-01 Examination will be MCQ based**

BSC- Basic Science Course ESC- Engineering Science Course, PCC- Programme Core Course , AEC- Ability Enhancement Course, IKS- Indian Knowledge System, CC- Co-curricular Courses,

VSEC-Vocational and Skill Enhancement Course

List of Open Electives 01 (Semester –III)

1. OE-01A: Advanced Mathematics and Statistics
2. OE-01B Digital Marketing and E-Commerce
3. OE-01C Humanities and Social Sciences
4. OE-01D Industrial and Quality Management
5. OE-01E Mathematics for Software and Hardware
6. OE-01F Soft Skills and Personality Development

List of Open Electives 02 (Semester –IV)

1. OE-02A Entrepreneurship and Innovation
2. OE-02B Environmental Sustainability
3. OE-02C Renewable Energy
4. OE-02D Measurement, Instrumentation and Sensors
5. OE-02E Operation Research
6. OE-02F Computational Mathematics
7. OE-02G Professional Business Communication

Semester IV

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Semester-IV (as per NEP) w.e.f. 2024-25

ENTPCC- 04: Signals and Systems

Teaching Scheme:
Lecture - 3 Hrs/week, 3 credits

Examination Scheme:
ESE- 70 Marks
ISE - 30 Marks

Course Objective:

1. To understand the fundamental characteristics of signals and systems
2. To develop mathematical skills and to solve problems involving convolution.
3. To represent and to realize LTI System by differential and difference Equations.
4. To understand the concept of Fourier Transform and its applications.
5. To understand the concept of Z transform with ROC

Course Outcome:

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

1. Understand the fundamental concepts of signals and systems, including their types and characteristics.
2. Develop analytical and problem-solving skills by applying the concepts of convolution integral and Convolution sum to represent the LTI system.
3. Realize LTI system equations by using different forms.
4. Use Fourier series for analysis of complex exponential signals.
5. Enumerate Fourier transform of the signals.
6. Enumerate ZT of a function and plot its ROC.

Section - I

Unit 1: Signals and Systems: **(08Hrs)**

Introduction to signal and systems, Types of Signals, Elementary Continuous time and discrete time Signals, Transformations of independent Variable, Classification of Signals, Properties of System (Static and Dynamic, Linear and Nonlinear, Time variant and Time Invariant, Causal and Non Causal)

Unit 2 Continuous Time (CT)systems: **(06Hrs)**

Introduction, The Representation of Signals in Terms of Impulses, Convolution integral, Block Diagram representation of LTI Systems described by Differential Equations.

Unit 3 - Discrete Time (DT) systems: **(06Hrs)**

The Representation of Signals in Terms of Impulses, Convolution Sum, and Block diagram Representation of LTI Systems described by Difference Equations, Interconnections of systems.

Section - II

Unit 4- Fourier Representation of Periodic Signals: **(06Hrs)**

Introduction, The Response of LTI Systems to Complex Exponentials, Fourier series, and Representation of Continuous-Time Periodic signals, Convergence of Fourier Series and basic problems.

Properties of Continuous time Fourier series (statement and proof of theorems).

Unit 5- Fourier Representation of aperiodic Signals: **(08Hrs)**

Introduction to Fourier Transform & DTFT, Definition and basic problems.

Properties of Fourier Transform:

Linearity, Time shift, Frequency shift, Scaling, Differentiation and Integration, Convolution and Modulation, Parseval's theorem and problems on properties of Fourier Transform (statement and proof of theorems).

Unit 6 - Z-Transform **(06Hrs)**

Introduction, The Z-Transform, The Region of Convergence for the Z-Transform, Properties of Z Transform, The Inverse Z-Transform (IZT)(Power Series method and Partial Fraction Expansion Method), Application and Characteristics of LTI System Using Z Transform.

Text books:

1. Signals and Systems A.V. Oppenheim and A. S. Wilsky, 2nd edition [PearsonEducation]

2. Signals and Systems Simon Haykin and Barry Van Veen, 2nd edition [Wiley andSons]

3. Signals and Systems, I. Ravi Kumar, PHI

Reference Books:

1. Signals and Systems Dr. S. Palani [Ane Books Pvt Ltd, NewDelhi]

2. Signals and Systems by V. Krishnaveni and A. Rajeswari [WileyIndia]

3. Signals and Systems by P. Ramesh Babu and R. Anand Natarajan[Scitech]

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Semester-IV (as per NEP) w.e.f. 2024-25

ENTPCC- 05: Control System

Teaching Scheme:
Lecture - 2 Hrs/week, 2 credits
Tutorial - 1 Hrs/week, 1 credits

Examination Scheme:
ESE- 70 Marks
ISE - 30 Marks
ICA – 25 Marks

Course Objective-

1. To understand concepts of various control systems and mathematical Modelling.
2. To represent control system using block diagram and signal flow graph and obtain transfer function of system
3. To obtain stability of control systems.
4. To obtain Gain Margin and Phase Margin using Bode Plot

Course Outcomes-

After completion of this course, the students are able to –

1. Analyze various control systems and represents mathematical models for control systems
2. Obtain block diagram reduction of control system and transfer function of systems using signal flow graph.
3. Determine stability of systems.
4. Obtain Gain Margin and Phase Margin using Bode Plot

Section-I

Unit 01- Introduction and Mathematical modeling [07Hrs]

Open loop and Closed loop control systems, examples of control systems: Liquid Level Control System, Missile Launching and Guidance System.

Mathematical modeling of Electrical systems using R, L and C, Transfer function of RLC circuits, Transfer function of closed loop system,

Unit 02 -: System representation and components [06Hrs]

Block diagram representation and reduction techniques with problems, Signal Flow Graph- Construction with examples, Mason's Gain formula with problems.

Section –II

Unit 03- Stability and Error Coefficients [07Hrs]

Stability -Concept of stability, absolute and conditional stability, relative stability, Routh – Hurwitz criterion for stability with problems.

Errors- Steady state errors and error constants of type 0, type 1 and type 2 systems.

Unit 04- Stability Analysis [06Hrs]

Bode plot: asymptotic bode plot, stability analysis using bode plot. Need of compensators, types of compensations- Lead, Lag & Lead Lag

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Internal Continuous Assessment (ICA):

Minimum 06 assignments on the above topics.

Text Books-

1. Control Systems Engineering by I. J. Nagrath & M Gopal, New Age Publication. –pp 92

2. Feedback & Control Systems. By Schaum's Outline Series McGraw Hill.

3. Control Systems Engineering, by R. Anandanatrajan, P.RameshBabu - Scitech Publication.

Reference Books:

1. Modern Control Engineering by K.Ogata, Pearson Education.

2. Principles of Control Systems by S.C. Goyal & U. A. Bakshi Technical Publication, Pune.

3. Control systems by Dr. Sanjay Sharma, Katson publication.

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Semester-IV (as per NEP) w.e.f. 2024-25

ENTPCC- 06: Analog Integrated Circuits

Teaching Scheme:	**Examination Scheme:**
Lecture - 3 Hrs/week, 3 credits	**ESE- 70 Marks**
Practical - 2 Hrs/week, 1 credits	**ISE - 30 Marks**
	ICA – 25 Marks
	POE – 25 Marks

Course Objectives:

1. To make student understand principles, configurations and specification of ideal and practical op amp
2. To make student understand frequency response of op amp
3. To make student understand linear and nonlinear applications of op amp
4. To enable student design active filters using op amp and analyze waveform generators
5. To introduce to student working of special Linear ICs and its applications

Course Outcomes: At the end of the course, students will be able to-

1. Describe fundamentals of op amp and compare characteristics of ideal and practical op amp
2. Understand and analyze frequency response of op amp
3. Develop various Linear and Nonlinear applications of op amp
4. Design first order and second order filters
5. Understand and describe the concept of special ICs and its applications

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SECTION– I

Unit 1: Fundamentals of Operational Amplifier: **[08Hrs]**

Concept of Differential amplifier- DIBO, AC & DC analysis, op amp fundamentals- block Diagram, equivalent circuit, Transfer curve, Electrical Parameters- practical & Ideal, Open loop configurations, closed loop configurations with negative feedback- Inverting, non-inverting& Differential Amplifier.

Unit 2: Practical op amp & frequency response: [06Hrs]

Input offset voltage, Input bias current, Input offset current, total output offset voltage, Thermal drift, PSRR,CMRR,SR &its importance, IC 741 characteristics. High frequency equivalent circuit and compensation techniques.

Unit 3: General Linear applications of Op amp: [07Hrs]

Summing, scaling and averaging amplifier, adder-subtractor , Instrumentation Amplifier: Block diagram output voltage , IC of Instrumentation amplifier, V to I and I to V convertors, Op-Amp as differentiator and Integrator including study of frequency response.

SECTION-II

Unit 4: Non linear applications*:* [07Hrs]

Comparator-Basic, ZCD, Schmitt trigger, window detector, sample & hold circuit, peak detector, precision rectifiers, log-antilog amplifier, clipper & clamper.

Unit5: Active filters & Waveform Generators: [07Hrs]

Basic filter definitions, Advantages of active filters, First and second order low pass and high pass Butterworth filters.

Waveform Generators- Square Wave Generator Triangular saw tooth wave generators using Op-Amp, Oscillators- principle, Phase shift, Wien Bridge, Quadrature oscillators.

Unit6: Special ICS and its applications: *[07Hrs]*

Phased Locked Loops (PLL), 565, Application of PLL, LM317, LM337, IC 555Timer-basic, astable, monostable modes of operation and applications.

Internal Continuous Assessment (ICA): ICA should be based on minimum eight experiments from the following list of experiments.

Internal Continuous Assessment (ICA):

Minimum 08 experiments from given list

Experiments List:-

1. Measurement of parameters –V_{io}, I_{io}, I_B etc
2. Op-Amp as Inverting and Non-inverting amplifier, Voltage follower.
3. Frequency response of Inverting and Non-inverting amplifiers.
4. Implementation of Op-Amp as adder and subtractor.
5. Op-Amp as Integrator and Differentiator.
6. Op-Amp as Schmitt trigger.
7. Op-Amp as window detector.
8. Op-Amp as peak detector.
9. Op-Amp as waveform generators(Square, Triangular, Sawtooth)
10. RC oscillator.
11. Op-Amp as Precision rectifier.
12. Op-Amp as Clippers and Clampers.
13. V to I convertor with grounded load.
14. Implementation of first and second order low pass Butterworth filter.
15. Implementation of first and second order high passes Butterworth filer.

Note: Simulate results using simulation software for at least two experiments.

Textbooks:

1. Op-Amps and Linear Integrated Circuits, Ramakant A. Gaikwad, PHI Learning Pvt. Ltd.,Third and Fourth edition
2. LinearIntegratedCircuits,D.RoyChoudhary,ShailB.Jain,NewageInternational Publishers, Thirdedition

Reference Books:

1. OperationalAmplifiers, G.B.Clayton, English Language Book Society, Second edition
2. Operational amplifiers and Linear ICS by David Bell,oxford university press,3rd edition
3. Linear Integrated circuits by S Salivahanan, TataMc Grawhill
4. Integrated Circuits by K R Botkar, Khanna Publication

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Semester-IV (as per NEP) w.e.f. 2024-25

ENTSEC- 01: Data Structure

Teaching Scheme:
Lecture - 1 Hrs/week, 1 credit
Practical - 2 Hrs/week, 1 credits

Examination Scheme:
ICA – 25 Marks
POE – 25 Marks

Course Objectives:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures

Course Outcomes: At the end of the course, students will be able to-

1. Understand data organizations and data structure operations, with the ability to evaluate their efficiency in terms of time and space complexity..
2. Develop solutions using stacks and queues, and critically evaluate their performance in terms of time and space complexity.
3. Construct various types of linked lists and conduct performance analysis based on time and space complexity.
4. Implement search and traversal algorithms for trees and graphs, and analyze their computational complexity.
5. Design, implement, and compare the performance of selection sort, bubble sort, insertion sort, quick sort, merge sort, and heap sort algorithms in terms of time and space complexity.

SECTION– I

Unit 1: Introduction: **[02Hrs]**

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; complexity analysis.

Unit 2: Stacks: **[03Hrs]**

ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation (converting infix to postfix expression using algorithm, evaluating postfix expression using algorithm), programs using recursive functions (factorial, Fibonacci sequence) and complexity analysis.

Unit 3: Queues: **[02Hrs]**

ADT queue, Types of Queue: Simple Queue and its operations, Circular Queue, and their analysis.

SECTION-II

Unit 4: Linked Lists: **[02Hrs]**

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; doubly linked list , Circular Singly Linked Lists

Unit 5: Trees and Graph: **[02Hrs]**

Tress: Basic Tree Terminologies, Different types of Trees: Binary Tree, Binary Search Tree its operations and complexity analysis, Applications of Binary Trees: B Tree, B+ Tree: definitions

Graph: Basic Terminologies and Representations.

Unit 6: Searching and Sorting: **[03Hrs]**

Searching: Linear Search and Binary Search Techniques, complexity analysis of searching techniques.

Sorting: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort

Hashing: basics of hashing, Different Hashing techniques.

Internal Continuous Assessment (ICA):

Students should perform minimum twelve practical's based on the following:

Practicals: -

Minimum twelve practicals from the following.

1. Implementation of stack using array.
2. Implementation of stack for converting infix to postfix expression.
3. Find Factorial of a given no, by defining recursive function.
4. Fibonacci sequence implementation using recursive function.
5. Implementation of Queue using array.
6. Implementation of circular Queue using array.
7. Implementation of singly Linked list.
8. Implementation of stack using Linked list.
9. Implementation of Queue using Linked list.
10. Write the program for Tree traversal.
11. Write the program for Adjacency Matrix representation of Graph.
12. Search element from list using linear search and Binary search method.
13. Write the program to Sort the given list using Selection sort and Bubble sort method.
14. Write the program to Sort the given list using Insertion sort and Quick sort method.

Text books:

1. Data Structures Using C and C++, Y.Langsam, M.J. Augenstein, A.M Tanenbaum Pearson Education Second Edition
2. Data structures using C, Rajani Jindal Umesh Publication
3. Data structures through C in Depth, S.K.Srivastava, Deepali Srivastava, BPB Publication.
4. Data Structures using C, ISRD Group, TMH
5. Data Structures- Venkatesan, Wiley Publication.

Reference Books:

1. Fundamentals of Data Structures, Ellis Horowitz, Sartaj Sahni (Galgotia Book Source).
2. Data Structures and Program design, Robert L. Kruse (PHI).
3. Data structure and algorithm, mark Allen Weiss (Pearson Publication, Second edition).
4. Data Structures using C and C++, Rajesh K. Shukla, Wiley