WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR

(AN AUTONOMOUS INSTITUTE)

Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University,
Solapur

CHOICE BASED CREDIT SYSTEM (CBCS)

Structure and Syllabus
for

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

W.E.F. 2023-24

Electronics and Telecommunication Engineering Department

Department Vision

To be a distinguished center for nurturing the holistic development of competent young engineers in the electronics and allied field.

Department Mission

1. To inculcate and stimulate Electronics & allied Engineering proficiency amongst students through quality education and innovative educational practices.
2. To create engineering professionals with social consciousness.
3. To foster technical skills of students through creativity and critical thinking.
4. To enhance soft skill set of students which is crucial for career success through effectual training.

Electronics and Telecommunication Engineering
Under Graduate Program
Program Educational Objectives (PEOs)

1. Graduates will exhibit strong fundamental knowledge and technical skills in Electronics and Telecommunication Engineering and allied fields.
2. Graduates will manifest technological progression, hardware & software skills to fabricate sustainable, energy efficient and futuristic solutions to pursue successful professional careers in multidisciplinary fields.
3. Graduates will demonstrate professional ethics, effective communication, teamwork, leadership qualities and ability to relate engineering issues to broader social context along with lifelong learning.

Program Outcomes (POs)

The program outcomes of B. Tech. E&TC Engineering Program are summarized as following:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities, relevant to the professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

Engineering graduate in Electronics and Telecommunication Engineering Programme will be able to do-

1. Graduates will be able to attain a solid foundation in Electronics and Telecommunication Engineering with an ability to function in multidisciplinary environment.
2. Graduates will be able to use techniques and skills to design, analyze, synthesize, and simulate Electronics and Telecommunication Engineering components and systems.
3. Graduate will be capable of developing programs in Assembly, High level and HDL languages using contemporary tools for software development.

Legends used–

L	Lecture Hours / week
T	Tutorial Hours / week
P	Practical Hours / week
FA	Formative Assessment
SA	Summative Assessment
ESE	End Semester Examination
ISE	In Semester Evaluation
ICA	Internal Continuous Assessment
POE	Practical and Oral Exam
OE	Oral Exam
MOOC	Massive Open Online Course
HSS	Humanity and Social Science
NPTEL	National Programme on Technology Enhanced Learning
F.Y.	First Year
S.Y.	Second Year
T.Y.	Third Year
B.Tech.	Bachelor of Technology

Course Code Format:

2	2	E	T	U/P	2	C	C	1	T / L
Batch Entry Year		Program Code		U-Under Graduate, P-Post Graduate	Semester No. / Year 1/2/3/…8	Course Type		Course Serial No. 1-9	T-Theory, L-Lab session A- Tutorial P-Programming/ Drawing / Design

Program Code ET	Electronics and Telecommunication Engineering
Course Type	
BS	Basic Science
ES	Engineering Science
HU	Humanities & Social Science
MC	Mandatory Course
CC	Core Compulsory Course
SN*	Self-Learning **N*** *indicates the serial number of electives offered in the respective category*
EN*	Core Elective **N*** *indicates the serial number of electives offered in the respective category*
SK	Skill Based Course
SM	Seminar
MP	Mini project
PR	Project
IN	Internship

Sample Course Code:

22ETU3BS1T	Engineering Mathematics –III

Walchand Institute of Technology, Solapur

Structure of S. Y. B. Tech. Electronics and Telecommunication Engineering.,

(W.E.F. 2023-2024)

Semester- III

Course Code	Name of Course	Engagement Hours			Credits	FA		SA		Total
		L	T	P		ESE		ISE	ICA	
22ETU3BS1T	Engineering Mathematics –III	3		-	3	60		40		100
22ETU3BS1A	Engineering Mathematics –III		1		1				25	25
22ETU3CC2T	Electronic Circuit Analysis and Design	3	-	-	3	60		40	-	100
22ETU3CC3T	Network Theory and Analysis	3	-	-	3	60		40	-	100
22ETU3CC4T	Digital Techniques	3	-	-	3	60		40	-	100
22ETU4CC5P	Python Programming	2	-	-	2	-		25	-	25
22CEU3HU6T	Universal Human Values	3	-	-	3	60		40	-	100
	Total	**17**	**1**	**-**	**18**	**300**		**225**	**25**	**550**
	Laboratory:					**POE**	**OE**			
22ETU3CC2L	Electronic Circuit Analysis and Design	-	-	2	1	25*	-		25	50
22ETU3CC3L	Network Theory and Analysis	-	-	2	1		-		25	25
22ETU3CC4L	Digital Techniques	-	-	2	1	25	-		25	50
22ETU4CC5P	Python Programming	-	-	2	1	50			25	75
	Total	**-**	**-**	**8**	**4**	**100**		**-**	**100**	**200**
	Grand Total	**17**	**1**	**8**	**22**	**400**		**225**	**125**	**750**

Note:* The Practical exam in Electronic Circuit Analysis and Design will include experiments from Network Theory and Analysis course

1. Vocational Training - Four weeks of Vocational Training can be completed by students from after the completion of Semester II up to the end of Semester VII, the report of which will be assessed in Semester VII. Students can complete two separate trainings of two weeks each or one training of four weeks. Vocational Training can be done in the form of an Industrial Internship / Vocational Training / Industry recognized MOOC course / Industry recognized Certification / Workshop or Bootcamp by industry or any other relevant activity as specified by the department.

Walchand Institute of Technology, Solapur

Structure of S. Y. B. Tech. Electronics and Telecommunication Engineering,

(W. E.F. 2023-2024)

Semester – IV

Course Code	Name of Course	Engagement Hours			Credits	FA		SA		
		L	T	P		ESE		ISE	ICA	Total
22ETU4CC1T	Control Systems	3		-	3	60		40		100
22ETU4CC1A	Control Systems		1		1				25	25
22ETU4CC2T	Signal and Systems	3		-	3	60		40		100
22ETU4CC2A	Signal and Systems		1		1				25	25
22ETU4CC3T	Data Structures	3	-	-	3	60		40	-	100
22ETU4CC4T	Analog Integrated Circuits	3	-	-	3	60		40	-	100
22ETU4CC5P	Verilog HDL Programming	2			2	-		25	-	25
	Total	**14**	**2**	**-**	**16**	**240**		**185**	**50**	**475**
	Laboratory:					**POE**	**OE**			
22ETU4CC3L	Data Structures	-	-	2	1		25		25	50
22ETU4CC4L	Analog Integrated Circuits	-	-	2	1	25	-		25	50
22ETU4CC5P	Verilog HDL Programming	-	-	2	1	50	-		25	75
	Total	**0**	**0**	**6**	**3**	**100**		**-**	**75**	**175**
	Grand Total	**14**	**2**	**6**	**19**	**340**		**185**	**125**	**650**

Mandatory Course: Environmental Studies course will be taught in both Semester III and IV whereas the assessment will be in Semester IV as End Semester Examination**.**

Course Code	Name of Course	Engagement Hours			Credits	FA	SA		
		L	T	P		ESE	ISE	ICA	Total
22GEU4MC2T	Environmental Studies	1	-	-	-	50	-	-	50

Note:

1. The number of students in a Practical/Tutorial batch shall be 20. A new batch shall be formed if the number of remaining students (after forming batches of 20) exceeds 9.
2. Internal Continuous Assessment (ICA): ICA shall be a continuous process based on the performance of the student in assignments, class tests, quizzes, attendance and interaction during theory and lab sessions, journal writing, report presentation, etc., as applicable.
3. Students must study and pass Environmental Science in the Second Year of B. Tech. E&TC Engineering to become eligible for award of degree.

Walchand Institute of Technology, Solapur

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

22ETU3BS1T: Engineering Mathematics - III

Teaching Scheme:	**Examination scheme:**
Lecture: 3 hrs/week, 3 credits	ESE : 60 Marks
Tutorial: 1 hr/week, 1 credit	ISE : 40 Marks
	ICA: 25 Marks

This course includes mathematical theory and concepts required by an Electronics & Telecommunication engineering. The course consists of linear differential equations which can be used for mathematical model of electrical circuits where these variables are dynamically related. This course introduces Z- transform which provide a mathematical framework for a series of mathematical conversions that are useful for digital filters. Laplace transforms is another powerful mathematical tool for engineering problems such as circuit analyses in Electronics/electric and signal processing. This course also introduces fundamentals of probability distributions which are useful for digital communication and numerical solutions of linear.

Course Prerequisite:

Fundamentals of trigonometry, method of finding roots of algebraic equations, differentiation, integration, partial fraction, sum of sequence and methods of solving definite integrations, basics of statistics and probability theory

Course Objective:

1. To introduce to student method of solving higher order linear differential equations
2. To introduce to student various probability distributions
3. To introduce to student Laplace transform and inverse Laplace transforms and make him analyze electrical circuits using it.
4. To introduce to student numerical methods for solving non linear equations and for evaluating the definite integrals.
5. To introduce to student Fourier Transform.

Course Outcomes:

At the end of this course, student will be able to –

1. Solve higher order linear differential equation related to electrical circuit theory
2. Develop the relation between two variables for the given data using regression and can explain various probability distribution functions.
3. Apply Laplace and inverse Laplace transforms for analysis of simple electrical circuits.
4. Apply numerical methods for solving non linear equations and for evaluating the definite integrals
5. Express the functions as Fourier integral and compute the Fourier transform.

SECTION – I

Unit 1: Higher order linear differential equations and applications [09 Hrs]

Basic definition, differential operator, complimentary functions, particular integral, Shortcut methods for standard functions like e^{ax} , sin(ax+b) , cos(ax+b) , x^m , $e^{ax}v$, $x^m v$ particular integral by general method (without method of variation of parameters) for other functions. electrical engineering applications.

Unit 2: Fourier Transform: [06 Hrs]

Fourier integral, Fourier sine and cosine integral, complex form of Fourier integral.
Fourier transform, Fourier sine and cosine transform and inverse transform

Unit 3: Statistics and Probability: [07 Hrs]

Coefficient of correlation by Karl Pearson's method and lines of regression of bivariate data. Random variable, discrete and continuous random variable, Probability density function, Binomial, Poisson and Normal distributions.

SECTION- II

Unit 4: Laplace transform: [09Hrs]

Definition, Laplace transform of standard functions, properties- first shifting, change of scale, multiplication of power t and division by t, Laplace transform of derivative and integral, Laplace transform of periodic functions, unit step functions and unit impulse functions.

Unit 5: Inverse Laplace transform: [06Hrs]

Definition, inverse Laplace transform of standard functions, Properties of inverse Laplace transforms: linearity property, first shifting theorem, partial fraction, inverse transform of logarithmic &inverse trigonometric functions and convolution theorem, solution of differential equations by Laplace transform.

Unit 6: Solution of Algebraic and Transcendental Equations and Numerical Integration: [07Hr]

Introduction, basic properties of equations, False position method, Newton-Raphson's method, numerical integration using Newton's Cote's formulae-Trapezoidal rule, Simpson's 1\3rd rule, Simpson's 3/8th rule, Gaussian Quadrature two point and three-point formulae.

Internal Continuous Assessment (ICA):

ICA consists of minimum one assignment based on each unit

Text books:

1. A textbook of Applied Mathematics Vol. II and Vol. III, J.N. and P.N. Wartikar, Vidyarthi Grah Prakashan, Pune.
2. Higher Engineering Mathematics, Dr.B.S. Grewal, Khanna Publications, Delhi.
3. A Textbook of Applied Mathematics, N.P. Bali, Ashok Saxena and N.Ch. S.N. IyengarLaxmi Publications, Delhi.
4. Advanced Engineering Mathematics, Kreyzig-John Wiley & SMS, New York.
5. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill
6. Numerical Methods, Dr.B.S.Grewal, Khanna Publications, Delhi

Reference Books:

1. Advanced Engineering Mathematics, Peter O'Neil, Cengage Learning.
2. Engineering Mathematics, Srimanta Pal, Subodh Chandra Bhunia, Oxford University Press

Walchand Institute of Technology, Solapur

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

22ETU3CC2T : Electronic Circuit Analysis and Design

Teaching Scheme:
Lecture: 3 hrs/week, 3 credits
Practical : 2 hrs/week, 1 credit

Examination Scheme:
ESE : 60 Marks
ISE : 40 Marks
ICA : 25 Marks
POE : 25 Marks*

This course consists of characteristics of BJT, FET & MOSFET. Applications of these devices as amplifiers and oscillators are elaborated. The design of amplifiers is explored. Specifications of these devices from data sheets are used for design.

Course Prerequisite: This course requires knowledge of Basic Semiconductor devices & basic components R, L & C. Analysis of circuits using KVL and KCL is required.

Course Objectives:

1. To make students analyze wave shaping circuits & voltage multipliers.
2. To make students design and analyze unregulated power supply.
3. To make students comprehend the working of BJT with basic configurations and its hybrid model.
4. To make students design and analyze single-stage feedback amplifiers using BJT amplifiers.
5. To make students Design and analyze Oscillators using BJT.
6. Describe and verify the characteristics of JFET, MOSFET, and their applications.

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

1. Analyze wave-shaping circuits & voltage multipliers.
2. Analyze unregulated power supply designed using different filter circuits.
3. Elaborate working, characteristics, and hybrid model of BJT.
4. Analyze Single stage feedback amplifiers & Oscillators designed using BJT.
5. Describe the construction, working & drain characteristics of JFET and MOSFET.

SECTION– I

Unit 1: Diode Special applications: [5Hrs]

Clippers: series & shunt and its analysis for positive, negative & combinational biasing clippers, transfer characteristics. Clamper circuits: analysis for positive and negative clampers. Voltage multipliers: Voltage Doubler, Tripler and Quadrupler.

Unit 2: Design of unregulated power supply: [8Hrs]

Capacitor, inductor, LC & π filter, its analysis for ripple factor; power supply design using rectifier & above filters.

Unit 3: Bipolar junction transistor: **[08Hrs]**

BJT characteristics –common base, common emitter & common collector configuration- input output characteristics, early effect, punch through effect. BJT biasing DC load line and Q point, analysis of voltage divider biasing circuit expression for stability factor, applications of BJT as a switch, hybrid model of BJT for CB, CE & CC configuration, generalized h-parameter analysis of BJT amplifier for Av, Ai, Ri, Ro.

SECTION-II

Unit 4: Feedback Amplifiers: **[07Hrs]**

Classification of amplifiers, feedback concept, General characteristics of negative feedback amplifiers, Feedback Topologies and analysis (with numerical examples), Effect of negative feedback on stability, Bandwidth, noise, distortion, i/p resistance and o/p resistance. Multistage transistor amplifiers: Need of cascading, different coupling schemes, Design of single stage CE amplifier.

Unit 5: Oscillators: **[07Hrs]**

Types Oscillator startup mechanism, Barkhausen's criteria, sinusoidal oscillators- RC phase shift Oscillator, Wein bridge oscillator, Colppits oscillator, Hartley oscillator Derivations for frequency of oscillations of above oscillators.

Unit 6: Field Effect Transistor: **[07Hrs]**

Introduction, Construction and working, JFET characteristics (Transfer and Drain), Schockley's equation, JFET biasing and DC analysis, JFET as CS amplifier, MOSFET-Construction, working & V-I characteristics, application as a switch.

Internal Continuous Assessment:

Internal Continuous Assessment (ICA) consists of a minimum of eight experiments from the following suggested list including a minimum of 20% experiments based on simulation tools.

Note: For the selection of components in the design, Data Sheet should be referred.

* The Practical exam in Electronic Circuit Analysis and Design will include experiments from Network Theory and Analysis course.

List of Experiments: -

1. Analysis & verification of clipper & clamper circuit
2. Analysis & verification of voltage multiplier circuit
3. Design of unregulated power supply using bridge rectifier & capacitor filter
4. I/O characteristics of CE configuration
5. I/O characteristics of CB configuration
6. Design and analysis of single-stage CE amplifier.
7. V-I characteristics of JFET.
8. V-I Characteristics of MOSFET
9. Application of MOSFET as a switch.
10. JFET/MOSFET CS Amplifier and calculation of Av, Ri, and Ro.
11. RC coupled CE amplifier
12. LC oscillator
13. MOSFET amplifier

Textbooks:

1. Electronic Devices and Circuits Allen Mottershed PHI Publication.
2. Electronic Devices and Circuits- J.B. Gupta 3rd Edition KATSON Books.
3. A Practical Approach to Electronic Circuit Design -D S Mantri& G P Jain, Nikita Publication
4. Electronics Devices and Circuits-S. Shalivahanan, N. Suresh Kumar, TMH Publication.

Reference Books:

1. Electronic Devices Floyd Pearson Education
2. Microelectronics: Digital and Analog Circuits and Systems- Jacob Millman
3. Electronic Devices and Circuit Theory Boylestad Pearson Education
4. “Microelectronics Circuit” by Sedra Smith, Oxford University Press, 4thEdition.

Walchand Institute of Technology, Solapur

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

22ETU3CC3T : Network Theory and Analysis

Teaching Scheme:
Lecture: 3 hrs/week, 3 credits
Practical : 2 hrs/week, 1 credit

Examination Scheme:
ESE : 60 Marks
ISE : 40 Marks
ICA : 25 Marks

Students of Electronics and Telecommunication Engineering need to possess a good understanding of concepts and principles of passive circuit analysis and synthesis by applying various circuit laws and theorems. This is one of the foundation courses which are required to understand the concepts of advanced courses and develop skills that are needed in the Electronics field.

Course Prerequisite:
KVL, KCL, star-delta transformation, Mesh and Nodal Analysis

Course Objectives:
1. To develop skills for analysis of linear circuits with dependent and independent DC excitations.
2. To introduce concepts of resonance in electric circuits and their applications.
3. To impart transient and steady-state analysis techniques for linear circuits.
4. To introduce fundamentals of two-port networks, passive filters, and Attenuators.

Course Outcomes:
At the end of the course, students will be able to-
1. Analyze linear circuits with the use of different network theorems and analysis methods.
2. Compute two-port network parameters.
3. Determine transient and steady-state response of linear circuits.
4. Design passive filter and attenuator circuits.

SECTION – I

Unit 1: Circuit Analysis and Network Theorems: [08 Hrs]
Types of Network Elements, Types of Sources and Source transformation, Superposition, Thevenin's, Norton's, and Maximum Power Transfer Theorems. Numerical problems based on DC analysis.

Unit 2: Resonance: [06 Hrs]
Series resonance: Series resonance, impedance, and phase angle of the series resonant circuit, voltage and current in the series resonant circuit. Effect of resistance on frequency response curve, Bandwidth, Selectivity, and quality factor.
Parallel resonance: Parallel resonant circuit (Tank circuit), resonant frequency, and variation of Impedance with frequency, reactance curves. Numerical problems based on the above.

Unit 3: Two Port Networks: **[08 Hrs]**

Two port Network: Open circuit impedance parameters (Z), Short circuit admittance parameters (Y), Transmission parameters (ABCD), Hybrid parameters (H), and reciprocity and symmetry conditions. Interconnection of two port networks: Parallel, Series and Cascade connection of two port networks, T and π representation, Terminated 2 port networks.

SECTION – II

Unit 4: Transient Response: **[08 Hrs]**

Review of Laplace Transform Basics: Initial conditions, Evaluation, and analysis of the transient and steady-state response of the following:
RL circuit: DC voltage and current response.
RC circuit: DC voltage and current response
RLC circuit: DC voltage and current response.

Unit 5: Network Function: **[06 Hrs]**

Complex frequency: Concept of complex frequency.
Network function: network function for one and two-port networks, Poles and Zeros of network function. Time domain behavior from poles and zero plot.

Unit 6: Filters and attenuators: **[08 Hrs]**

Filters: Characteristic of high pass, low pass and band pass, and band stop filter. Constant K type Filters, m-derived filter, section m-derived LPF, HPF, BPF, and BSF. Attenuators: Relationship between Neper and Decibels, Design of T, π and Lattice attenuators.

Internal Continuous Assessment:

Internal Continuous Assessment (ICA) consists of a minimum of eight experiments based on the above contents.

Note: The practical exam in Electronic Circuit Analysis and Design will include experiments from Network Theory and Analysis course.

Text Books:

1. Circuit and network analysis and synthesis by A Sudhakar and Sham Mohan S Palli. TMH publication, 3rd Edition
2. Electric circuit analysis by Ramesh Babu, Scientech Publication
3. Electrical network by Ravish Singh, TATA McGraw-Hill
4. Circuit Theory (Analysis and Synthesis) A. Chakrabarti Dhanpat Rai and Co. 6th Edition.
5. Network Analysis & Synthesis- Franklin Kuo, Wiley Publication.
6. Network Fundamentals & Analysis- Kaduskar, Wiley Publication.

Reference Books:

1. Network Analysis M.E. Van Valkenburg, PHI publication. 3rd Edition
2. Network and System - D. Roy Choudhary, Wiley Eastern (2nd Edition).
3. Theory and problems of Electric Circuits Joseph Aedminster, Shaum Series
4. Network Analysis F.F.Kuo - John Wiley and Sons (2nd Edition).

Walchand Institute of Technology, Solapur

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

22ETU3CC4T : Digital Techniques

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE : 60 Marks
Practical : 2 hrs/week, 1 credit	ISE : 40 Marks
	ICA : 25 Marks
	POE : 25 Marks

This course introduces the fundamentals of digital electronics. It focuses on the study of basic gates and realizations of Boolean expressions. It deals with the design, analysis, and implementation of basic combinational and sequential digital circuits.

Course Prerequisite: This course requires fundamental knowledge of BJT and number systems.

Course Objectives:

1. To demonstrate the use of codes and k-map minimization, Quine-McClusky techniques in digital circuits.
2. To design combinational logic circuits using logic gates.
3. To illustrate the use and significance of logic IC families and flip-flops in digital circuits.
4. To design asynchronous and synchronous sequential logic circuits.
5. To apply concepts of synchronous state machines for designing digital applications.

Course Outcomes:

At the end of this course, student will be able to –

1. Demonstrate the use of codes and k-map minimization, Quine-McClusky techniques in digital circuits.
2. Design combinational logic circuits using logic gates.
3. Illustrate the use and significance of logic IC families and flip-flops in digital circuits.
4. Design asynchronous and synchronous sequential logic circuits.
5. Apply concepts of synchronous state machines for designing digital applications.

SECTION– I

Unit 1: Codes and Simplification technique [06Hrs]

Codes- BCD and Gray codes, seven segment, Principles of combinational logic: Standard representation for Logical Function, canonical forms, don't care conditions, minimization techniques using Karnaugh map up to 4 variables only, Quine-McClusky technique, hazards and hazard free circuit.

Unit 2: Combinational Circuit Design [07Hrs]

Binary Adder, Subtractor, Decimal digit BCD adder, Code converters (binary to gray and gray to binary, BCD to 7 segment), IC 7447, MUX, DEMUX, encoder, priority encoder, decoder, Multiplexer (Tree) and Demultiplexer (Tree), magnitude comparator.

Unit 3: Logic Families and flip flop **[08Hrs]**

Logic Family - Introduction to logic families, Characteristics/Parameters of Digital ICs. Flip flop NAND Latch, Flip-Flop: D, SR, JK and T (Characteristic table, excitation table and characteristic equation), Race around condition, Master Slave J-K flip-flop, flip-flop conversion.

SECTION-II

Unit 4: Registers **[07Hrs]**

Asynchronous and synchronous sequential circuits, Shift register (modes of operation), 4-bit bidirectional shift register, universal shift registers, Ring counter, Johnson counter, IC7495.

Unit 5: Counters **[07Hrs]**

Design of ripple counter using flip-flop, 4 bit up/down counter, mod –N counter, Design of Synchronous counter using Flip-Flop, 4 bit up/down counter, mod –N counter, IC 7490,

Unit 6: State machines **[07Hrs]**

Moore and Mealy machines, representation techniques, state diagram, state assignment, state reduction, implementation using flip flops.

Internal Continuous Assessment (ICA):

Internal Continuous Assessment (ICA) consists of a minimum of eight experiments based on the above contents.

Suggestive list of experiments

1. Implementation of SOP and POS logical functions using universal gates.
2. Implementation of full adder, and full subtractor using logic gates.
3. Code conversion using logic gates or logic ICs: BCD to Binary, Binary to Gray, Gray to Binary.
4. Design and implementation of 2 bit digital comparator using logic gates and functional
5. Verification of 4 bit digital comparator using IC 7485.
6. Design and implementation of 1 decimal digit BCD adder using IC 7483.
7. (i) Verification of functionality of multiplexer.
   (ii) Design and implement combinational logic function using multiplexer ICs.
8. (i) Verification of functionality of decoder.
   (ii) Design and implement combinational logic function using decoder IC.
9. Verification of the functionality of BCD to Seven segment decoder/driver.
10. Implement S-R, D, J-K, T flip flops using logic gates.
11. Functional verification of universal shift registers using IC 7495.
12. Design and implementation of Ring counter using shift register.
13. Design and implementation of Johnson counter using shift register.
14. Design and implementation of Pulse train generator using IC 7495.
15. Functional verification of ripple counter using IC 7490

Text books:

1. Digital Design - M. Morris Mano - Pearson Education (3rd Edition)
2. Digital Principles – Leach, Malvino, TMH (6th Edition).
3. Fundamental of Digital Circuits- Anand Kumar- Prentice Hall of India Pvt. Ltd.
4. Digital Electronics – Dr. R. S. Sedha – S. Chand Publications (3rd Revised Edition).
5. Digital System, Principles and Applications, Ronald J. Tocci, PHI
6. Digital Electronics- Anil K Maini, Wiley Publication.

Reference Books:

1. Digital Design Principles and Application - Wakerly – Pearson Education
2. Digital Electronics - Gothman - (PHI)
3. Digital Logic and Computer Design - Morris Mano - Pearson Education
4. The Principles of Computer hardware- Alan Clements (3rd Edition),Oxford Press.

Walchand Institute of Technology, Solapur

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

21ETU4CC5P : Python Programming

Teaching Scheme:	**Examination Scheme:**
Lecture: 1 hr/week, 1 credit	ISE : 25 Marks
Practical: 4 hrs/week, 2 credit	ICA : 25 Marks
	POE : 50 Marks

In this course, students are introduced to core programming concepts like data structures, conditionals, loops, variables, and functions. This course includes an overview of the various tools available for writing and running Python

Course Prerequisite:

Basic knowledge of any programming language concepts like what is a loop, what if and else does, how operators are used, etc. will be helpful.

Course Objectives:

1. To make students learn and understand Python programming basics and paradigms.
2. To make students learn and understand python looping, control statements, and string manipulations.
3. To familiarize students with the concepts of database and API integration techniques
4. To make students learn and know the concepts of file handling, exception handling, and database connectivity.

Course Outcomes:

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

1. Write Python scripts using the procedure and object-oriented approach.
2. Exhibit ability to use Python's standard library packages to provide solutions to a given problem.
3. Implement SQLite using python and implement applications using API
4. Make database connectivity in a python programming language.

SECTION– I

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

Introducing the Python Interpreter, Program Execution, Execution Model Variations, The interactive Prompt, System Command Lines and Files. Syntactic and semantic differences between Python 2.x and Python 3.x.

Unit 2: Introduction to Python Programming Constructs **[04 Hrs]**

Data types and variables, Collection data types, Control structures, loops and functions, Lambdas, Generators, Exception Handling, String handling, Scope of variables, Modules, Packages, Command line arguments. Built-in: Functions, Constants, Types, Exceptions.

Unit 3: Introduction to Object-Oriented Programming in Python [04 Hrs]

Classes, Instance Objects, Method Objects, Class and Instance Variables, Attributes, and methods, Inheritance and polymorphism

SECTION – II

Unit 4: Python Standard Library Modules and Packages -1 [06 Hrs]

Common string operations, Regular expression operations, Basic date and time types, General calendar-related functions, Container datatypes, Efficient arrays of numeric values, Dynamic type creation and names for built-in types, Shallow and deep copy operations, Mathematical functions, Generate pseudo-random numbers, Functional Programming Modules, File and Directory Access

Unit 5 : Python Standard Library Modules and Packages -2 [06 Hrs]

Data Persistence: Python object serialization, DB-API 2.0 interface for SQLite databases. Work with ZIP archives, CSV File Reading and Writing, Configuration file parser, Logging facility for Python. Concurrent Execution: Thread-based parallelism, Process-based parallelism, Context Variables, Asynchronous I/O. Low-level networking interface, JSON encoder and decoder, URL handling modules, urlib, HTTP modules, HTTP protocol client.

Unit 6: Testing, Debugging and Profiling [04 Hrs]

Testing output, Unit tests in Python, Handling Multiple exceptions, creating custom exceptions, Debugging programs, Unit testing, Measure execution time of small code snippets, Creation of virtual environments, System-specific parameters and functions and profiling Python scripts.

Internal Continuous Assessment (ICA):

Students should perform minimum ten experiments based on above contents preferably conducted on Unix / Linux platform and a mini project based on above programming concepts.

- The assignments should test and develop students' practical proficiency and ability to use Python standard library modules and packages efficiently in writing effective code for varied applications scenarios & requirements, and use cases.
- Use of IDEs like PyCharm, Eclipse with PyDev, Jupyter Notebook for Interactive development and debugging of Python applications is highly recommended to enhance hands-on skills in Python Programming.
- Every assignment shall be performed under 3.x runtime environment configured using any of the following tools 1) pyenv 2) virtualenv 3) Anaconda

Text Book:

1. e-Resource : Python 2.7.16 documentation https://docs.python.org/2/
2. e-Resource : Python 3.10.5 documentation https://docs.python.org/3/
3. Programming in Python 3, Second Edition, Mark Summerfield, Addison-Wesley Professional, ISBN: 9780137129294

Reference Books:

1. Python9 Cookbook, Third Edition, David Beazley and Brian K. Jones, Shroff Publishers & Distributors Pvt. Ltd., ISBN :978-93-5110-140-6
2. Learning Python FIFTH EDITION Mark Lutz, O'Reilly Media, Inc., ISBN: 9781449355739
3. Programming Python (English) 4Th Edition Mark Lutz, O'Reilly Media, Inc., ISBN: 9780596158101
4. Testing Python, David Sale, Wiley India (P) Ltd., ISBN :978-81-265-5277-1

Walchand Institute of Technology, Solapur

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

22CEU3HU6T: Universal Human Values

Teaching Scheme	**Examination Scheme**
Lectures : 3 Lectures/week, 3 Credit	ESE : 60 Marks
	ISE : 40 Marks

Course Outcomes:

At the end of this course, students will be able to –

1. Appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
2. Develop a holistic perspective towards life and profession as well as towards happiness and prosperity based on a correct understanding of Human reality and the rest of Existence.
3. Appreciate the Universal Human Values and movement towards value-based living in a natural way.
4. Highlight ethical human conduct, trustful and mutually fulfilling human behavior, and mutually enriching interaction with Nature.

UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education [07 Hrs]

1. Understanding the need, basic guidelines, content, and process for Value Education
2. Self-Exploration–what is it? – it's content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations.
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations understanding and living in harmony at various levels.

UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself! [07 Hrs]

1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' –*Sukh* and *Suvidha*
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail.
6. Programs to ensure *Sanyam* and *Swasthya*

UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship [08 Hrs]

1. Understanding Harmony in the family – the basic unit of human interaction
2. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship
3. Understanding the meaning of Vishwas; Difference between intention and competence
4. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship
5. Understanding the harmony in the society (society being an extension of family):
Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family

UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence [08 Hrs]

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
3. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence

Text Books

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2
2. The teacher's manual: R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010

Reference Books

1. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted2008.
2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Common wealth Purblishers.
3. Sussan George, 1976, *How the Other Half Dies*, Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, *Energy & Equity*, The Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6.SubhasPalekar, 2000, *How to practice Natural Farming*, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, *Jeevan Vidyaek Parichay*, Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

Relevant websites, movies and documentaries

1. Value Education websites, http://uhv.ac.in,http://www.uptu.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology – the Untold Story
6. Gandhi A., Right Here Right Now, Cyclewala Productions
7. AICTE On-line Workshop on Universal Human Values Refresher Course-I Handouts
8. UHV-I handouts https://drive.google.com/drive/folders/16eOka8AoBpLGlCDajRvk4MXgfXQWzFCB?usp=sharing
9. UHV-II handouts https://drive.google.com/drive/folders/15eHkMVguzRBDrb65GFi7jMN6UEP5JEk1?usp=sharing

Walchand Institute of Technology, Solapur

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

22ETU4CC1T : Signals & Systems

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE : 60 Marks
Tutorial: 1 hr/week, 1 credit	ISE : 40 Marks
	ICA : 25 Marks

This course covers the fundamentals of signal and system analysis, focusing on representations of discrete-time and continuous-time signals (singularity functions, complex exponentials and geometrics, Fourier representations and Z transforms, sampling) and representations of linear, time-invariant systems.

Course Prerequisite:

Basic knowledge of Integration, Differentiation, Complex Numbers

Course Objectives:

1. To introduce the fundamental characteristics of signals and systems
2. To develop mathematical skills and solve problems involving convolution and sampling.
3. To introduce the process of sampling and reconstruction of a signal.
4. To impart the concept of the Fourier Series and Fourier Transform and its applications.
5. To introduce the concept of Z-Transform with ROC

Course Outcomes:

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

1. Analyze the operations on signals and systems using mathematics.
2. Analyze the behavior of continuous time and discrete time LTI systems using convolution.
3. Explain the process of sampling and reconstruction of a signal.
4. Compute coefficients and represent the spectral characteristic of signals using Fourier analysis.
5. Analyze signals and systems using Z-Transform.

SECTION– I

Unit 1: Signals and Systems: [10 Hrs]

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.

Unit 2: Continuous Time (CT) systems: [06 Hrs]

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: **[06 Hrs]**

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: Sampling: **[04 Hrs]**

Introduction, Representation of a Continuous- Time Signal by Its Samples, The Sampling Theorem, Reconstruction of a signal from its Samples using different methods (Interpolation, Zero order hold, low pass filter), The Effect of Under-sampling (Aliasing)

Unit 5: Fourier Analysis for Continuous-Time Signals and Systems: **[09 Hrs]**

Introduction, The Response of LTI Systems to Complex Exponentials, Fourier series, and Representation of Continuous-Time Periodic signals, Convergence of Fourier Series, Representation of Aperiodic Signals: The Continuous -Time Fourier Transform, Properties of Fourier Transform, Application of Fourier Transform in LTI systems.

Unit 6: Z-Transform: **[07 Hrs]**

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

Internal Continuous Assessment (ICA):

Internal Continuous Assessment consists of a minimum of eight tutorials based on the above contents.

Textbooks:

1. Signals and Systems A.V. Oppenheim and A. S. Wilsky, 2nd edition [Pearson Education]
2. Signals and Systems Simon Haykin and Barry Van Veen, 2nd edition [Wiley and Sons]
3. Signals and Systems, I. Ravi Kumar, PHI

Reference Books:

1. Signals and Systems Dr. S. Palani [Ane Books Pvt Ltd, New Delhi]
2. Signals and Systems by V. Krishnaveni and A. Rajeswari [Wiley India]
3. Signals and Systems by P. Ramesh Babu and R. Anand Natarajan [Scitech]

Walchand Institute of Technology, Solapur

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

22ETU4CC1T : Control Systems

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE : 60 Marks
Tutorial: 1 hrs/week, 1 credit	ISE : 40 Marks
	ICA : 25 Marks

Control systems are considered one of the major aspects of our growing technology. Every sector of the industry is linked with the control system in some or the other way.

A control system is an interconnection of components forming a system configuration that will provide the desired system response. The basis for the analysis of a system is the foundation provided by a linear system, which assumes a cause-effect relationship for the components of a system.

Prerequisite:

Concept of complex variables and Laplace transform.

Course Objectives:

1. To make student classify the control system and represent it mathematically.
2. To introduce various control system components used in feedback control system.
3. To make student understand time domain and frequency domain analysis to evaluate system performance.
4. To introduce student different methods to determine the system stability.
5. To introduce student different types of compensators & controllers.

Course Outcomes:

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

1. Classify the control system and represent it mathematically.
2. Explore different control system components of feedback control system.
3. Analyze system performance using time domain and frequency domain analysis.
4. Apply different techniques to determine the system stability.
5. Evaluate different compensators and controllers.

SECTION – I

Unit 1: Introduction and Mathematical modeling: [07 Hrs]

Open loop and Closed loop control systems, examples of control systems: Liquid level control system, missile launching and guidance system, Transfer function of closed loop system, Mathematical modeling of Electrical systems using R, L and C, Transfer function of RLC circuits.

Unit 2: System representation and components: **[07 Hrs]**

Block diagram representation and reduction techniques, Signal Flow Graph- Construction, Mason's Gain formula, Stepper motor-Working principle, construction, and applications.

Unit 3: Time response of systems: **[07 Hrs]**

Standard test signals, time response of first-order systems to step, ramp, and impulse input. Step response of second order system, time domain specifications, steady-state errors, and error constants of type0, type1, and type2 systems.

SECTION – II

Unit 4: Stability analysis & Root locus: **[08 Hrs]**

Concept of stability, absolute and conditional stability, relative stability, Routh – Hurwitz criterion for stability. Concept of root locus, construction of root locus, and stability analysis using root locus.

Unit 5: Frequency domain analysis: **[07 Hrs]**

Frequency domain specifications-bode plots, determination of frequency domain specifications and transfer function from the bode plot – phase ma rgin and gain margin-stability analysis from bode plots.

Unit 6: Compensators & Controllers: **[06 Hrs]**

Need of compensator, lag compensators, lead compensators and lag-lead compensator and their design in the frequency domain, proportional controllers, PI controllers and PID controllers

Internal Continuous Assessment (ICA): -

Minimum eight tutorials based on the above syllabus (At least one tutorial from each unit).

Textbooks:

1. Control Systems Engineering I. J. Nagrath & M Gopal New Age Publication (Fifth Edition)
2. Feedback & Control Systems. Schaum's Outline Series McGraw Hill
3. Automatic Control Systems B. C. Kuo PHI Publication
4. Control Systems Engineering, R. Anandanatrajan, P.Ramesh Babu - Scitech Publication.

Reference Books:

1. Modern Control Engineering K. Ogata Pearson Education
2. Principles of Control Systems S.C. Goyal & U. A. Bakshi Technical Publication, Pune.

Walchand Institute of Technology, Solapur

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

22ETU4CC4T : Analog Integrated Circuits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE : 60 Marks
Practical : 2 hrs/week, 1 credit	ISE : 40 Marks
	ICA : 25 Marks
	POE : 25 Marks

This course deals with the fundamentals of an Operational amplifier (Opamp), it's characteristics and specifications. These characteristics of Opamp from datasheets are studied. Linear and nonlinear applications are analyzed. Special regulators and PLL ICs are elaborated.

Course Prerequisite: This course requires knowledge of BJT and analysis of circuits using KVL & KCL. Knowledge of basic components R and C is required.

Course Objectives:

1. To make students understand AC, and DC characteristics of ideal & practical opamp and compare them.
2. To make students describe the frequency response of opamp
3. To make students analyze different linear and nonlinear applications of opamp
4. To make students design first and second-order filters and analyze oscillators & signal generators
5. To make students Design applications using voltage regulators, and timer ICs.

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

1. Describe the working, AC, and DC characteristics of ideal & practical opamp and compare them.
2. Describe the frequency response of opamp
3. Analyze different linear and nonlinear applications of opamp
4. Design first and second-order filters and analyze oscillators & signal generators
5. Design applications using voltage regulators, and timer ICs.

SECTION– I

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

Concept of Differential amplifier- DIBO, AC & DC analysis, Opamp 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: OP-AMP frequency response: [05Hrs]

Frequency Response of Opamp, High-frequency equivalent circuit, and compensation techniques. Slew rate consideration & its importance

Unit 3: General Linear applications of OP-AMP: **[08Hrs]**
Summing, scaling, and averaging amplifier, Instrumentation Amplifier, V to I and I to V converters, Op-Amp as differentiator and Integrator including the study of frequency response.

SECTION-II

Unit 4: Nonlinear applications of OP-AMP: **[07Hrs]**
Comparator- Basic, ZCD, Schmitt trigger, precision rectifiers, log-antilog amplifier, clipper & clamper.

Unit 5: Active filters & Oscillators: **[07Hrs]**
Basic filter definitions, Advantages of active filters, First and second order low pass and high pass Butterworth filters, astable multivibrator, Triangular wave generators using Op-Amp, Oscillators- principle, Phase shift, Quadrature oscillators.

Unit 6: Special ICS and its applications: **[07Hrs]**
Voltage regulators- 78xx, 79xx, LM317, LM337, IC 555 Timer- basic, astable, monostable.

Internal Continuous Assessment (ICA):
Internal Continuous Assessment (ICA) consists of a minimum of eight experiments from the following suggested list including a minimum of 20% experiments based on simulation tools.

Suggestive list of experiments: -
1. Measurement of parameters – Vio, Iio, IB 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, Saw tooth)
10. RC oscillator.
11. Op-Amp as Precision rectifier.
12. Op-Amp as Clippers and Clampers.
13. Implementation of first and second-order low-pass Butterworth filer.
14. Implementation of first and second-order high pass Butterworth filer.

Textbooks:

1. Op-Amps and Linear Integrated Circuits, Ramakant A. Gaikwad, PHI Learning Pvt. Ltd., Third and Fourth edition
2. Linear Integrated Circuits, D. Roy Choudhary, Shail B. Jain, New age International Publishers, Third edition

Walchand Institute of Technology, Solapur

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

22ETU4CC4T : Data Structures & Algorithms

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE : 60 Marks
Tutorial: 2 hrs/week, 1 credit	ISE : 40 Marks
	ICA : 25 Marks
	POE : 25 Marks

A data structure is a specific format for storing, organizing, and processing data. There are a variety of simple and advanced data structures available, all of which are designed to organize data for a specific purpose. Data structures make it simple for users to find and work with the data they need in the most efficient way possible.

Course Prerequisite:

This course requires the basics of C programming, data types, functions, arrays, structure, and pointers.

Course Objectives:

1. To Implement search algorithms
2. To describe and implement abstract data structures with associated operations.
3. To describe and implement sorting algorithms
4. To describe and implement traversal algorithms for non-linear data structures.
5. To compare given data structures on the time and space complexity of CRUD operations.

Course Outcomes:

On completion of the course, students will be able to:

1. Implement searching algorithms.
2. Execute abstract data structures with associated operations.
3. Implement sorting algorithms.
4. Execute traversal algorithms for non-linear data structures.
5. Compare given data structures on the time and space complexity of CRUD operations.

SECTION -I

Unit 1: Introduction: **[07 Hrs]**

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal, etc.; Analysis of an Algorithm, Asymptotic Notations, complexity analysis Time-Space trade-off. Searching: Linear Search and Binary Search Techniques complexity analysis of searching techniques.

Unit 2: Stacks: **[07 Hrs]**

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

Unit 3: Queues: **[08 Hrs]**

ADT queue, Types of Queues: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues: Algorithms and their analysis.

SECTION-II

Unit 4: Linked Lists: **[08 Hrs]**

Singly-linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from the linked list; Linked representation of Stack and Queue, Header nodes, doubly linked list, Circular Singly Linked Lists: its all operations and algorithms.

Unit 5: Trees & Graphs: **[06 Hrs]**

Basic Tree Terminologies, Different types of Trees: Binary Tree, Binary Search Tree its operations and complexity analysis, Threaded Binary Tree, AVL Tree, Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms, and analysis. Graph: Basic Terminologies and Representations, Graph search and traversal algorithms, and complexity analysis.

Unit 6: Sorting and Hashing: **[08 Hrs]**

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, basics of hashing, Different Hashing techniques, and collision resolution techniques.

Internal Continuous Assessment (ICA):

Students should perform a minimum of ten experiments based on the above contents preferably conducted on a Unix / Linux platform.

Suggestive list of Experiments.

1. Implementation of stack using an array.
2. Implementation of Queue using an array.
3. Implementation of circular Queue using an array.
4. Implementation of stack using the Linked list.
5. Implementation of Queue using the Linked list.
6. Implementation of a Circular Queue using the Linked list.
7. Implementation of the Singly Linked list.
8. Implementation of Josephus problem using Circular Linked list.
9. Find the Factorial of a given no, by defining a recursive function.
10. Fibonacci sequence implementation using recursive function.
11. Search elements from the list using linear search and Binary search methods.

12. Write the program to Sort the given list using the Bubble sort method.
13. Write the program to Sort the given list using the Selection sort method.
14. Write a program to Sort the given list using the Insertion sort method.

Textbooks:

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 Precise.

Walchand Institute of Technology, Solapur

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

22ETU4CC5P : Verilog HDL Programming

Teaching Scheme:	**Examination Scheme:**
Lecture: 2 hrs/week, 2 credits	ISE : 25 Marks
Practical: 2 hrs/week, 1 credit	ICA : 25 Marks
	POE : 50 Marks

This course introduces how to design, simulate and test digital logic circuits using hardware description languages Verilog HDL. It also introduces the CPLD and FPGA architectures used to implement the digital logic circuits.

Course Prerequisite:

Students shall have knowledge of Digital components, and combinational and sequential logic circuit design.

Course Objectives:

1. To make students learn EDA Tools for Verilog programming and simulation.
2. To make students design Verilog HDL modules for combinational logic circuits.
3. To make students design Verilog HDL modules for sequential logic circuits.
4. To acquaint students with CPLD and FPGA architecture.

Course Outcomes:

At the end of this course, Students will be able to,

1. Explain the different syntaxes of Verilog HDL language.
2. Analyze combinational logic circuits using Verilog HDL
3. Analyze sequential logic circuits using Verilog HDL
4. Describe the architecture and internal components of CPLD and FPGA.

Unit I- Hardware Modeling With The Verilog HDL [04 Hrs]

Hardware Encapsulation –The Verilog Module, Hardware Modeling Verilog Primitives, Descriptive Styles, Structural Connections, Behavioral Description in Verilog, Hierarchical Descriptions of Hardware, Structured (Top Down) Design Methodology, Arrays of Instances, Using Verilog for Synthesis, Language Conventions, Representation of Numbers.

Unit II- Logic System, Data Types, and Operators For Modeling In Verilog HDL [08 Hrs]

User-Defined Primitives, User-Defined Primitives – Combinational Behavior User-Defined Primitives –Sequential Behavior, Initialization of Sequential Primitives. Verilog Variables, Logic Value Set, Data Types, Strings. Constants, Operators, Expressions and Operands, Verilog Models for Gate Propagation Delay (Inertial Delay), Time Scales for Simulation, Verilog Models for Net Delay (Transport Delay), Module Paths and Delays, Path Delays and Simulation, Inertial Delay Effects and Pulse Rejection, Examples using Verilog.

Unit III- Behavioral Descriptions In Verilog HDL [08 Hrs]

Verilog Behaviors, Behavioral Statements, Procedural Assignment, Procedural Continuous Assignments, Procedural Timing Controls and Synchronization, Intra-Assignment, Delay-Blocked Assignments, Non-Blocking Assignment, Intra-Assignment Delay: Non-Blocking Assignment, Simulation of Simultaneous Procedural Assignments, Tasks, and Functions, Summary of Delay Constructs in Verilog, Examples using Verilog.

Unit IV- Switch-Level Models In Verilog [04 Hrs]

MOS Transistor Technology, Switch Level Models of MOS Transistors, Switch Level Models of Static CMOS Circuits, Alternative Loads and Pull Gates, and CMOS Transmission Gates. Bio-Directional Gates (Switches), Signal Strengths, and Wired Logic. Design Examples in Verilog.

Unit V- State Machines and Architecture of Commercial Devices [06 Hrs]

State machine using Moore and Mealy model, Verilog HDL model using a state machine for sequence detector, multiplier using ADD and SHIFT method, CPLD Architecture, Xilinx XC9500, FPGA organization, and architecture, Altera Flex 10k

Internal Continuous Assessment (ICA):

Students should perform a minimum of eight experiments based on the above contents using EDA tools and a mini project based on the above concepts.

Suggested List of Experiments:

1. Design of half adder and full adder using Verilog HDL.
2. Design of 4-bit adder using structural style modeling using Verilog HDL.
3. Design of carry look-ahead adder using Verilog HDL.
4. Design of code converters using Verilog HDL.
5. Design of comparators using Verilog HDL.
6. Design of encoder and decoder using Verilog HDL.
7. Design of multiplexer and demultiplexer using Verilog HDL.
8. Design of flip flops using Verilog HDL.
9. Design of universal shift register using Verilog HDL.
10. Design of asynchronous and synchronous counters using Verilog HDL.
11. Design of sequence detector using state machine using Verilog HDL.
12. Frequency multipliers or dividers using Verilog HDL.
13. Design of ALU using Verilog HDL.
14. Design of RAM with read-write control using Verilog HDL.
15. Writing test bench for adder, and encoder using Verilog HDL.
16. Implement any Verilog HDL module on CPLD or FPGA

Text Books:

1. Nazeih M.Botros, HDL Programming VHDL And Verilog, Dreamtech Press
2. Nazeih Botros. HDL with Digital Design: VHDL and Verilog, Mercury Learning And Information LLC. ISBN: 978-1-938549-81-6
3. M.D.CILETTI, Modeling, Synthesis and Rapid Prototyping with the Verilog HDL, Prentice-Hall.
4. M.G.ARNOLD, Verilog Digital – Computer Design", Prentice-Hall (PTR).
5. Fundamentals of Digital logic Design with VHDL, Brown,Vranesic – McGraw-Hill (2ndedition).
6. Digital Systems Design using Verilog, Charles H. Roth, Lizy Kurian John, Byeong Kil Lee-Cengage Learning.

Reference Books:

1. Digital Design Principles and Practices, John F. Wakerly, Printice Hall, 3rd Edition.
2. Datasheets of CPLDs and FPGAs.

Walchand Institute of Technology, Solapur

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

22GEU4MC2T: Environmental Studies

Teaching Scheme:	**Examination scheme:**
Lecture: 1 hr. /week	ESE: 50 Marks

The need of sustainable development is a key to the future mankind. continuing the problems of all types of pollutions, loss of forests, solid waste disposal, degradation of environment, issues like economic productivity and national security, global warming, ozone layer depletion and loss of biodiversity have made everyone aware of environmental issues. No citizen of the earth affords to be ignorant of environmental issues. Environmental management has captured the attention of health care managers. Managing environmental hazard has becomes very important. It is now more critical than ever before for mankind as a whole to have clear understanding of environmental concerns and to follow sustainable development practices. Destructions of habitats, over-use of energy resources and environmental pollution have been found to be responsible for the loss of a large number of life-forms. It is feared that a large proportion of life are which may get wiped out in the near future

Course Prerequisite:

This course requires knowledge of surroundings, resources, ecosystem, biodiversity and pollution

Course Objectives:

1. Recognize & understand major concepts in Environmental studies & demonstrate in depth understanding of environment.
2. Understand the interdisciplinary approach to complex Environmental problems using basic tools of the natural & social sciences including Biology, Chemistry, Physics, Economics, Political sciences, Laws, Electronics etc.
3. Develop analytical skills, ability to critically evaluate the science & policy ramifications of diverse energy portfolios on air, water & food quality climate, forests etc.

Course Outcomes:

At the end of course student is able to-

1. Describe the natural environment and its relationships with human activities.
2. Explain the ethical means and technological methods for sustainable management of environmental systems.
3. Explain social, economical and legal policies involved in the resolution of environmental problems.

Unit 1: Nature of Environmental studies **[2 Hrs]**

Definition, scope and importance.

Multidisciplinary nature of environmental studies, Need for public awareness.

Unit 2: Natural resources and associated problems. **[8 Hrs]**

a) Forest, resources, use and over-exploration, disforestation, timber extraction, mining, dams and their effects on forests and tribal people.
b) Water resources, Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems
c) Mineral resources. And usage and exploitation, environmental effects of extracting and using mineral resources.
d) Food resources, world food problem, changes caused by agriculture effects of modern agriculture, fertilizer-pesticide problems
e) Energy resources, growing energy needs renewable and non-renewable energy sources, use of alternate energy sources
f) Land resources, land as a resource, land degradation man induced landslides, soil erosion and decertification
g) Role of an individuals in conservation of natural resources
h) Equitable use of resources for sustainable lifestyle

Unit 3: Ecosystems **[8 Hrs]**

Concept of an ecosystem

a) Structure and function of an ecosystem
b) Producers, consumers and decomposers
c) Energy flow in the ecosystem
d) Ecological succession
e) Food chains, food webs and ecological pyramids

Introduction types, Characteristics features, structure and function of the ecosystem: -

I. Forest ecosystem
II. Grassland ecosystem
III. Desert ecosystem
IV. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 4: Biodiversity and its conservations **[8 Hrs]**

a) Introduction-Definition, genetic, species and ecosystem diversity
b) Biogeographically classification of India
c) Value of biodiversity consumptive use, productive use, social, ethical aesthetic and option values
d) Biodiversity at global, national and local levels
e) India as a mega-diversity nation
f) Western Chat as a bio-diversity region
g) Hot –spot of biodiversity
h) Threats of biodiversity, habitual loss, poaching of wildlife, man wildlife conflicts
i) Endangered and endemic, species of India

j) Conservation of biodiversity, in-situ and Ex-situ conservation of biodiversity

Unit 5: Environmental Pollutions **[8 Hrs]**

Definitions: - Causes, effects and control measures of

a) Air Pollution
b) Water pollution
c) Soil Pollution
d) Marine pollution
e) Noise pollution
f) Thermal pollution
g) Near hazards
h) Solid waste Management, causes effects and control measures of urban and Industrial wastes
i) Role of an individual in presentation of pollution
j) Pollution case studies
k) Disaster management: Floods, earthquake, cyclone and landslides, Tsunami

Unit 6. Social issues and the Environment **[8Hrs]**

a) From Unsustainable to Sustainable development
b) Urban problems related to energy
c) Water conservation, rain water harvesting, watershed management
d) Resettlement and rehabilitation of people, its problems and concerns
e) Environmental ethics, issue and possible solutions
f) Climate change, Global warming, acid rain, Ozone layer depletion, nuclear accidents and holocaust.
g) Consumerism and waste products

Unit 7. Environmental Protection **[8Hrs]**

Environment Protection act

a) Air (prevention and control of Pollution act)
b) Water (prevention and control of Pollution act)
c) Wildlife Protection act
d) Population growth and human health, human rights

Reference Books:

1. Erach Bharucha (2013): Textbook of Environmental Studies for undergraduate courses, second Edition (2013).
2. P. S Verna and V.K. Agarwal, 1983. Environmental biology, S. Chand Publications, New Delhi.
3. https://www.google.co.in/ images
4. https://envfor.nic.in/legis/legis.html
5. Dr Prakash Sawant (2009) “Environment studies” Fadake Publisher Kolhapur
6. Dr S. D Kadam (2005) “Human, Environment and Pollution” Fadake Publisher Kolhapur
7. Environment studies- University Press, Solapur University, Solapur

8. Erach Bharucho-“Environmental Studies” UGE Press New Delhi
9. Dr J S Samant (2005)-“Environmental Studies” Shivaji University press
10. Bharucha, E. (2004): Textbook for environmental studies for undergraduate students of all branches of higher education. University Grants Commission (UGC), New Delhi pp 249-286.