WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(AN AUTONOMOUS INSTITUTE)

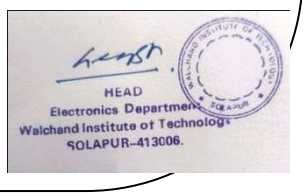
Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University, Solapur

CHOICE BASED CREDIT SYSTEM (CBCS)

Structure and Syllabus
for
S. Y. B.Tech. (Sem III & Sem IV)
Electronics & Computer Engineering

W.E.F. 2023-24

V0.5



Electronics and Computer Engineering Department

Department Vision

To be a distinguished center for nurturing the holistic development of competent young engineers in the Electronics and Information Technology fields

Department Mission

1. To inculcate and stimulate Electronics & Computer 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 Computer Engineering
Undergraduate Program
Program Educational Objectives (PEOs)

Graduate will -

1. Have a successful professional career in Electronics & Information Technology fields
2. Leverage his fundamental knowledge to pursue higher education and will continue his professional development in Electronics & Information Technology fields
3. Exhibit professional ethics, team spirit and effective communication skills to be successful leader and manager with a holistic approach.
4. Be sensitive to ethical, societal & environmental issues while conducting his professional work.

Program Outcomes (POs)

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)

1. **Algorithms :** Graduate will able to develop, realize and validate algorithms for different electronic systems and programming applications
2. **Systems:** Graduate will able to develop, implement and test different electronic systems and computer applications
3. **Self Learning:** Graduate with his sound fundamentals is prepared to comprehend applications of the Electronics and Computer engineering through self learning mode

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	Humanities and Social Sciences
NPTEL	National Program 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	1	E	C	U/P	2	C	C	1	T / L
Year of Syllabus revision		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

Program Code EC	Electronics and Computer Engineering
Course Types	
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 Program Code:

21ECU1BS1T	Engineering Physics (Group A)

Walchand Institute of Technology, Solapur

Structure of S.Y. B. Tech. Electronics and Computer Engineering
(W.E.F. 2023-24)
Semester III

Course Code	***Theory Course Name***	***Engagement Hours***			***Credits***	***FA***	***SA***		
		L	***T***	***P***		***ESE***	***ISE***	***ICA***	***Total***
22ECU3BS1T	Applied Mathematics	3	_	_	3	60	40	_	100
22ECU3BS1A	Applied Mathematics Tutorial	_	1	_	1	_	_	25	25
22ECU3CC2T	Analog Electronic Circuits	3	_	_	3	60	40	_	100
22ECU3CC3T	Analog and Digital Communication	3	_	_	3	60	40	_	100
22ECU3CC4T	Digital Techniques	3	_	_	3	60	40	_	100
22CEU3HU6T	Universal Human Values	3	_	_	3	60	40	_	100
Sub Total		**15**	**1**	**_**	**16**	**300**	**200**	**25**	**525**
Course Code	***Laboratory Course Name***								
						ESE			
						POE	***OE***		
22ECU3CC2L	Analog Electronic Circuits	_	_	2	1	50		_	25	75
22ECU3CC3L	Analog and Digital Communication	_	_	2	1	_	–	_	25	25
22ECU3CC4L	Digital Techniques	_	_	2	1	_	_	_	25	25
22ECU3CC5P	Object-Oriented Programming with C++	2	_	2	3	50	–	25	25	100
22ECU3CC7P	Software Simulation Tools	2	_	2	3	_	25	_	25	50
Sub Total		**4**	**_**	**10**	**9**	**125**		**25**	**125**	**275**
Grand Total		**19**	**1**	**10**	**25**	**425**		**225**	**150**	**800**

Walchand Institute of Technology, Solapur

Structure of S.Y. B. Tech. Electronics and Computer Engineering
(W.E.F. 2023-24)
Semester IV

Course Code	*Theory Course Name*	*Engagement Hours*			*Credits*	*FA*	*SA*		
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	*Total*
22ECU4CC1T	Digital Signal Processing	3	_	_	3	60	40	_	100
22ECU4CC2T	Control Systems	3	_	_	3	60	40	_	100
22ECU4CC2A	Control Systems Tutorial	_	1	_	1	_	_	25	25
22ECU4CC3T	Computer Networks	3	-	_	3	60	40	-	100
22ECU4CC4T	Microcontrollers	3	_	_	3	60	40	_	100
22ECU4CC5T	Data Structures	3	_	_	3	60	40	_	100
Sub Total		**15**	**1**	**_**	**16**	**300**	**200**	**25**	**525**

Course Code	*Laboratory Course Name*									
						ESE				
						POE	*OE*			
22ECU4CC1L	Digital Signal Processing	_	_	2	1	_	_	_	25	25
22ECU4CC3L	Computer Networks	_	_	2	1	_	_	_	25	25
22ECU4CC4L	Microcontrollers	_	_	2	1	50	_	_	25	75
22ECU4CC5L	Data Structures	_	_	2	1	_	25	_	25	50
22ECU4CC6P	Programming with Python	2	_	2	3	50	_	25	25	100
Sub Total		**2**	**_**	**10**	**7**	**125**		**25**	**125**	**275**
Grand Total		**17**	**1**	**10**	**23**	**425**		**225**	**150**	**800**

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

Course Code	**Theory Course Name**	**Hrs./week**			**Credits**	**FA**	**SA**		
		L	**T**	**P**		**ESE**	**ISE**	**ICA**	**Total**
22GEU4MC2T	Environmental Studies	1	_	_	_	50	_	_	50

- ***Notes:***
    1. Student shall study and pass Environmental Studies course in Second Year to become eligible for award of degree.
    2. Batch size for the practical / tutorial shall be of 20 students. On forming the batches, if the strength of remaining students exceeds 9, then a new batch shall be formed.
    3. Internal Continuous Assessment (ICA) shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, and laboratory books and their interaction and attendance for theory and lab sessions as applicable.

Walchand Institute of Technology,Solapur

S.Y. B. Tech. (Electronics & Computers) Semester-III

22ECU3BS1T APPLIED MATHEMATICS

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits
Tutorial –1 Hour / week, 1 Credit

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

This course includes mathematical theory and concepts required by Electronics engineers. 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 provides 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 different statistical test for making analysis of the given data.

Course Prerequisite:
Fundamentals of trigonometry, differentiation, integration, partial fraction, sum of sequence and methods of solving definite integrations, basics of statistics and probability theory

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Course Objectives:

1. To introduce to student statistics and probability distributions
2. To introduce to student method of solving higher order linear differential equations
3. To make student understand Z transform and its properties
4. To introduce to student Laplace and inverse Laplace transforms and make him analyze electrical circuits using it.
5. To introduce to student Fourier Transform.

Course Outcomes:
After completing this course, student shall able to –

1. Compute measures of central tenancy, probability distribution and apply different statistical tests.
2. Solve higher order linear differential equations related to electrical circuit theory.
3. Solve problems on Z transform and explain its properties
4. Apply Laplace and inverse Laplace transforms for analysis of simple electrical circuits.
5. Express the functions as Fourier integral and compute the Fourier transform.

SECTION-I

Unit 1 Elements of Statistics No. of lectures-07

Elements, central tendency and spread, Karl Pearson's coefficient of correlation and lines of regression, conditional probability, random variable, probability distributions Binomial, Poisson, Normal distribution.

Unit 2- Linear Differential Equations with Constant Coefficients No. of lectures-07

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

Unit 3– Z-Transform No. of lectures-07

Introduction, Z-Transform of standard sequence, properties of Z-transform – linearity, change of scale, shifting property, multiplication by k, division by k, inverse Z-transform –power series method, partial fraction method

SECTION II

Unit 4– Laplace Transform No. of lectures-07

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, Laplacetransform of periodic functions, unit step functions and unit impulse functions

Unit 5– Inverse Laplace Transform No. of lectures-07

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: Fourier Transform No. of lectures-07

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

- **Internal Continuous Assessment (ICA)**
  ICA consists of minimum one assignment based on each unit

- **Textbooks:**
  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. Iyengar, Laxmi Publications, Delhi.

4. Advanced Engineering Mathematics, Kreyzig-John Wiley & SMS, New York.
5. Signals and systems -by Alan v. Oppenheim, Alans. Willsky, PHI Publications.

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

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Walchand Institute of Technology, Solapur

S. Y. B. Tech (Electronics and Computer Engineering) Semester-III

22ECU3CC2T ANALOG ELECTRONIC CIRCUITS

Teaching Scheme	**Examination Scheme**
Lectures– 3 Hours/week, 3 Credits	**ESE** - 60 Marks
Practical– 2 Hours/week, 1 Credit	**ISE** - 40 Marks
	ICA - 25 Marks
	POE - 50 Marks

This core course provides essential fundamental knowledgeto the student to understand working of electronic devices, their analysis and designing of electronic applications using these electronic devices. It also covers design and analysis applications IC 555 timer and IC 741.This is one of the foundation courses which is vital for students to comprehend working of complex electronic circuits and systems

Course Prerequisite:

Student need to complete an introductory course in basic electronics which includes basic knowledge of diode, rectifiers, BJT and different BJT configuration. Student is expected to apply basic electrical theorems such as Kirchhoff's current law and Thevenin's theorem in electrical circuit to simplify its analysis.

Course Objectives:

1. To make student analyze performance of different filter circuits and design unregulated dc power supply.
2. To introduceneed of biasing, simplification of BJT circuit and its ac & dc analysis.
3. To make student understand principles, configurations and specifications of ideal and practical op amp and applications of op amp.
4. To introduce different types of Butterworth filters and various issues in its designing.
5. To introduce IC 555 timer and its configuration as different pulse generating circuits.

Course Outcomes:

After completing this course, student shall be able to -

1. Analyze performance of different filter circuits connected to rectifiers and design unregulated dcpower supply using different filter circuit.
2. Design appropriate biasing circuit, construct simplified small signal equivalent circuit using h-model and analyze both ac and dc performance of BJT application.
3. Compare performance of an ideal and practical op amp and evaluate different opamp applications.
4. Differentiatebetween passive and active filters and design active Butterworth filters for specific bandwidth and passband gain.
5. Design pulse generating circuits using IC555 timer.

SECTION-I

Unit 1- Design of Unregulated Power Supply No of lectures – 06

Review of Bridge rectifier

Analysis of capacitor, inductor and, LC filter connected to bridge rectifier.

Design of unregulated DC power supply using bridge rectifier&mentioned filters

Unit 2- Bipolar Junction Transistor No of lectures – 08

BJT biasing,DC load line, operating point, thermal runaway, bias stabilization, generalized equation for finding stability factor of biasing circuit.

Analysis of voltage divider biasing method with expression for stability factor.

Small signal analysis of BJT using hybrid model, simplification of BJT circuit using h-model, analysis of BJT amplifier for determination of Av, Ai, Ri, Ro using h-model.

BJT application as single stage common emitter amplifier and switch.

Design of single stage CE amplifier

Unit 3- Op Amp Fundamentals No of lectures – 07

Opamp- block diagram, parameters, ideal opamp, equivalent circuit of op amp, open loop opamp circuits

Practical opamp- input offset voltage, input bias current, total output offset voltage,offset minimization, common mode configuration, common mode rejection ratio, slew rate, open loop frequency response.

SECTION-II

Unit 4- Linear Applications of Op Amp No of lectures – 08

Inverting- non-inverting amplifier, adder, subtractor, summing- scaling - averaging amplifier, instrumentation amplifier.

V to I converter- floating and grounded load, I to V converter, integrator, differentiator, basic comparator, comparator characteristics, zero crossing detector, peak detector.

Schmitt trigger

Unit 5- Active filters using Op Amp No of lectures – 07

Active filter's introduction, first order low pass Butterworth filter, second order low pass Butterworth filter, first order high pass Butterworth filter, second order high pass Butterworth filter, wide and narrow band pass filters.

Unit 6- The555 Timer No of lectures – 06

IC 555- pin diagram, internal block diagram

IC 555 connected as astable multivibrator-its operation,derivation of frequency&duty cycle, design of astable multi.

Application of astable multivibrator- assquare wave generator.

IC 555 connected as monostable multivibrator, analysis for pulse width,

Application of monostable as - timer circuit, power ON delay circuit, frequency divider

- **Internal Continuous Assessment (ICA):**

ICA shall consist of minimum eight experiments and a small project based upon-

1. Design and analysis of unregulated dc power supply
2. Analysis of single stage CE amplifier and its frequency response.
3. Inverting and non-inverting amplifier using IC 741.
4. Adder and subtractor using IC 741.
5. Design and analysis of first order Butterworth filter.
6. Comparator and zero crossing detector using IC 741
7. Design of timer circuit using IC555.
8. Analysis of astable multivibrator using IC 555.

Mini- project- One mini project in a group of 4 students.

- **Textbooks:**

1. Op-Amps and Linear Integrated Circuits, Ramakant A. Gayakwad, PHI Learning Pvt. Ltd., Fourth edition
2. Electronic Devices and Circuits, Allen Mottershed, PHI Publication
3. Electronic Devices and Circuits, David A. Bell, Oxford University, Press India, Fifth edition.

- **Reference Books:**

1. An introduction to Operational Amplifiers, Lucas M. Faulkenberry, John Wiley & Sons, Second edition.
2. Operational Amplifiers, G.B. Clayton, English Language Book Society, Second edition.
3. Electronic Devices and Circuits, Robert Boylestad , Prentice Hall International.
4. Electronic Circuit Design, S.N. Talbar, T.R. Sontakke, Sadhu Sudha Publications.

Walchand Institute of Technology,Solapur

S. Y. B. Tech (Electronics and Computer Engineering) Semester-III

22ECU3CC3T ANALOG AND DIGITAL COMMUNICATION

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits
Practical –2 Hours / week, 1 Credit

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

This is a first course on electronic communication which intends to introduce the concepts of analog and digital communication systems, and to equip students with various issues related to analog and digital communication such as modulation, demodulation, transmitters and receivers and noise performance. Also, Error control techniques along with spread spectrum and multiple access techniques.

Course Prerequisite:

A basic knowledge of signals and systems is desirable. Student shall have mathematical background of trigonometry; student shall also have background of analog electronic circuit design and digital technique.

Course Objectives:

1. To make student learn about theoretical aspects of analog and digital communication system and compute spectra of modulated signals.
2. To introduce to student sampling theorem & pulse modulation techniques.
3. To make student understand different carrier modulation and detection techniques along with their performance analysis.
4. To make student learn about error detection and correction to produce optimum receiver.
5. To make student simulate some of above systems using suitable simulation tool.

Course Outcomes:

After completing this course, student shall be able to –

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth.
2. Analyze and compare different digital modulation schemes for their efficiency and bandwidth
3. Compute source and error control coding.
4. Can describe various optimum receiver techniques
5. Can describe need for multiple access techniques and can compare them.

SECTION-I

Unit 1-Analog Communication No of lectures –08

Introduction to communication systems, modulation, types – need for modulation, principles of amplitude modulation systems- DSB, SSB and VSB modulations, angle modulation, representation of FM and PM signals, spectral characteristics of angle modulated signals, noise: source of noise - external noise- internal noise- noise calculation

Unit 2– Pulse and Data Communication No of lectures – 07

Digital communication system blocks, sampling theory, Nyquist rate, aliasing, PAM, PTM, PCM-generation and reconstruction, quantization, PCM bandwidth, ISI, eye diagram, differential pulse code modulation, adaptive differential pulse code modulation, delta modulation, delta-sigma modulation, adaptive delta modulation

Unit 3– Source and Error Control Coding No of lectures – 07

Discrete message and information content, entropy, information rate, source coding to increase average information- Shannon Fanon coding, Huffman coding, Shannon's theorem, channel capacity, capacity of a Gaussian channel, bandwidth –S / N trade off, error control coding, linear block codes, cyclic codes – ARQ Techniques

SECTION II

Unit 4– Digital Carrier Modulations and Detection No of lectures – 07

Binary ASK, FSK, PSK, DPSK,QPSK, Wideband FSK, QAM- methods of generations, signal space representation, spectrum and detection. Comparison of various digital communication modulation.

Unit 5– Baseband Transmission and Optimal Reception of Digital Signal: No of lectures – 06

A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception

Unit 6- Spread Spectrum and Multiple Access Techniques No of lectures – 07

Introduction, pseudo-noise sequence, DS spread spectrum with coherent binary PSK, processing gain, FH spread spectrum, multiple access techniques – wireless communication, TDMA and FDMA, wireless communication systems, source coding of speech for wireless communications

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- **Internal Continuous Assessment (ICA)**

  ICA shall consist of minimum eight experiments and a small project based on –

  1. Spectrum analysis of modulation using spectrum analyzer
  2. AM modulation & demodulation techniques
  3. Single sideband techniques
  4. Angle modulation & demodulation techniques
  5. Radio receivers
  6. Noise measurement
  7. Sampling theorem
  8. Pulse Modulation (PAM, PWM, PPM)
  9. PCM, DPCM, DM, ADM
  10. ASK, FSK, PSK, BPSK
  11. Hamming code and cyclic redundancy code
  12. Convolution code

- **Text Books:**
  1. Taub's Principles of Communication Systems, Herbert Taub, Donald L Schilling, Goutam Saha, 4th edition, McGraw Hill Education (India) Pvt. Ltd.
  2. Digital Communication Systems Design, Martin S. Roden, Prentice- Hall International Inc

3. Communication Systems, Analog & Digital, R P Sing, S D Sapre, 2nd Edition, Tata McGraw Hill Education Pvt. Ltd
4. Communication Electronics –Principles and Applications, Lois E. Frenzel, Tata McGraw Hill Education Pvt. Ltd; Third edition.

- **Reference Books:**
  1. Digital Communication, Simon Haykin, John Wilely & Sons (Asia) Pvt. Ltd.
  2. Digital Communications, Fourth Edition, John G. Prokis, McGraw Hill International Edition
  3. Digital Communications Fundamentals and Applications, Bernard Skalar, 2nd Edition, Pearson Education

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Walchand Institute of Technology, Solapur

S.Y B. Tech (Electronics and Computer Engineering) Semester-III

22ECU3CC4T DIGITAL TECHNIQUES

Teaching Scheme	**Examination Scheme**
Lectures –3 Hours/week, 3 Credits	**ESE–**60 Marks
Practical –1 Hours/week, 1 Credit	**ISE-** 40 Marks
	ICA–25 Marks

Digitization has spread to a wide range of applications, including information (computers), telecommunications, control systems and signal processing. This first course on digital electronics provides a thorough understanding of digital system design. The course intends to cover combinational and sequential circuit analysis and design. The course also introduces the finite state machine structures and state machines approach to solve problems. The course covers introduction to programmable logic device and programmable gate arrays.

Course Prerequisite:

Student shall have knowledge of binary number system and logic gates. Student shall also have knowledge about basic electronics devices – diodes, BJT and FET

Course Objectives:

1. To introduce to student concepts of digital logic circuits like number systems, Boolean algebra, operation of various gates etc. along with their applications.
2. To make student design combinational and sequential circuit.
3. To introduce the student concept of synchronous state machines.
4. To make student understand programmable logic devices.

Course Outcomes:

After completing this course, student shall able to –

1. Illustrate underlying concepts of digital logic circuits and their applications.
2. Design combinational and sequential circuits.
3. Apply the concept of synchronous state machines for solving design problems.
4. Use programmable logic devices for designing logic circuits.

SECTION I

Unit 1: Number system and codes No of lectures – 05

Review of number system, BCD codes, Gray code, Seven segment, Representation of signed numbers, Error detecting and correcting codes - parity codes and hamming code, Introduction to logic families, Parameter definitions - noise margin, power dissipation, voltage andfan-in, fan-out, propagation delay, typical values for TTL,CMOS & ECL

Unit 2 – Boolean algebra and logic simplification No of lectures –06

Theorems of Boolean algebra, DeMorgan's law, Standard representation of logic functions – SOP, POS and canonical forms, Simplification of logic functions - Karnaugh maps, NAND and NOR Implementations, Circuit timing – timingdiagram, propagation delay, timing hazards – static and dynamic

Unit 3- Combinational circuit design: No of lectures-10

Design and analysis procedure, Design of adder, subtractor and binary parallel adder, code conversion, Design of multiplexers, demultiplexers, encoders, decoders and their applications, Design of magnitude comparators and parity circuits, parity generatorand checker.

SECTION II

Unit 4 - Sequential circuit design No of lectures – 10

Latches - SR latch; Flip-flops: SR, JK, D, T and Master-slave, triggering of flip-flops, Flip-flop characteristic equations and excitationtables. Flip-flop applications –counters, registers

Unit 5 - Synchronous state machine design No of lectures – 07

State machine structures - Mealy and Mooremachines, Design of state machines- state table, state assignment, transition/excitation table, excitation mapsand equations, logic realization, Design of sequence detectors.

Unit 6- Programmable logic devices No of lectures – 04

PLDs, PROMs & applications, Programmable logic arrays & applications , Programmable array logic & applications

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- **Internal Continuous Assessment (ICA)**
  ICA *shall consist of minimum ten experiments based upon-*

1. Verification of truth table of basic and universal gates.
2. Implementation of universal gates using basic gates.
3. Code conversion using logic gates: binary to gray, gray to binary, binary to excess-3.
4. Implementation of any one combinational circuit using multiplexer.
5. Implementation of any one combinational circuit using de-multiplexer.
6. Design a n-bit comparator using logic gates.
7. Perform 1's and 2's complement adder/subtraction using 4 bit parallel adder.
8. Convert J-K flip-flop to T (Toggle) flip-flop and D (Data) flip-flop.
9. Design and implement mod-n asynchronous counter.
10. Design and implement mod-n synchronous counter.
11. Design and implement a 4 bit bi-directional shift register.

- **Text books:**

1. Digital Fundamentals, Thomas L. Floyd, Global Edition-Pearson Education Limited
2. Fundamental of Digital Circuits- Anand Kumar- Prentice Hall of India Pvt. Ltd.
3. Digital Design, M. Morris Mano, PHI, Third edition
4. Modern Digital Electronics, R. P. Jain , TMH, Third edition

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- **Reference books:**

1. Digital Design: Principles and Practices, Wakerly John F., Pearson Education, Forth edition
2. Digital Principles & Applications, Leach, Malvino, Sixth edition

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Walchand Institute of Technology,Solapur

S. Y. B. Tech (Electronics and Computer Engineering) Semester-III

22ECU3CC5P OBJECT ORIENTED PROGRAMMING WITH C++

Teaching Scheme:
Lectures- 2 Hours / week, 2 Credits
Practical–2 Hours / week, 1 Credit

Examination Scheme
ISE- 25 Marks
ICA - 25 Marks
POE- 50 Marks

This course provides an introduction to object-oriented software development through C++. It's an extension to C with number of features added. This course introduces concept of class and object. The fundamental feature of OOP's is 'data hiding' which is implemented using class. The course also introduces other features of C++ like data abstraction, data encapsulation, polymorphism, inheritance, and message passing.

Course Prerequisite:

Student has completed a course in 'C programming' and shall have an adept knowledge of programming with C.

Course Objectives:

1. To introduce to student features of object oriented language.
2. To make student understand concept of data hiding implemented using class.
3. To introduce to student concept of constructors and destructors.
4. To make student understand different types of inheritance.
5. To make student understand compile type polymorphism and run time polymorphism.
6. To make student analyze a given problem and implement by using suitable features of C++.

Course Outcomes:

After completing this course, student shall able to -

1. Compare C and C++ in terms of data hiding and class.
2. Design and implement object-oriented programming paradigms using C++.
3. Implement different types of constructors, inheritance and polymorphism.
4. Analyze a given problem and implement by using suitable features of C++.

SECTION-I

Unit 1- Brief review of C No. of Lectures – 04

Overview of C programming- token, data types, variables, operators and operator precedence, formatted I/O functions, control structures, arrays: declaration and element access, definition and declaration of structures and unions, member access operator; pointer to basic data types, pointer arithmetic.

Unit 2 – Introduction to C++ No. of Lectures – 04

Introduction to object-oriented programming, features: class, object, encapsulation, data abstraction, inheritance, polymorphism, data hiding; difference between C and C++, structure of

C++ program, tokens, keywords, identifiers & constants, operators in C++, scope resolution operator; declaration of functions, stream IO functions in C++, inline functions, concept of function overloading.

Unit 3- Classes and Object No. of Lectures – 04

Declaration of a class, defining member functions, creating objects, concept of public, private and protected visibility labels, private member functions, arrays within a class, static data members, static member functions, inline functions, friend functions, friend class

Unit 4-Constructors and Destructors No. of Lectures – 05

Structure of a constructor, types of constructors: default constructor, parameterized constructor, default argument constructor, copy constructor, dynamic constructor; destructors

SECTION II

Unit 5–Inheritance No. of Lectures – 05

Structure of inheritance, defining a derived class, types of derivation: public, private and protected; types of inheritance: single, multilevel, multiple, hierarchical and hybrid; virtual base class, constructors in derived class

Unit 6-Function Overloading and Operator Overloading (Compile Time Polymorphism) No. of Lectures – 04

Concept of compile time polymorphism, function overloading, defining operator overloading, overloading unary operators, overloading binary operators, overloading binary operators using friends, manipulation of strings using operators

Unit 7–Polymorphism No. of Lectures – 03

Types of polymorphism: compile time polymorphism and run time polymorphism, pointers to objects, this pointer; pointer to derived class, virtual functions, virtual constructors and destructors

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- **Internal Continuous Assessment (ICA)**

  ICA shall consist of minimum ten experiments based upon above curriculum containing-

  1. Program using member function in a class using concept of private, public, and protected data members
  2. Program using inline function
  3. Program using function overloading.
  4. Program using constructor.
  5. Program using destructors.
  6. Program to access private data of class using friend function.
  7. Program on operator overloading
  8. Program on single inheritance.
  9. Program on multilevel inheritance.
  10. Program using virtual base class with keyword virtual.
  11. Program using virtual function to represent polymorphic features.
  12. Project based learning.

- **Textbooks:**
    1. Object Oriented Programming with C++ ,E. Balagurusamy, Tata McGraw Hill Publication, New Delhi
    2. Object – Oriented Programming in C++, Rajesh K. Shukla, Wiley Publications, New Delhi.
    3. Object – Oriented Programming with C++, Rohit Khurana, 2nd Edition, Vikas Publications.
- **Reference Books:**
    1. Programming with C++, Ravichandran D, 2nd Edition, Tata McGraw Hill Publication and New Delhi.
    2. Turbo C++ Techniques and application, Scoot, Robert Ladd, BPB Publication, New Delhi
    3. Mastering C++, K.R. Venugopal, T. Ravishankar, Rajkumar, Tata McGraw Hill Publication, New Delhi.

Walchand Institute of Technology, Solapur

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

22CEU3HU6T: UNIVERSAL HUMAN VALUES

Teaching Scheme

Lectures: 3 Lectures/week, 3 Credits

Examination Scheme

ESE- 60 Marks

ISE- 40 Marks

Course Outcomes:

Upon completion 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 holistic perspective towards life and profession as well as towards happiness and prosperity based on a correct understanding of the 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 No. of Lectures-07

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self-Exploration–what is it? - its 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!

No. of Lectures-07

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*36

Unit 3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship No. of Lectures-08

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 No. of Lectures-08

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*, Commonwealth 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.Subhas Palekar, 2000, *How to practice Natural Farming*, Pracheen(Vaidik) KrishiTantraShodh,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 InternationalPublishers.

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 UntoldS tory
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

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Walchand Institute of Technology,Solapur

S. Y. B. Tech (Electronics and Computer Engineering) Semester-III

22ECU3CC7P SOFTWARE SIMULATION TOOLS

Teaching Scheme:	**Examination Scheme**
Lectures- 2 Hours / week, 2 Credits	ICA - 25 Marks
Practical –2 Hours / week, 1 Credit	OE - 25 Marks

MATLAB is widely used as numeric computation software for engineering and scientific calculations. It is an interactive programming language that can be used for many applications including data analysis and visualization, simulation and engineering problem solving. This course introduces MATLAB and other simulation software tools like OrCAD / PROTEUS to simulate electronic circuits for solving engineering problems.

Course Prerequisite:

Student should have basic knowledge of structured programming language such as C.

Course Objectives:

1. To make student understand the MATLAB environment along with basic programming constructs.
2. To make student use MATLAB and SIMULINK as a tool to simulate electronic circuits.
3. To make student understand system behavior using different analysis tools and functions available in MATLAB and SIMULINK
4. To make student use OrCAD/PROTEUS as a tool to simulate electronic circuits

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Course Outcomes:

After completing this course, student shall be able to -

1. Create function for mathematical operation in MATLAB.
2. Simulate diode and transistorized electronic circuits using MATLAB.
3. Develop simple passive filter models using SIMULINK blocks.
4. Evaluate performance of AM, FM modulation and other communication related system by applying different analysis tools and functions of MATLAB SIMULINK.
5. Simulate simple electronic circuit using PROTEUS or eSim simulator.

SECTION - I

Unit 1: MATLAB Fundamentals No. of Lecture-06

MATLAB Environment, constants, variables and expressions, operators, matrix operations, vectors, complex numbers, math functions, input–output, control structures-loops and branching.

Unit 2: MATLAB Functions No. of Lecture-03

M files and script files function, sub programs, types of functions, functions handling, errors and warnings

Unit 3: MATLAB Graphics No. of Lecture-05

Two dimensional plots, multiple plots, sub plots, specialized two dimensional plots, three dimensional plots

SECTION – II

Unit 4: Problem Solving Using MATLAB No. of Lecture-02

DC circuit analysis using MATLAB: loop analysis problems using MATLAB, verification of maximum power transfer theorem using MATLAB

Unit 5: Simulation using MATLAB / SIMULINK No. of Lecture-06

Introduction to SIMULINK, modeling, commonly used blocks, simulation using MATLAB / SIMULINK - rectifiers, filters, series and parallel circuits, filter circuits, any other circuits / concepts covered in course –Analog electronics circuit

Unit 6: Simulation using Other Software Simulation Tools No. of Lecture-06

Simulation of circuits using software simulation tool like OrCAD / PROTEUS – single stage transistorized amplifiers, feedback amplifiers, multivibrators using IC555, op amp configurations, op amp applications, active filters, any other circuits / concepts covered in courses - Analog electronics circuit course

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- **Internal Continuous Assessment (ICA):**

  ICA shall consist of minimum ten experiments and a small project based upon-

  1. MATLAB Programming – Students shall solve/simulate simple electronic circuit related problems to learn various MATLAB features / concepts
  2. Simulation of circuits / concepts covered in Analog electronics circuit course using MATLAB/ SIMULINK
  3. It is recommended that with a group of 4/5 students, few lab sessions shall be utilized for carrying out a small project.

- **Text Books:**
  1. MATLAB and its application in Engineering, R. K. Bansal, A. K. Goel and M. K. Sharma, Pearson Education.
  2. MATLAB & Simulink, Agam Kumar Tyagi, Oxford University Press.
  3. Getting starting with MATLAB-7, Rudra Pratap, Oxford University Press.
  4. Electronics and Circuit Analysis using MATLAB, John O. Attia, CRC Press.
  5. PSPICE and MATLAB for Electronics: An Integrated Approach, John O. Attia, CRC press.

- **Reference Books:**
  1. MATLAB and SIMULINK manuals.
  2. OrCAD/ PROTEUS manual.

Walchand Institute of Technology,Solapur

S. Y. B. Tech (Electronics and Computer Engineering) Semester-IV

22ECU4CC1T DIGITAL SIGNAL PROCESSING

Teaching Scheme:	**Examination Scheme**
Lectures- 3 Hours/ week, 3 Credits	**ESE-** 60 Marks
Practical- 2 Hours/ week, 1 Credit	**ISE -** 40 Marks
	ICA- 25 Marks

The signal for processing is mathematically modeled as a function or a sequence of numbers that represents the state or behavior of a physical system. Examples includes speech, audio, image and video in multimedia systems, electrocardiograms in medical systems, electronic radar waveforms in military applications etc. Signal processing is concerned with the representation, transformation, and manipulation of signals and the information they contain. For example, we may wish to remove the noise in speech to make it clear, or to enhance an image to make it more natural. Signal processing is one of the fundamental techniques to construct modern information systems. The course includes the concept and the classification of discrete-time signal, representations of signals, z transform and discrete frequency transform, representations and analysis of systems, and filter designs.

Course Prerequisite:

A course on basic concepts of signals and systems is desirable. Student shall also have mathematical background of Fourier series, Fourier Transform and Z Transform

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Course Objectives:

1. To make student understand processing of signals in frequency domain using mathematical transforms
2. To make student understand the methods for realization of discrete time systems.
3. To make student understand the design methods for digital IIR & FIR filters.

Course Outcomes:

After completing this course, student shall able to-

1. Analyze a given signal or system using Fourier transform.
2. Compute transforms and apply properties of transforms for analyzing the discrete time systems.
3. Realize the discrete time FIR and IIR systems using structures.
4. Design digital filters for processing of discrete time signals.

SECTION I

Unit1- Introduction to DSP No of lectures– 05

Signals, systems and signal processing, basic elements of a digital signal processing system, advantages of digital over analog signal processing, classification of signals, the concept of frequency in continuous-time and discrete-time signals, analog-to-digital and digital-to-analog conversion

Unit 2–Discrete Time Signals & Systems No of lectures– 05

Discrete-time signals, discrete-time systems, analysis of discrete-time linear time-invariant systems, discrete-time systems described by difference equations

Unit 3–Frequency analysis of Signals and Systems No of lectures – 12

Frequency analysis of discrete-time signals, the discrete Fourier transform (DFT), DFT as a linear transformation, circular convolution, efficient computation of the DFT: FFT algorithms, radix-2 FFT algorithms

SECTION II

Unit 4–Implementation of Discrete Time Systems No of lectures –07

Structures for realization of discrete time systems, structures for FIR filters: direct form, cascade form, structures for IIR filters: direct form, signal flow graph & transposed structure, cascade form & parallel form, representation of numbers, quantization of filter coefficients

Unit 5–FIR Filter Design No of lectures –07

Causality and its implications, characteristics of practical frequency selective filters, symmetric and anti-symmetric FIR filters, FIR filter design using windowing & frequency sampling method, finite word length effects in FIR filters, FIR implementation techniques.

Unit 6–IIR Filter Design No of lectures–07

IIR filter design by Impulse invariant technique, IIR filter design by bilinear transformation, frequency transformations, digital Butterworth filters, digital Chebyshev filters, finite world length effects in IIR filters, and implementation of IIR Filters.

- **Internal Continuous Assessment (ICA):**
  ICA consists of minimum eight experiments based on DFT & IDFT, fast convolution, FIR & IIR filter design.

- **Text Books:**
  1. Digital Signal Processing – Principles, Algorithms and applications, John G Proakies, Prentice Hall India
  2. Digital Signal Processing–A Practical Approach, Ifeachor E.C.& Jervis B.W., Pearson Education
  3. Digital Signal Processing -A.V.Oppenheim & R.W. Schalfer, Pearson Education
- **Reference Books:**
  1. Digital Signal Processing, S Salivahanan, A Vallavaraj & C Gnanapriya, TataMcGraw Hill
  2. Introduction to Digital Signal Processing – Johnny R Johnson
  3. Digital Signal Processing: A Computer - Sanjit K. Mitra Tata McGraw-Hill

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Walchand Institute of Technology,Solapur

S. Y. B. Tech (Electronics and Computer Engineering) Semester-IV

22ECU4CC2T CONTROL SYSTEMS

Teaching Scheme	**Examination Scheme**
Lectures – 3 Hours/week**,** 3 Credits	**ESE -** 60 Marks
Tutorial – 1 Hour/week, 1 Credit	**ISE -** 40 Marks
	ICA - 25 Marks

This course provides a thorough introduction to the fundamentals of control systems. The course covers transfer function and mathematical modeling of electrical systems. The course intends the study of stability analysis of the closed loop systems using various mathematical and graphical methods along with necessary compensation techniques to evaluate the performance of electrical systems. Analysis of the linear time invariant single input & single output control system in time domain and frequency domain is included.

Course Prerequisite:

Mathematical background for finding system transfer function and its mathematical model, knowledge of Laplace transform, inverse Laplace transform and electrical circuit simplification methods is necessary.

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:

After completing this course, student shall 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-Basics of Control Systems and Mathematical Modeling No of lectures-08

Classifications of control systems, open loop and closed loop control system, liquid level control system, servo mechanism, transfer function and related terminologies, mathematical modeling of electrical system, transfer function using block diagram reduction techniques, signal flow graph and mason’s gain formula

Unit 2-Control System Components No of lectures-05

Working principle, construction, types and applications of following control system components- stepper motor, AC and DC servomotor, synchro, potentiometer and tacho generator, transfer function of field controlled & armature-controlled dc motor

Unit 3-Time Response Analysis No of lectures – 08

Introduction, standard test signals, analysis of first order system, analysis of second order system, time domain specifications of second order system, steady state error and error constants of type 0, type 1, and type 2 systems

SECTION II

Unit 4-Stability of System and Root Locus No of lectures – 08

Introduction**,** concept of stability, necessary conditions for stability, hurwitz stability criterion, routh's stability criterion, construction of root locus and stability analysis using root locus

Unit 5-Frequency Domain Analysis No of lectures – 08

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

Unit 6- Compensators & Controllers No of lectures – 06

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

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- **Internal Continuous Assessment (ICA)**
  ICA consists of minimum eight tutorials based upon
  1. Transfer function by using block diagram reduction technique.
  2. Transfer function by using Mason's gain formula.
  3. Analysis of first order and second order system.
  4. Time domain specification of second order system.
  5. Steady state error for Type 0, 1 and 2 systems.
  6. Stability analysis using Routh criterion.
  7. Stability analysis using Root Locus.
  8. Bode Plot.
  9. Polar Plot

- **Text Books:**
  1. Control Systems Engineering, I. J. Nagrath & M Gopal, 5th Edition, New Age International Publication.
  2. Control Systems Principals and Design, M Gopal, 3rd Edition, Tata McGraw Hill Education Private Limited.
  3. Control Systems Engineering, Rajiv Gupta, Wiley INDIA Private Limited.

- **Reference Books:**

  1. Modern Control Engineering, K.Ogata, 3rd edition, Pearson Education.
  2. Feedback & Control Systems, Schaum's Outline Series, Tata McGraw Hill Education Private Limited.
  3. Feedback control problems using MATLAB, Dean Fedric and Joe Chow, Thomson learning.

Walchand Institute of Technology,Solapur

S. Y. B. Tech (Electronics and Computer Engineering) Semester-IV

22ECU4CC3T COMPUTER NETWORKS

Teaching Scheme
Lectures- 3 Hours / week, 3 Credits
Practical–2 Hours/week, 1 Credit

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

This course introduces data communication fundamentals and computer networks basic knowledge. It also covers the details of physical layer, data link layer and network layer design issues along with TCP/IP protocol.

Course Prerequisite:

Students should have knowledge of computer systems and C programming language.

Course Objectives:

1. To explain uses of computer network, OSI reference model and TCP/IP reference model.
2. To introduce different Data Link layer protocols.
3. To introduce different routing algorithms and congestion control
4. To introduce in IPv4 addressing.
5. To demonstrate client-server paradigm for communication

Course Outcomes:

After completing this course, student shall be able to-

1. Differentiate between the OSI reference model and TCP/IP reference model.
2. Demonstrate functions of data link layer
3. Simulate different routing algorithms in Network Layer.
4. Identify different addressing modes usingIPv4
5. Implement client-server paradigm for socket interfaces using UDP/TCP.

SECTION-I

Unit 1-Data Communication No oflectures–06

Uses of computer networks, network hardware, network software, layered model, communication between layers, ISO-OSI reference model- description of each layer, physical layer- band limited signals, maximum data rate of a channel, packet switching, EIA 232 serial interface standard

Unit 2–DataLink Layer and Medium Access Control No of lectures–09

DLL design issues, error detection & correction, flow control- stop_and_wait, sliding window flow control protocol, channel allocation problems, multiple access protocol: ALOHA, CSMA, CSMA/ CD, collision free protocols, limited contention protocols

Unit 3–IEEE LAN Standards and Network devices- No of lectures – 06

IEEE standards-802.3, 802.4, 802.5 and 802.11, bridges, hub, switches, routers and gateway

SECTION II

Unit 4–Network Layer No of lectures – 07

Network layer design issues, routing algorithms: shortest path routing, packet flooding, flow-based routing, distance vector routing, link state routing, OSPF, BGP

Unit 5–TCP/IP Reference Model No of lectures – 10

TCP/IP reference model, encapsulation, de-capsulation, Transmission Control Protocol (TCP)–header format, three-way handshake, TCP communication, TCP congestion & its control, TCP timers, IPv4-header format, IP communication, addressing–sub netting & masking, classless addressing, NAT, User Datagram Protocol (UDP)–header format, checksum, UDP communication

Unit 6–Client Server Model No of lectures – 05

Client server paradigm-simple server, simple client, client server architecture, client server model characteristics, socket, client server communication

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- **Internal Continuous Assessment (ICA)**
  Students should perform minimum 8 experiments based on the following guidelines–
  1. Implementation of simplex, half duplex and full-duplex using RS232C (9 pin) standard and bios com function.
  2. Simulation of different Framing methods.(Character count, starting and ending flag)
  3. Implement error detection method – CRC
  4. Implement error detection and correction method- Hamming code.
  5. Implement a program for simulation of sliding window protocols.
  6. Implementation of IEEE 802.3, and network configuration
  7. Simulation of routing algorithm.
  8. Given the IP address find out class, subnet mask, net id and host id.
  9. Client server communication

- **Textbooks:**

1. Computer Networks; Andrew S. Tanenbaum; 4th Edition; Prentice Hall.
2. TCP/IP Protocol Suite; Behrouz A.Forouzan; 4thEdition.
3. Data Communication and Computer Networks; P.C.Gupta; Prentice Hall India Publication.
4. Internet working with TCP/IP Vol III; Client-Server Programming & Applications; Douglas E. Comer; 4thEdition; Prentice Hall.

- **Reference Books:**
  1. Data and Computer Communications; William Stallings-Pearson Education Asia Publication.
  2. High Speed networks and Internets-Performance and Quality of service; William Stallings; Pearson Education.
  3. UNIX Network Programming- Networking APIs: Sockets & XTI; Richard Stevens; Prentice Hall India Publication.

S. Y. B. Tech (Electronics and Computer Engineering) Semester-IV

22ECU4CC4T MICROCONTROLLERS

Teaching Scheme:	**Examination Scheme**
Lectures- 3 Hours / week, 3 Credits	**ESE-** 60 Marks
Practical- 2 Hours / week, 1 Credit	**ISE -** 40 Marks
	ICA- 25 Marks
	POE- 50 Marks

This course provides a thorough introduction to the architecture of microcontrollers 8051 and PIC 16F877. The course also introduces assembly language programming and 'C' language programming concepts for 8051 and PIC 16F877. The course enables student to write programs addressing fundamental programming skills and also interfacing with different peripherals. The SPI and I2C serial communication are also part of the syllabus.

Course Prerequisite:

Student has completed a course in basic electronics and digital logic design. Student also has knowledge of C programming language.

Course Objectives:

1. To learn architecture of 8051 and PIC 16F877 microcontrollers architecture to develop these microcontroller based system.
2. To develop assembly language and C program for different applications with 8051 and PIC 16F877 microcontrollers.
3. To design the system for different applications using 8051.
4. To configure PIC 16F877 on chip peripherals for different applications.

Course Outcomes:

After completing this course, student shall be able to -

1. Apply knowledge of 8051 and PIC 16F877 microcontroller's architecture to develop this microcontroller-based system.
2. Develop assembly language and C program for different applications with 8051 and PIC 16F877 microcontrollers.
3. Design the system for different applications using 8051 microcontrollers.
4. Program PIC 16F877 on chip peripherals for different applications.

SECTION-I

Unit 1 - Fundamentals of Microprocessors No of lectures – 06

Fundamentals of 8086 microprocessor architecture, address, data and control bus, internal working of microprocessor, memory organization, classification of memory, introduction to microcontroller and its comparison with microprocessor

Unit 2 - The 8051 Architecture No of lectures – 08

8051-features, 8051 architecture- ALU, Boolean processor, oscillator, timing and control, registers in 8051, clock and reset circuits, stack and stack pointer, program counter, I/O ports, memory structures, data and program memory, pin configuration, addressing modes and instruction set

Unit 3 – 8051 On-chip Peripherals No of lectures – 08

Port structure, timers and counters, serial port, interrupt structure, programming with on chip peripherals

SECTION II

Unit 4 - Memory and I/O Interfacing No of lectures – 07

Interfacing of different display devices like switches, LED's, seven segment display and LCD, data RAM and ROM, program memory, ADC 0808, DAC, stepper motor, and keypad

Unit 5 - PIC Microcontroller 16F877A No of lectures – 07

RISC and CISC architecture, PIC 16F877-features, architecture-CPU registers, memory structures, pin configuration, addressing modes, instruction set, assembly language and 'C' programming

Unit 6 - PIC 16F877 On-chip Peripherals No of lectures – 07

Parallel slave port, timers and counters, capture and compare modes, PWM, and ADC

- **Internal Continuous Assessment (ICA):**

  ICA consists of minimum 10 experiment based on following with 5 experiments on MCS 51 and 5 experiments on Microchip PIC Microcontrollers

  1. Arithmetic and Logic operations
  2. Interfacing of Switches, LEDs and Buzzer.
  3. Interfacing of Matrix Keyboard
  4. Interfacing of LCD Display.
  5. Interfacing of DAC 0808 and generation of various waveforms.
  6. Interfacing of ADC 0808
  7. Use of Timer for generation of time delays
  8. Use of Timer as counter.

9. Interfacing of Stepper motor.
10. Speed control of DC Motor.
11. Use of ADC in PIC Microcontrollers.
12. Use of Interrupts for any Application.
13. Serial communication. Serial communication.
14. Use of PWM in PIC Microcontrollers.

- **Text Books:**
  1. 8051 and Embedded C Programming, Mazidi , Pearson Education, 2nd edition
  2. Microcontrollers, Ajay Deshmukh, Tata McGRAW HILL

- **Reference Books:**
  1. 8051 Microcontroller Architecture, Programming and Application', 3rd edition, Kenneth Ayala, West publication company.
  2. Designs with PIC Microcontrollers, John B. Peatman, Pearson Education Asi LPE
  3. Datasheets of Microchip PIC family of Microcontrollers

Walchand Institute of Technology,Solapur

S. Y. B. Tech (Electronics and Computer Engineering) Semester-IV

22ECU4CC5T DATA STRUCTURES

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits
Practical–2 Hours / week, 1 Credit

Examination Scheme
ESE- 60 Marks
ISE - 40 Marks
ICA- 25 Marks
OE - 25 Marks

Data Structure is a way of collecting and organizing data in such a way that operations on these data can be performed in an effective way. Data Structures is about rendering data elements in terms of some relationship, for better organization and storage. This course introduces linear and non linear data structures including stack, queues, linked list, trees and graphs

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Course Prerequisite:

Student has completed a course in 'C programming' and shall have an adept knowledge of programming with C. Student has also completed a course in 'Object Oriented Programming using C++' and has knowledge about programming using class in depth

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Course Objectives:

1. To introduce to student data structure and its real life applications.
2. To make student understand, design and implement stack and queues.
3. To make student implement different types of linked lists.
4. To make student implement nonlinear data structures like trees and graphs.
5. To make student realize need of recursion and its applications.
6. To make student use searching methods and different sorting techniques efficiently.

Course Outcomes:

After completing this course, student shall be able to -

1. Implement linear data structures.
2. Implement non-linear data structures.
3. Analyze and implement various kinds of searching and sorting techniques.
4. Describe the significance of recursion and use it efficiently.
5. Analyze a given problem and implement by using suitable data structure.

SECTION-I

Unit 1- Stack and Queues No of lectures – 08

Introduction to data structure, examples and real-life applications, stack definition, operations on stack, static implementation using arrays, applications of stack; queue definition, operations on simple queue using arrays, operations on circular queue using arrays & concept of dequeue and priority queue, concept of applications of queue

Unit 2– Linked Lists No of lectures – 10

Definition, representation and operations on linked list, types of linked lists: singly linked list, circular linked list, concept of doubly linked list; stack using linked list, queue using linked list, concept of applications of linked list

Unit 3 – Recursion No of lectures – 04

Recursion in C, how recursion works: static storage allocation and dynamic storage allocation; writing recursive algorithm, examples of recursion

SECTION II

Unit 4– Trees No of lectures – 06

Definition of trees, terminologies of trees, binary trees, types of binary trees, operations on the binary search tree, tree traversals, construction of binary tree, concepts of threaded binary trees

Unit 5– Graph No of lectures – 06

Definition and examples of graphs, types of graphs, representation methods of graphs: adjacency matrix representation, adjacency linked representation and multi-list representation; graphs traversal methods: depth first search, breadth first search

Unit 6– Searching and Sorting Techniques No of lectures – 08

Linear search, binary search, definition of hashing, hashing functions, collision resolution techniques: open hashing, closed hashing; definition of sorting, bubble sort, selection sort, insertion sort, merge sort, quick sort, heap sort

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- **Internal Continuous Assessment (ICA)**
  ICA shall consist of minimum ten experiments based upon above curriculum containing-
  1. Static implementation of stack
  2. Static implementation of queue
  3. Static implementation of circular queue
  4. Implementation of singly linked list
  5. Implementation of circular linked list

6. Dynamic implementation of stack using linked list
7. Dynamic implementation of queue using linked list
8. Reverse printing a linked list using recursion
9. Linear search and binary search
10. Bubblesort, selection sort and insertion sort.

- **Textbooks:**
  1. Data Structures -A Pseudocode Approach with C, Richard F.Gilberg, Behrouz A. Forouzan, Cengage Learning, Second edition
  2. Data Structure using C & C++, Rajesh K. Shukla, WILEY India.
  3. Data Structure through C in Depth, S.K. Srivastava, Deepali Srivastava, BPB Publications

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- **Reference Books:**
  1. Fundamentals of Data Structures, Ellis Horowitz, Sartaj Sahni, Orient Blackswan publisher
  2. Data Structures and Program Design in C, Robert L. Kruse, Easter Economy Edition, PHI Private Limited, Third Edition
  3. Data Structure using C & C++, Y.Langsam, M.J. Augenstein, A.M Tanenbaum, Second Edition, Pearson India.
  4. Introduction to Data Structures in C, Ashok N.Kamthane, Pearson Education
  5. Understand Pointers in C, Yashwant Kanetkar, BPB Publication, Third edition

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Walchand Institute of Technology,Solapur

S. Y. B. Tech (Electronics and Computer Engineering) Semester-IV

22ECU4CC6P PROGRAMMING WITH PYTHON

Teaching Scheme:
Lectures- 2 Hours / week, 2 Credits
Practical–2 Hours / week, 1 Credit

Examination Scheme
ISE - 25 Marks
ICA - 25 Marks
POE- 50 Marks

This course aims at introducing basics of python programming language. Python is an open source general-purpose programming language with easy syntax. Due to its cross-platform operating systems support, simple, short, readable, intuitive, and powerful programming structure along with object oriented features, python is used to develop and demonstrate applications quickly. Although, python is an interpreted language unlike C, C++, it allows faster interfaces to the code written in these languages thus speed intensive tasks can also be handled effectively using python.

Course Prerequisite:

Student shall have basic knowledge of programming with C and C++. Student should have necessary skills for problem solving using procedural and object oriented programming concepts

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Course Objectives:

1. To introduce to student the fundamentals of writing python scripts.
2. To make student learn core python scripting elements such as variables and flow control structures
3. To make student write python functions to facilitate code reuse
4. To make student understand how to work with lists, tuples, sets and dictionaries
5. To introduce to students concepts of object-oriented programming paradigm using python
6. To introduce to students the notion of data structures using python

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Course Outcomes:

After completing this course, student shall be able to -

1. Set up python development environment and are able to write python scripts.
2. Employ core python scripting elements such as variables and flow control structures.
3. Use python functions to facilitate code reuse.
4. Create and manipulate python programs by utilizing the data structures like lists, dictionaries, tuples and sets.
5. Implement concepts of object-oriented programming paradigm using python.
6. Implement different data structures like stack and queue using python

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SECTION-I

Unit 1- Basics of Python Programming Language No. of Lectures – 03

Identifiers, keywords, statements and expressions, variables, operators (arithmetic, assignment, comparison, logical and bitwise), operator precedence, data types, indentation, comments, python software development environments: anaconda, pycharm

Unit 2– Control Flow Statements and Functions No. of Lectures -05

If, if-else, if-elif-else statements, while and for loops, continue and break statements, exception handling using try and except blocks, use of built-in and module functions, defining functions and calling, return statement, recursive functions and the Lambda function

Unit 3 – Strings No. of Lectures – 03

Creating and storing strings, basic string operations, basic inbuilt python functions for string, accessing characters in string by index[] operator, string slicing and joining, string methods

Unit 4- Lists and Dictionaries No. of Lectures – 04

Creating lists, basic list operations, indexing and slicing in lists, modifying items in list, list methods, creating dictionary, accessing and modifying key:value pairs in dictionaries, dictionary methods, traversing dictionaries

SECTION II

Unit 5- Tuples and Sets No. of Lectures – 04

Creating tuples, basic tuple operations, indexing and slicing in tuples, relation between tuples and lists, tuple methods, zip function, sets, set methods, set operations

Unit 6– Object Oriented Programming No. of Lectures – 05

Classes and objects, creating classes in python, creating objects in python, constructor method, destructor method, passing objects as function arguments, returning objects, inheritance, operator overloading

Unit 7- Data Structures No. of Lectures – 04

Stack operations, stack implementation, queue operations, queue implementation, linked list operations, linked list implementation.

- **Internal Continuous Assessment (ICA)**

  Minimum 10 Python programming experiments covering:

  1. Program using decision control statements
  2. Program using loops
  3. Program using functions
  4. Program using string manipulations using built-in functions
  5. Program using lists

6. Program using dictionaries
7. Program using tuples
8. Program using sets
9. Program using OOP concepts in python
10. Program using data structure concepts in python
11. Project based learning

- **Text Books:**
  1. Introduction to Python Programming, Gowrishankar S. and Veena A., Chapman and Hall/CRC Press, New Delhi, 2019
  2. Core Python Programming, R. Nageswara Rao, Dreamtech Press; Second edition (2018)
  3. Programming and Problem Solving with Python, Ashok Kamthane and Amit Kamthane, McGraw Hill Education (India) Private Limited
  4. Data Structures and Algorithms Using Python, Necaise Rance D., Wiley India Pvt. Ltd

- **Reference Books:**
  1. Introduction to Python, Y. Daniel Liang, Pearson publication, 2012.
  2. Python Cookbook, Alex Martelli and David Ascher, O'Reilly Media, 2002
  3. Python How to Program, Harvey M. Deitel, Paul J. Deitel, Jonathan P. Liperi and Ben Wiedermann, Prentice Hall, 2002
  4. Learn Python 3 the Hard Way, Zed A. Shaw, Pearson Education, 2017

Walchand Institute of Technology, Solapur

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

22GEU4MC2T: ENVIRONMENTAL STUDIES

Teaching Scheme:
Lecture: 1 Hour /week

Examination scheme:
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 forest, 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

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Course Prerequisite:

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

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Course Objectives:

Through the courses sequence in ES studies will be able to:

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. Students recognize and understand the major concepts in Environmental studies & can demonstrate in depth understanding of the Environment.
2. Students understand inter disciplinary approach.
3. Students evaluate the critical analytical skills concerning to energy portfolios & other.

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. **(5 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 **(5 Hrs.)**

a) Concept of an ecosystem
b) Structure and function of an ecosystem
c) Producers, consumers and decomposers
d) Energy flow in the ecosystem
e) Ecological succession
f) 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 **(5 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 **(5 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 **(4 Hrs.)**

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 **(4 Hrs.)**

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

Reference Books:

1. Erach Bharucha (2013): Text book of Environmental Studies for under graduate courses, second Edition(2013).
2. P. S Verna and V.K. Agarwal, 1983. Environmental biology, S. Chand Publications, NewDelhi.
3. https://www.google.co.in/images
4. https://envfor.nic.in/legis/legis.html
5. Dr Prakash Sawant (2009) “Environment studies” Fadake PublisherKolhapur
6. Dr S. D Kadam (2005) “Human, Environment and Pollution” Fadake PublisherKolhapur
7. Environment studies- University Press, Solapur University,Solapur
8. Erach Bharucho-“Environmental Studies” UGE Press NewDelhi
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 pp249-286.