BVC COLLEGE OF ENGINEERING(A)
(An AUTONOMOUS Institution)
(Approved by AICTE, Permanently Affiliated to JNTUK, Kakinada)
(Accredited by NAAC with 'A' Grade)
Included under section 2(f) & 12(b) of UGCAct, 1956
Palacharla Post, East Godvari District, Andhra Pradesh, India – 533294
Phone No: 088320 04299, E-Mail : bvcr@bvcgroup.in, Website : www.bvcr.edu.in

REG: VR23

B.Tech.– II Year I Semester Course Structure

S.No.	Category	Subject Code	Subject Name	L	T	P	Credits
1	Basic Science	23BS3T05	Probability theory and stochastic Process	3	0	0	3
2	HSMC	23HM3T02	Universal Human Values–Understanding Harmony andEthical Human Conduct	2	1	0	3
3	Engineering Science	23ES3T05	Signals and Systems	3	0	0	3
4	Professional Core	23EC3T02	Electronic Devices and Circuits	3	0	0	3
5	Professional Core	23EC3T03	Switching Theory and Logic Design	3	0	0	3
6	Professional Core	23EC3L02	Electronic Devices and Circuits Lab	0	0	3	1.5
7	Professional Core	23EC3L03	Switching Theory and Logic Design Lab	0	0	3	1.5
8	Skill Enhancement Course	23CS3S01	Data Structures using Python	0	1	2	2
9	Audit Course	23AC3T01	Environmental Science	2	0	0	0
Total				**16**	**2**	**08**	**20**

B.Tech. II Year II Semester Course Structure

S.No.	Category	Subject Code	Subject Name	L	T	P	Credits
1	HSMC	23HM4T03	Managerial Economics and Financial Analysis	2	0	0	2
2	Engineering Science	23ES4T09	Linear Control Systems	3	0	0	3
3	Professional Core	23EC4T04	Electromagnetic Waves and Transmission Lines	3	0	0	3
4	Professional Core	23EC4T05	Electronic Circuit Analysis	3	0	0	3
5	Professional Core	23EC4T06	Analog Communications	3	0	0	3
6	Professional Core	23EC4L04	Signals and Systems Lab	0	0	3	1.5
7	Professional Core	23EC4L05	Electronic Circuit Analysis lab	0	0	3	1.5
8	Skill Enhancement course	23HM4S01	Soft Skills	0	1	2	2
9	Engineering Science	23ES4L05	Design Thinking & Innovation	1	0	2	2
Total				**15**	**1**	**10**	**21**
Basic Science		23BS5P01	Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation				

CC:23BS3T05		REG: VR23			
II Year I Semester	**Probability Theory and Stochastic Process**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objectives:

- This gives basic understanding of random variables and operations that can be performed on them.
- To know the Spectral and temporal characteristics of Random Process.
- To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics

UNIT – I: Probability & Random Variable

Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events, Random Variable- Definition, Conditions fora Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

UNIT – II: Operations on Single & Multiple Random Variables Expectations:

Expectations: Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew,Chebychev's Inequality ,Characteristic Function, Moment Generating Function ,Transformations of a Random Variable: Joint Distribution Function and its Properties ,Marginal Distribution Functions, Conditional Distribution and Density–Point Conditioning, Conditional Distribution and Density–Interval conditioning, Statistical Independence. Sum of Two Random Variables ,Sum of Several Random Variables, Central Limit Theorem,(Proof not expected).Unequal Distribution, Equal Distributions. Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments ,Joint Characteristic Functions ,Jointly Gaussian Random Variables: Two Random Variables case ,N Random Variable case, Properties, Transformationsof Multiple Random Variables.

UNIT – III: Random Processes – Temporal Characteristics

The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

UNIT – IV: Random Processes – Spectral Characteristics

The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

CC:23BS3T05

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UNIT – V: Noise Sources & Information Theory

Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties. Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law, Trade-off between bandwidth and SNR

TEXT BOOKS:

1. Peyton Z. Peebles-Probability, Random Variables & Random Signal Principles, 4thEd,TMH,2001.
2. Taub and Schilling-Principles of Communication systems,TMH,2008
3. B Prabhakara Rao, T S R Murthy, Probability Theory and Stochastic Process, BS Publications2012

REFERENCE BOOKS:

1. Bruce Hajck-Random Processes for Engineers, Cambridge unipress,2015
2. Athanasios Papoulis and S. Unni krishna Pillai -Probability, Random Variables and stochasticProcesses,4th Ed., PHI, 2002.
3. B.P. Lathi-Signals, Systems & Communications, B.S.Publications,2003.
4. Y Mallikarjuna Reddy, Probability Theory and Stochastic Process, 4th edition, Universities press,2013

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc21_ma66/preview2.http://www.egwald.ca/statistics/
- https://www.youtube.com/watch?v=ofPv2NiTJ1E
- https://www.slideshare.net/slideshow/ptsp-pptpdf/255856157

Course Outcomes:

COs	Statements	BL
CO1	Student able to Understand the Mathematical model theory and phenomena of probabilistic problems and concepts of Random Variables	BL2
CO2	Student able to Perform operations on single and multiple Random variables.	BL4
CO3	Student able to Determine the Temporal characteristics of Random Signals.	BL2/BL3
CO4	Student able to Determine the Spectral characteristics of Random Signals.	BL2/BL3
CO5	Student able to Understand the concepts of Noise and Information theory in Communication systems	BL2

Course Co-Ordinator's
1. Mrs.Y.SatyaVeni
2. Mr. B.Sreenivas rao

BoS Chairperson

Dr. Jagadeesh Bodapati, Ph.D Professor & Head Department ECE, BVCCE, Rajahmundray Chairperson	Dr. N V Narasimha Sarma, Professor, Department of ECE, NIT Warangal, Subject Expert	Dr. M Ramasubba Reddy, Professor, Dept of applied Mechanics, IIT Chennai, Subject Expert	Dr.A.Mallikarjuna Prasad, Professor, Dept of ECE, UCEK,JNTUK, Kakinada JNTUK Nominee	Dr.M.Venkateswara Rao, ASIC Senior Verification Engineer, ACL Digital, Bangalor Industrial Expert	Mr.Venkatesh Nukella, Assistant Professor(Ph.D), Department of ECE, Aditya Engineering College, Surampalem, Invitee From Alumni

CC:23HMVT02	REG: VR23

II Year I Semester	Universal Human Values–Understanding Harmony and Ethical Human Conduct	L	T	P	C
		2	1	0	3

Course Objectives:

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students 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. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Course Topics

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions. The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT I **Introduction to Value Education**

(6 lectures and 3 tutorials for practice session)
Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: self-exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT II **Harmony in the Human Being**

(6 lectures and 3 tutorials for practice session)
Lecture 7: Understanding Human being as the Co-existence of the self and the body.
Lecture 8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self
Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self
Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III **Harmony in the Family and Society**
(6 lectures and 3 tutorials for practice session)
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT IV **Harmony in the Nature/Existence**
(4 lectures and 2 tutorials for practice session)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT V **Implications of the Holistic Understanding – a Look at Professional Ethics** (6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education
PS1 Sharing about Oneself
PS2 Exploring Human Consciousness
PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being
PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self
PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society
PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)
PS10 Exploring the Four Orders of Nature PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

READINGS:
Textbook and Teachers Manual
a. The Textbook
R R Gaur, R Asthana, G P Bagaria, *A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
b. The Teacher's Manual
R R Gaur, R Asthana, G P Bagaria, *Teachers' Manual for A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

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

Mode of Conduct:
Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
Tutorial hours are to be used for practice sessions.
While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.
In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.
Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.
Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.
It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.
Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

Online Resources:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%202325%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-humanvalues/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

Course Outcomes:

COs	Statements	BL
CO1	Define the terms like Natural Acceptance, Happiness and Prosperity	BL1/BL2
CO2	Identify one's self, and one's surroundings (family, society nature)	BL1/BL2
CO3	Apply what they have learnt to their own self in different day-to-day settings in real life	BL3
CO4	Relate human values with human relationship and human society.	BL4
CO5	Justify the need for universal human values and harmonious existence &Develop as socially and ecologically responsible engineers	BL5/BL6

B. Sandhya

Course Co-Ordinator's
1.Mrs.B SANDHYA

BoS Chairperson

Dr. K. Veerabbayi Chairperson	Dr. B. Asecsh Babu Subject Expert	Dr. Demudu Naidu Jureddi Subject Expert	Dr.K.Sree Ramesh JNTUK Nominee

CC:23ES3T05		REG: VR23			
II Year I Semester	**Signals And Systems**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objectives:

- To study about signals and systems.
- To analyze the spectral characteristics of signal using Fourier seriesand Fourier transforms.
- To understand the characteristics of systems.
- To introduce the concept of sampling process
- To know various transform techniques to analyze the signals and systems.

UNIT- I: INTRODUCTION

Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time- scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Related problems.

UNIT–II: FOURIER SERIES AND FOURIER TRANSFORM

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform, Related problems.

UNIT-III: ANALYSIS OF LINEAR SYSTEMS

Introduction, Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant(LTV)system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems. Filter characteristics of linear systems. Distortion less transmission through a system, Signal band width, system band width, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

UNIT–IV: CORRELATION

Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

SAMPLING THEOREM: Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to B and Pass sampling, Related problems.

UNIT–V: LAPLACE TRANSFORMS:

Introduction, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and

F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

Z–TRANSFORMS: Concept of Z-Transform of a discrete sequence .Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z- transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z- transforms.

TEXTBOOKS:

1. Signals, Systems & Communications-B.P.Lathi, BS Publications,2003.
2. Signals and Systems-A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn,1997
3. Signals & Systems-Simon Haykinand VanVeen,Wiley,2ndEdition,2007

REFERENCEBOOKS:

1. Principles of Linear Systems and Signals–BP Lathi, Oxford University Press,2015
2. Signals and Systems–TK Rawat, Oxford University press,2011
3. Signals and Systems-Anand Kumar, PHI 3rd edition 2015.

Online Learning Resources:

- http://nptel.ac.in/courses/117106114/
- https://www.tutorialspoint.com/signals_and_systems

Course Outcomes:

COs	Statements	BL
CO1	Student able to Differentiate the various classifications of signals and systems	BL2
CO2	Student able to Analyze the frequency domain representation of signals using Fourier concepts	BL4
CO3	Student able to Classify the systems based on their properties and determine the response of LTI Systems.	BL2
CO4	Student able to Define the sampling process and various types of sampling techniques.	BL1
CO5	Student able to Apply Laplace and Z-transforms to analyze signals and Systems (continuous & discrete).	BL3

Course Co-Ordinator's
1. Mr.TLV Ramana
2. Mrs. T Vidya

BoS Chairperson

Dr. Jagadeesh Bodapati, Ph.D Professor&Head Department ECE, BVCCE, Rajahmundray Chairperson	Dr. N V Narasimha Sarma, Professor, Department of ECE, NIT Warangal, Subject Expert	Dr. M Ramasubba Reddy, Professor, Dept of applied Mechanics, IIT Chennai, Subject Expert	Dr.A.Mallikarjuna Prasad, Professor, Dept of ECE, UCEK,JNTUK, Kakinada JNTUK Nominee	Dr.M.Venkateswara Rao, ASIC Scnior Verification Engineer, ACL Digital, Bangalor Industrial Expert	Mr.Venkatesh Nukella, Assistant Professor(Ph.D), Department of ECE, Aditya Engineering College, Surampalem, Invitee From Alumni

CC:23EC3T02	REG: VR23

II Year I Semester	Electronic Devices and Circuits	L	T	P	C
		3	0	0	3

Course Objectives:

To learn and understand the basic concepts of semiconductor physics.

- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics ofdifferent diodes.
- To learn and understand the application of diodes as rectifiers with their operation and characteristicswith and without filters are discussed.
- Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor andField Effect Transistor and their characteristics.
- To learn and understand the purpose of transistor biasing and its significance.
- Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare differentconfigurations.
-

UNIT-I: Review of Semiconductor Physics

Mobility and Conductivity, Intrinsic and extrinsic semiconductors, continuity equation, law of junction,Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors. (Text book: 1)

Junction Diode Characteristics : Energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in p-n junction Diode, Diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance. (Text book: 1)

UNIT-II: Special Semiconductor Devices

Zener Diode, Breakdown mechanisms, Zener diode applications, Varactor Diode, LED, Photodiode, Tunnel Diode, UJT, PNPN Diode. SCR, Construction, operation and V-I characteristics. (Text book: 1)

Diode Circuits: The Piecewise Linear Diode model, Clipping (limiting) circuits, Clipping at Two Independent Levels, Peak Detector, Clamping circuits, Comparators, Sampling Gate, Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers.Filters, Inductor filter, Capacitor filter, π-section Filter, comparison of various filter circuits in terms of ripple factors.

(Text book: 1, 2)

UNIT- III: Transistor Characteristics

Junction transistor, transistor current components, transistor equation in CB configuration, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values. (Text book: 1)

Transistor Biasing and Thermal Stabilization: Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias,Stabilization against variations inVBE, Ic, and β, Stability factors, (S,S',S''), Bias compensation, Thermal runaway, Thermal stability. (Text book: 1)

UNIT- IV: Small Signal Low Frequency Transistor Amplifier Models BJT

Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers. (Text book: 1, 2)

UNIT- V:FET FET types, JFET operation, characteristics, small signal model of JFET. (Text book: 1)
MOSFET: MOSFET Structure, Operation of MOSFET: operation in triode region, operation in saturation region, MOSFET as a variable resistor, derivation of V-I characteristics of MOSFET, Channel length modulation, MOS transconductance, MOS device models: MOS small signal model, PMOS Transistor, CMOS Technology, Comparison of Bipolar and MOS devices. (Text book: 3)CMOS amplifiers: General Considerations, Common Source Stage, Common Gate Stage, Source Follower, comparison of FET amplifiers.(Text book: 3)

Text Books:

1. Millman's Electronic Devices and Circuits- J. Millman, C. C. Halkias and Satyabrata Jit, Mc-Graw HillEducation, 4th edition, 2015.
2. Millman's Integrated Electronics-J. Millman, C. Halkias, and Ch. D. Parikh, Mc-Graw Hill Education, 2ndEdition, 2009.
3. Fundamentals of Micro electronics-BehzadRazavi, Wiley, 3rd edition, 2021.

References:

1. Basic Electronics- Priciples and Applications, Chinmoy Saha, Arindam Halder, Debarati Ganguly, Cambridge University Press.
2. Electronics devices & circuit theory- Robert L. Boylestad and Loui Nashelsky, Pearson, 11th edition,2015.
3. Electronic Devices and Circuits - David A. Bell, Oxford University Press, 5th edition, 2008.
4. Electronic Devices and Circuits- S. Salivahanan, N. Suresh Kumar, Mc-Graw Hill, 5th edition, 2022.

Online Learning Resources:

- https://nptel.ac.in/courses/117/103/117103063/
- https://nptel.ac.in/courses/108/108/108108122/

Course Outcomes:

COs	Statements	BL
CO1	Student able to Apply the basic concepts of semiconductor physics.	BL3
CO2	Student able to Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.	BL2
CO3	Student able to Analyze the construction, working principle of Semiconductor Devices and Diode Circuits	BL4
CO4	Student able to Understand the need of transistor biasing, various biasing techniques for BJT andFET and stabilization concepts with necessary expressions	BL2
CO5	Student able to Apply small signal low frequency transistor amplifier circuits using BJT and FET in different configurations	BL3

Course Co-Ordinator's
1. Mr.S.A.VaraPrasad
2. Mr. D. Durga Manoj

D. Durga Manoj

BoS Chairperson

Dr. Jagadeesh Bodapati, Ph.D Professor&Head Department ECE, BVCCE, Rajahmundray Chairperson	Online Dr. N V Narasimha Sarma, Professor, Department of ECE, NIT Warangal, Subject Expert	Online Dr. M Ramasubba Reddy, Professor, Dept of applied Mechanics, IIT Chennai, Subject Expert	Dr.A.Mallikarjuna Prasad, Professor, Dept of ECE, UCEK,JNTUK, Kakinada JNTUK Nominee	ON line Dr.M.Venkateswara Rao, ASIC Senior Verification Engineer, ACL Digital, Bangalor Industrial Expert	Mr.Venkatesh Nukella, Assistant Professor(Ph.D), Department of ECE, Aditya Engineering College, Surampalem, Invitee From Alumni

CC:23EC3T03		REG: VR23			
II Year I Semester	Switching Theory and Logic Design	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To solve a typical number base conversion and analyze new error coding techniques.
- Theorems and functions of Boolean algebra and behavior of logic gates
- To optimize logic gates for digital circuits using various techniques.
- Boolean function simplification using Karnaugh maps and Quine-McCluskey methods
- To understand concepts of combinational circuits.
- To develop advanced sequential circuits.

UNIT – I : REVIEW OF NUMBER SYSTEMS & CODES

Representation of numbers of different radix, conversation from one radix to another radix, r- 1'scompliments and r's compliments of signed members. Gray code, 4 bit codes; BCD, Excess-3, 2421, 8 4- 2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

BOOLEAN THEOREMS AND LOGIC OPERATIONS

Boolean theorems, principle of complementation & duality, De-morgan theorems. Logic operations ; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX- NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits.

UNIT – II: MINIMIZATION TECHNIQUES

Minimization and realization of switching functions using Boolean theorems, K-Map (up to6 variables) and tabular method (Quine-McCluskey method) with only four variables and single function.

COMBINATIONAL LOGIC CIRCUITS DESIGN:

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4- bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a- head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

UNIT – III: COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI

Design of encoder, decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder.

INTRODUCTION OF PLD's

PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

UNIT – IV: SEQUENTIAL CIRCUITS I

Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip- flop, T flip-flop, D flip- flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop. Design of 5ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi- directional shift register, universal shift register.

Study the following relevant ICs and their relevant functions 7474, 7475, 7476, 7490, 7493, 74121.

UNIT – V: SEQUENTIAL CIRCUITS II

Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping)

CC:23EC3T03

REG: VR23

TEXT BOOKS:

1. Switching and finite automata theory Zvi. KOHAVI, Niraj. K.Jha 3rdEdition, Cambridge University Press,2009
2. Digital Design by M.MorrisMano, Michael D Ciletti,4th edition PHI publication,2008
3. Switching theory and logic design by Hill and Peterson, Mc-Graw Hill TMH edition, 2012.

REFERENCES:

1. Fundamentals of Logic Design by Charles H. Roth Jr,Jaico Publishers,2006
2. Digital electronics by R S Sedha.S.Chand &company limited,2010
3. Switching Theory and Logic Design by A. Anand Kumar,PHI Learning pvt ltd,2016.
4. Digital logic applications and design by John M Yarbough, Cengage learning,2006.
5. TTL 74-Seriesdatabook.

Online Learning Resources:

https://nptel.ac.in/courses/108/105/108105132/
https://nptel.ac.in/courses/117/106/117106086/

Course Outcomes:

COs	Statements	BL
CO1	Student able to Classify different number systems and apply to generate various codes.	BL2
CO2	Student able to Apply the concept of Boolean algebra in minimization of switching functions	BL3
CO3	Student able to Develop different types of combinational logic circuits.	BL3
CO4	Student able to Apply knowledge of flip-flops in designing of Registers and counters	BL3
CO5	Student able to The operation and design methodology for synchronous sequential circuits and algorithmic state machines&Produce innovative designs by modifying the traditional design techniques.	BL4

Course Co-Ordinator's
1. Mr. D.Veerraju
2. Mrs. Gowthami Naga Prasanna

BoS Chairperson

Dr. Jagadeesh Bodapati, Ph.D Professor&Head Department ECE, BVCCE, Rajahmundray Chairperson	Dr. N V Narasimha Sarma, Professor, Department of ECE, NIT Warangal, Subject Expert	Dr. M Ramasubba Reddy, Professor, Dept of applied Mechanics, IIT Chennai, Subject Expert	Dr.A.Mallikarjuna Prasad, Professor, Dept of ECE, UCEK,JNTUK, Kakinada JNTUK Nominee	Dr.M.Venkateswara Rao, ASICScnior Verification Engineer, ACL Digital, Bangalor Industrial Expert	Mr.Venkatesh Nukella, Assistant Professor(Ph.D), Department of ECE, Aditya Engineering College, Surampalem, Invitee From Alumni

CC:23EC3L02		REG: VR23			
II Year I Semester	**Electronic Devices and Circuits Lab**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

Course Objectives:

- To analyse the modelling, characteristics and electrical parameters of Diode, BJT, and JFET.
- To illustrate the concepts of biasing in BJT, JFET.
- To illustrate the application of diode in rectifiers and regulated power supply.
- To analyze single stage amplifier circuits using equivalent circuits.

Note: The students are required to perform the experiment to obtain the V-I characteristics and todetermine the relevant parameters from the obtained graphs.

List of Experiments :(Minimum of Ten Experiments has to be performed)

1. Clipper circuit using diode
2. Clamping circuit using diode
3. Rectifiers(without and with c-filter)
   i. Part A: Half-wave Rectifier
   ii. Part B:Full-wave Rectifier
4. BJT Characteristics(CE Configuration)
   i. Part A: Input Characteristics
   ii. Part B:Output Characteristics
5. FET Characteristics(CS Configuration)
   i. Part A: Drain Characteristics
   ii. Part B: Transfer Characteristics
6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. Cathode Ray Oscilloscope Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

Equipment required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multi-meters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters(Analog or Digital)
8. Voltmeters(Analog or Digital)
9. Active & Passive Electronic Components.

CC:23EC3L02	REG: VR23

Note: Students supposed to do an Experiment beyond the Syllabus / Lab oriented mini-Project /Case Study and submit it for Internal Evaluation.

Course Outcomes:

COs	Statements	BL
CO1	Student able to Apply the concepts of different electronic devices to verify their characteristics And measure the important parameters.	BL2
CO2	Student able to Analyze the performance of rectifier circuits with and without filters.	BL4
CO3	Student able to Analyze the performance of BJT and FET amplifier circuits.	BL4
CO4	Student able to Design and verify clipping and clamping circuits operation.	BL6

Course Co-Ordinator's
1. Ms. R.Smile
2. Mrs. Penugula Esther Rani

BoS Chairperson

Dr. Jagadeesh Bodapati, Ph.D Professor&Head Department ECE, BVCCE, Rajahmundray Chairperson	Dr. N V Narasimha Sarma, Professor, Department of ECE, NIT Warangal, Subject Expert	Dr. M Ramasubba Reddy, Professor, Dept of applied Mechanics, IIT Chennai, Subject Expert	Dr.A.Mallikarjuna Prasad, Professor, Dept of ECE, UCEK,JNTUK, Kakinada JNTUK Nominee	Dr.M.Venkateswara Rao, ASIC Seenior Verification Engineer, ACL Digital, Bangalor Industrial Expert	Mr.Venkatesh Nukella, Assistant Professor(Ph.D), Department of ECE, Aditya Engineering College, Surampalem, Invitee From Alumni

CC:23EC3L03	REG: VR23

II Year I Semester	Switching Theory and Logic Design Lab	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To outline the basics of Digital electronics, Boolean algebra and basic logic gates.
- Able to design the simple logic circuits and verify the functionality.
- Design combinational and sequential logic circuits using digital ICs.
- Students use a digital trainer kit and Vivado emulator to test their electronic designs.(for additional experiments)

List of Experiments: (Minimum o f Ten Experiments has to be performed)

1. Verification of truth tables of the following Logic gates Two input (i)OR (ii)AND (iii)NOR (iv)NAND (v)Exclusive-OR (vi)Exclusive-NOR
2. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Traine Kit.
3. Verification of functional table of 3 to 8-line Decoder / De-multiplexer
4. 4 variable logic function verification using 8 to 1 multiplexer.
5. Design full adder circuit and verify its functional table.
6. Verification of functional tables of (i) J K Edge triggered Flip–Flop (ii)D Flip-Flop
7. Design a four-bit ring counter using D Flip–Flops/JK Flip Flop and verify output.
8. Design a four-bit Johnson's counter using D Flip-Flops/JK Flip Flops and verify output
9. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
10. Draw the circuit diagram of MOD-8ripple counter and construct a circuit using T-Flip-Flops and Test It with a low frequency clock and sketch the output wave forms.
11. Design MOD–8synchronouscounterusingTFlip- Flop and verify the result and sketch the output waveforms.
12. (a)Draw the circuit diagram of a single bit comparator and test the output

    (b)Construct 7Segment Display Circuit Using Decoder and 7 Segment LED and test it.

Additional Experiments:

1. Design BCD Adder Circuit and Test the Same using Relevant IC.
2. Design Excess-3 to 9-Complement convert or using only four Full Adders and test the Circuit.
3. Design an Experimental model to demonstrate the operation of 74154 De- Multiplexer using LEDs for outputs.
4. Design of any combinational circuit using Hardware Description Language.
5. Design of any sequential circuit using Hardware Description Language.
6. **Note:** Students supposed to do an Experiment beyond the Syllabus / Lab oriented mini-Project / Case Study andsubmit it for Internal Evaluation.

CC:23EC3L03	REG: VR23

Course Outcomes:

COs	Statements	BL
CO1	Student able to Analyze and design basic combinational logic circuits using Digital IC's.	BL3
CO2	Student able to Analyze and design basic Sequential logic circuits using Digital IC's.	BL4
CO3	Student able to Implement basic combinational and sequential logic circuits using HDL programming.(for additional experiments)	BL4
CO4	Student able to Implement basic sequential logic circuits using Digital IC's and HDL programming	BL4

Course Co-Ordinator's
1. Mr.TLV.Ramana
2. Mr.P.T.RaviKumar

BoS Chairperson

	ONline	ONline	Approved	ONline	
Dr. Jagadeesh Bodapati, Ph.D Professor&Head Department ECE, BVCCE, Rajahmundray Chairperson	Dr. N V Narasimha Sarma, Professor, Department of ECE, NIT Warangal, Subject Expert	Dr. M Ramasubba Reddy, Professor, Dept of applied Mechanics, IIT Chennai, Subject Expert	Dr.A.Mallikarjuna Prasad, Professor, Dept of ECE, UCEK,JNTUK, Kakinada JNTUK Nominee	Dr.M.Venkateswara Rao, ASIC Scnior Verification Engineer, ACL Digital, Bangalor Industrial Expert	Mr.Venkatesh Nukella, Assistant Professor(Ph.D), Department of ECE, Aditya Engineering College, Surampalem, Invitee From Alumni

CC:23CS3S01		REG: VR23			
II Year I Semester	**Data Structures Using Python**	**L**	**T**	**P**	**C**
		0	**1**	**2**	**2**

Course Objectives:

- Understanding Object-Oriented Programming Concepts
- Mastery of Data Structures and Algorithms
- Application of Computational Problem-Solving Techniques
- Understanding of Software Design and Modularity
- Practical Implementation of Data Structures and Algorithms

List of Experiments:

1. Write a Python program for class, Flower, that has three instance variables of type str, int, and float that respectively represent the name of the flower, its number of petals, and its price. Your class must include a constructor method that initializes each variable to an appropriate value, and your class should include methods for setting the value of each type, and retrieving the value of each type.
2. Develop an inheritance hierarchy based upon a Polygon class that has abstract methods area( ) and perimeter( ). Implement classes Triangle, Quadrilateral, Pentagon, that extend this base class, with the obvious meanings for the area( ) and perimeter( ) methods. Write a simple program that allows users to create polygons of the various types and input their geometric dimensions, and the program then outputs their area and perimeter
3. Write a python program to implement Method Overloading and Method Overriding.
4. Write a Python program to illustrate the following comprehensions: a) List Comprehensions b) Dictionary Comprehensions c) Set Comprehensions d) Generator Comprehensions
5. Write a Python program to generate the combinations of n distinct objects taken from the elements of a given list. Example: Original list: [1, 2, 3, 4, 5, 6, 7, 8, 9] Combinations of 2 distinct objects: [1, 2] [1, 3] [1, 4] [1, 5] .... [7, 8] [7, 9] [8, 9].
6. Write a program for Linear Search and Binary search.
7. Write a program to implement Bubble Sort and Selection Sort.
8. Write a program to implement Merge sort and Quick sort.
9. Write a program to implement Stacks and Queues.
10. Write a program to implement Singly Linked List.
11. Write a program to implement Doubly Linked list.
12. Write a program to implement Binary Search Tree.

CC:23ES3S01

REG: VR23

Course Outcomes:

COs	Statements	BL
CO1	Students will demonstrate proficiency in creating classes, defining instance variables, and implementing methods (including constructors and accessors) to manage object state in Python.	BL2
CO2	Students will be able to implement various data structures (such as linked lists, binary search trees, stacks, queues) and algorithms (including searching and sorting techniques) effectively in Python, demonstrating understanding of their operational principles and efficiency.	BL2/ BL4
CO3	Students will develop skills in solving computational problems through the implementation of algorithms like linear search, binary search, bubble sort, selection sort, merge sort, quick sort, and various list operations (comprehensions, combinations) using Python programming language.	BL3
CO4	Students will learn to design modular programs that utilize object-oriented principles and proper encapsulation. They will apply inheritance and polymorphism concepts to build hierarchical structures of classes, ensuring reusability and maintainability of code.	BL6
CO5	Students will gain hands-on experience in implementing fundamental data structures (linked lists, trees) and algorithms (sorting, searching) using Python. They will be able to analyze and compare the efficiency of these implementations in terms of time and space complexity.	BL4

Course Co-Ordinator's
1.Mr.N N V Ramana

BoS Chairperson

Dr Yalla Venkateswarlu, Chairperson	Dr. V S N Raju Subject Expert	Dr. M.Rajashekar Babu Subject Expert	Dr.D.Haritha JNTUK Nominee	Mr. B Rajesh Industrial Expert	Mr.MS Nanda Sekhar Invitee From Alumni

CC:23AC3T01		REG: VR23			
II Year I Semester	**Environmental Science**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**-**

Course Objectives:

- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
- To save earth from the inventions by the engineers.

UNIT – I

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness. Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT – II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and Its Conservation : Introduction and Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

Environmental Pollution:

Definition, Cause, effects and control measures of·

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns.

Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland /hill /mountain – Visit to a local polluted site-Urban /Rural /Industrial /Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Textbooks:

1. Erach Bharucha,Text book of Environmental Studies for Undergraduate Courses ,Universities Press (India) Private Limited, 2019.
2. Palaniswamy, Environmental Studies, 2/e, Pearson education, 2014.
3. S.Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

Reference Books:

1. Deeksha Dave and E.Sai Baba Reddy, Textbook of Environmental Science, 2/e, Cengage Publications, 2012.
2. M.Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, 2014.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
4. J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.
5. G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.
6. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science, 1/e, Prentice Hall of India Private limited, 1991.

Online Learning Resources:

- https://onlinecourses.nptel.ac.in/noc23_hs155/preview
- https://www.edx.org/learn/environmental-science/rice-university-ap-renvironmental-science-part-3-pollution-andresources?index=product&objectID=course-3a6da9f2-d84c-4773-8388-
- 1b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science+ +Part+3%3A+Pollution+and+Resources&source=edX&product_category=course& placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fenvironmentalscience
- http://ecoursesonline.iasri.res.in/Courses/Environmental%20Science-
- I/Data%20Files/pdf/lec07.pdf
- https://www.youtube.com/watch?v=5QxxaVfgQ3k

CC:23AC3T01	REG: VR23

Course Outcomes:

COs	Statements	Blooms Level
CO1	Grasp multi disciplinary nature of environmental studies and various renewable and non-renewable resources.	BL2
CO2	Understand flow and bio-geo- chemical cycles and ecological pyramids.	BL2
CO3	Understand various causes of pollution and solid waste management and related preventive measures.	BL2
CO4	Understand the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.	BL2
CO5	Illustrate the causes of population explosion, value education and welfare programmes.	BL3

Course Co-Ordinator's
1.Mr.Sk.Noorjahan SK-Nj
2.Mr.D.Manoj Kumar D. Durgamanoj

BoS Chairperson

Dr. K. Veerabbayi Chairperson	Dr. B. Aseesh Babu Subject Expert	Dr. Demudu Naidu Jureddi Subject Expert	Dr.K.Sree Ramesh JNTUK Nominee