

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY (A)::**VISAKHAPATNAM**

Department of Electronics and Communication Engineering

VR-20

Semester III (Second year)						
S.No	Course Code	Course Title	Hours per week			Credits
			L	T	P	
1	1004202100	Electronic Devices and Circuits	3	0	0	3
2	1004202101	Signals and Systems	3	0	0	3
3	1004202102	Random Variable and Stochastic Processes	3	0	0	3
4	1012202100	Python Programming	3	0	0	3
5	1099202100	Managerial Economics & Financial Analysis	3	0	0	3
6	1004202110	Electronic Devices and Circuits lab	0	0	3	1.5
7	1004202111	Signals and Systems Lab	0	0	3	1.5
8	1012202110	Python Programming lab	0	0	3	1.5
9	1012202180	Fundamentals of Networking	1	0	2	2
10	1000202121	Environmental Science	2	0	0	0
TOAL CREDITS						21.5

Course Code	ELECTRONIC DEVICES & CIRCUITS	L	T	P	C
1004202100		3	0	0	3

COURSE OBJECTIVES:

1. To provide an overview of the principles, operation and application of the analog building blocks like diodes, BJT, FET etc for performing various functions.
2. To provide the student with the basic knowledge about design, functionality and fabrication of semiconductor devices.
3. Understanding of complex devices such as semiconductor diodes and field-effect transistors are modelled and how the models are used in the design and analysis of useful circuits.
4. Capability to design circuits, take measurements of circuit behaviour and their performance, compare with predicted circuit models and explain discrepancies.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Summarize the characteristics of PN junction diode in different modes of operation.	PO-1, PO-2, PO-3, PO-4, PO-6, PO-12	2
CO2	Compare the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.	PO-1, PO-2, PO-3, PO-4, PO-5, PO-6	3
CO3	Summarize the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations and understand the various biasing techniques for BJT and FET.	PO-1, PO-2, PO-3, PO-4, PO-10, PO-12	2
CO4	Explain the stabilization concepts with expressions and perform the analysis of small signal low frequency transistor amplifier circuits using BJT	PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-8, PO-10, PO-12	3

UNIT- I

Junction Diode Characteristics: Open circuited p-n junction, Biased p-n junction, p-n junction diode and current components in PN junction Diode, diode equation, V-I Characteristics, Diode capacitance, and energy band diagram of PN junction Diode. Zener Diode characteristics.

UNIT-II

Special Diodes and Switching Devices: LED, Varactor diode, Tunnel Diode, UJT.

Rectifiers and Filters: Half wave rectifier, full wave rectifier, bridge rectifier, rectifier circuits-operation, filters; Inductor filter, Capacitor filter, comparison of various filter circuits in terms of ripple factors.

UNIT-III

BJT: Junction transistor, transistor current components, transistor configurations, transistor as a switch, and characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, punch through/ reach through.

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT-IV

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 in V_{BE} , I , and Stability factors, (S , S' , S''), compensation, Thermal runaway, Thermal stability

UNIT-V

Small Signal Low Frequency Transistor Amplifier Models: BJT: Two port network, Transistor hybrid model, determination 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.

Textbooks:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Fourth Edition 2015.
2. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Fourth Edition 2016

Reference Books:

1. Electronic Devices and Circuits- U.A.Bakshi A.P.Godse Technical Publications, 2009
2. Electronic Devices and Circuit Theory-R.L. Boylestad and Louis Nashelsky, Pearson Publications, Tenth Edition.

E-Books: (Specify links)

1. <https://www.smartzworld.com/notes/electronic-devices-and-circuits-pdf-notes-edc-notes-pdf/>

NPTEL/MOOC: (Specify Links)

1. <https://nptel.ac.in/courses/117/103/117103063/>
2. <https://nptel.ac.in/courses/122/106/122106025/>
3. <https://nptel.ac.in/courses/117/106/117106091/>

Course Code	SIGNALS & SYSTEMS	L	T	P	C
1004202101		3	0	0	3

COURSE OBJECTIVES:

- Understanding the fundamentals of Signals & Systems
- Understanding the concept of vector space and Orthogonal series
- Understanding signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide
- Developing the mathematical skills to solve problems involving filtering, modulation and sampling.
- Applying convolution both in time domain and frequency domain.
- Developing mathematical skills to solve differential and difference equation using Laplace transform and Z-transform

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Characterize the signals and systems and principles of vector spaces, Concept of orthogonality	PO1, PO2, PO12	3
CO2	Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform.	PO1, PO2, PO12	3
CO3	Apply sampling theorem to convert continuous-time signals to discrete-time signal and also apply z-transform to analyze discrete-time signals and systems	PO1, PO2, PO3, PO12	3
CO4	Illustrate the relationships among the various representations of LTI systems and apply the Concepts of convolution, correlation, Energy and Power density spectrums to communication problems.	PO1, PO2, PO3, PO12	3

**Strength of mapping (Intensity Scale) – 1(Lightly mapped), 2(Moderately mapped), 3(Heavily mapped)

UNIT- I**SIGNAL ANALYSIS**

Definition and classification of Signals and Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Complex exponential and sinusoidal signals, Singularity function and related functions: impulse function, unit step, ramp function.

UNIT-II**FOURIER SERIES&FOURIER TRANSFORMS:**

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series.

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.

UNIT-III

CONCEPT OF SAMPLING & SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS

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.

Linear system, Impulse response, Linear time invariant (LTI) system, Transfer function of a LTI system, Filter characteristics of linear systems. Distortion less transmission through a system.

UNIT-IV

CONVOLUTION AND CORRELATION OF SIGNALS

Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property, Cross correlation, auto correlation functions and their properties, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Relation between convolution and correlation

UNIT-V

LAPLACE TRANSFORMS & Z-TRANSFORMS

LAPLACE TRANSFORMS: Review of Laplace transforms, Properties of L. T's, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Relation between L.T and F.T. of a signal.

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

Text Books:

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 Learning Private Limited, 2nd Edn. 2010 .

Reference Books:

1. "Signals & Systems", Simon Haykin and Van Veen, Wiley, 2nd Ed., 2002.
2. "Signals & Systems", A.Anand Kumar, 2nd Edition, PHI, 2012

E-Books: (Specify links)

NPTEL/MOSOC: (Specify Links)

Course Code	RANDOM VARIABLES & STOCHASTIC PROCESSES	L	T	P	Credits
1004202102		3	0	0	3

Course Overview: This course deals with the behaviour and operations on random variable and random processes are studied.

Course Objectives:

- To give students an introduction to elementary probability theory, in preparation to learn the concepts of statistical analysis, random variables and stochastic processes.
- To mathematically model the random phenomena with the help of probability theory Concepts.
- To introduce the important concepts of random variables and stochastic processes.
- To analyse the LTI systems with stationary random process as input.

Course Outcomes:

After completion of the course students able to:

	Course outcome	Skill	Level	PO
CO1	Construct the Probability Distribution and Density functions for Single and Multiple Random Variables	Understand, Apply	L2, L3	PO-1, PO-2, PO-3
CO2	Identify different types of Random variables and compute their Statistical averages	Apply	L3	PO-1, PO-2, PO-3
CO3	Characterise the Random Processes in both Time and Frequency domains and determine the Auto-correlation function of Random Processes and then compute the relationship between PSD and Auto-correlation	Analyse	L4	PO-1, PO-2, PO-3
CO4	Estimate the characteristics of Noise in the Communication channels by analysing the LTI Systems in the presence of Noise	Analyse	L4	PO-1, PO-2, PO-3

UNIT-I

THE RANDOM VARIABLE:

Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions and its Properties, Types of Random Variables-Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution and Conditional Density functions, its Properties.

UNIT-II

OPERATION ON ONE RANDOM VARIABLE-EXPECTATIONS:

Introduction, Expected Value of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebyshev's Inequality, Characteristic Function,

Properties of Characteristic Function, Moment Generating Function, Properties of Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable.

UNIT-III

MULTIPLE RANDOM VARIABLES

Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Function, Joint density function, properties of joint density, marginal density function, Conditional Distribution and Density-point conditioning and interval conditioning Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, Equal Distributions.

OPERATIONS ON MULTIPLE RANDOM VARIABLES:

Joint Moments about the Origin, Joint Central Moments, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables.

UNIT-IV

RANDOM PROCESSES – TEMPORAL CHARACTERISTICS

Random Process Concept- Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity, Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, N-order and Strict-Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT-V

RANDOM PROCESSES – SPECTRAL CHARACTERISTICS: The Power Density Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

LINEAR SYSTEMS WITH RANDOM INPUTS: 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, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

Text Books:

1. “Probability, Random Variables & Random Signal Principles”, Peyton Z. Peebles, JR. TMH, 4th Edition, 2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S. Unnikrishna, PHI, 4th Edition, 2002.

Reference Books:

1. “Probability Theory and Stochastic Process” Y. Mallikarjuna Reddy, Universities press, 4th edition, 2015.

2. An Introduction to Random Signals and Communication Theory, B.P. Lathi, International Textbook,1968.
3. Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill,2015.

Course Code	Python Programming	L	T	P	C
1012202100		3	0	0	3

COURSE DESCRIPTION:

This course introduces computer programming using the Python programming language. This Python Programming course will help you master the Programming with Python by introducing the Object Oriented programming concepts, creation of Data Structures, Implementation of Functions, and Visualization libraries using the Python programming language. Lastly you will get into design, code, test, and debug Python programming LanguageScripts.

COURSE OUTCOMES:

CO	Course outcomes	Cognitive Level as perBloom’s Taxonomy	PO
CO1	Install Python IDE and run basic Python scripts.	Understand	PO1
CO2	Understand the operators, functions, key Concepts of Object Oriented Programming in python.	Understand	PO1,PO2
CO3	Access Python from various online resources and import packages to the current working environment.	Applying	PO5
CO4	Understand file handling operations and implement ML/DS Libraries using in Python.	Implementation	PO12

UNIT-I

Introduction: History of Python, Need of Python Programming, Applications, Basics of Python Programming, Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations..

UNIT-II

Control Flow- if, if-elif-else, for, while, break, continue, pass
Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

UNIT-III

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful

Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

Modules- Creating modules, import statement, from import statement, name spacing, Python packages-Introduction to PIP, Installing Packages via PIP, Using Python Packages.

UNIT-IV

Object Oriented Programming in Python: Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, and Data hiding.

Error and Exceptions: Difference between an Error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

UNIT-V

Regular Expressions: Simple Meta characters, Character classes.

File handling: Python File(doc and csv) Operation Reading config files in python, Writing log files in python, Understanding read functions, Understanding write functions, Manipulating file pointer using seek, Programming using file operation.

Introduction to ML/DS Libraries: Introduction to NumPy, Pandas and Matplotlib

Brief Tour of the Standard Library:

Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Multithreading.

Text Books:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orielly

Reference Books:

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W. Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage
4. <http://nptel.ac.in/courses/117106113/34>
5. <https://www.python.org/>

Course Code	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	L	T	P	Credits
1099202100		3	0	0	3

Course Overview: The present course is designed in such a way that it gives an overview of concepts of Economics. Managerial Economics enables students to understand micro environment in which markets operate how price determination is done under different kinds of competitions. Financial Analysis gives clear idea about concepts, conventions and accounting procedures along with introducing students to fundamentals financial statements. Break Even Analysis is very helpful to the Business Concern for Decision Making, controlling and forward Strategic Planning.

Course Objectives:

1. Understand the concepts of managerial economics and the market dynamics namely Demand, Elasticity of demand and pricing in different market structures.
2. Acquire the knowledge about production theories and cost analysis besides dealing with the production and factors of production.
3. Analyze the different market structures and understand various pricing methods which are adopted in attracting the customers under different markets.
4. To provide the basic knowledge on financial accounting
5. To understanding Capital budgeting decisions.

Course Outcomes:

Cos	Course outcome	Po s mapping	Strength of mapping
CO1	Analyze the Demand, Price and Cost	PO3, PO8, PO11, PO12	3
CO2	Identify the Nature of different markets	PO5, PO8, PO11, PO12	2
CO3	Understand Various Business Forms	PO5, PO8, PO11, PO12	3
CO4	Evaluate investment project proposals	PO3, PO11, PO12	3

Unit-I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand, Demand schedule, Demand curve - Law of Demand and its Exceptions- Elasticity of Demand & Its types - Demand forecasting and Methods of forecasting.

Unit-II

Production and Cost Analysis: Concept of Production function- Cobb-Douglas Production function – Leontief production function, Production Function with One

variable Input, Two Variable Inputs and Concept of Returns to scale -economies of scale, Different cost concepts – Cost –Volume-Profit (CVP) analysis (simple problems)

Unit-III

Part-I: Introduction to Market Structures and pricing methods: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly- Features – Price and Output Determination, Significance of Pricing and various methods of pricing with contemporary examples

Part-II: Introduction to Business: Features, Merits and Demerits - Sole Trader, Partnership, Joint Stock Company – Public Enterprises – Business Cycles: Meaning and Features – Phases of Business Cycle.

Unit-IV

Introduction to Financial Accounting: Systems of Book-keeping, Golden rules of Accounting, Accounting Principles, Accounting Cycle- Journal, Ledger, Trail Balance, Preparation of Trading- Account, P&L Account and Balance Sheet (Simple Problems)

Unit-V

Capital and Capital Budgeting Decisions: Introduction to Capital, Classification of Capital, Time value of money. Types of Capital Budgeting Decisions: Traditional Methods (Payback period, Accounting rate of return) and Modern methods (Net Present Value method, Internal Rate of Return Method and Profitability Index Method) (Simple Problems)

Text Books:

1. M.Kasi Reddy & Saraswathi, “Managerial Economics and Financial Analysis”, PHI Publications, New Delhi, 10th Revised Edition, 2012.
2. Varshney & Maheswari, “Managerial Economics”, Sulthan Chand Publishers, 1st Revised Edition, 2009.
3. S.N. Maheshwari & S.K. Maheshwari, “Financial Accounting”, Vikas Publication House Pvt.Ltd, 4th Edition, 2012.

Reference Books:

1. D.N. Dwivedi, “Managerial Economics”, Vikas Publication House Pvt.Ltd, 2nd Edition, 2012.
2. R.Narayana Swamy, “Financial Accounting- A managerial Perspective”, Pearson

publications, 1st Indian Reprint Edition, 2012.

3.J.V.Prabhakar Rao & P.V.Rao, “Managerial Economics & Financial Analysis”, Maruthi Publishers, 1st Revised Editon, 2011

NPTEL/SWAYAMMOOCS:

1.https://onlinecourses.swayam2.ac.in/imb19_mg08/preview

2.<https://www.coursera.org/learn/strategic-management>

Course Code	ELECTRONIC DEVICES AND CIRCUITS LAB	L	T	P	C
1004202110		0	0	3	1.5

COURSE OBJECTIVES:

1. To study basic electronic components.
2. To observe characteristics of electronic devices.
3. To observe characteristics of Diode, BJT, FET, UJT, SCR.
4. To observe the frequency response of BJT.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Analyze the diode and transistor characteristics	PO-1, PO-5, PO-6	3
CO2	Verify the rectifier circuits using diodes and implement them using hardware.	PO-1, PO-5, PO-6	2
CO3	Design various amplifiers like CE, CC, common source amplifiers and implement them using hardware and also observe their frequency responses	PO-1, PO-2, PO-3, PO-5, PO-6	3
CO4	Analyze the concept of UJT and observe its characteristics.	PO-1, PO-2, PO-3, PO-5, PO-6	3

**Strength of mapping (Intensity Scale) – 1(Lightly mapped), 2(Moderately mapped), 3(Heavily mapped)

LIST OF EXPERIMENTS

S.No.	Name of the experiment	Skill
1	Obtain the V-I characteristics of P-N junction diode. a) Germanium Diode (Forward bias & Reverse bias). b) Silicon Diode (Forward Bias only).	Observe & Verify the V-I characteristics of P-N junction diode.
2	Obtain the V-I characteristics of Zener diode. a) V-I Characteristics. b) Zener Diode as Voltage Regulator.	Observe & Verify the V-I characteristics of Zener diode.
3	Design the HWR with and without filter.	Verify HWR output with and without filter.
4	Design the FWR with and without filter.	Verify FWR output with and without filter.
5	Obtain the UJT Characteristics.	Observe & Verify the UJT Characteristics.
6	Obtain the Input and output characteristics of CB configuration.	Observe & Verify the CB Characteristics.

Detailed Syllabus (VR 20)

7	Obtain the Input and output characteristics of CE configuration.	Observe & Verify the CE Characteristics.
8	Obtain the FET characteristics.	Observe & Verify the FET Characteristics.
9	Obtain the Frequency response of CE amplifier.	Observe & Determine gain, bandwidth
10	Obtain the Frequency response of Emitter Follower (CC amplifier).	Observe & Determine gain, bandwidth

Text Books:

3. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Fourth Edition 2015.
4. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Fourth Edition 2016

Reference Books:

3. Electronic Devices and Circuits- U.A.Bakshi A.P.Godse Technical Publications, 2009
4. Electronic Devices and Circuit Theory-R.L. Boylestad and Louis Nashelsky, Pearson Publications, Tenth Edition.

Course Code	SIGNALS & SYSTEMS LAB	L	T	P	C
1004202111		0	0	3	1.5

COURSE OBJECTIVES:

- Understanding the fundamental characteristics of signals and systems.
- Understanding the concepts of vector space and orthogonal series.
- Understanding signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide.
- Developing the mathematical skills to solve problems involving filtering, modulation and sampling.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Understand the basic concept of signals and generate various types of signals and able to perform operations on it	1,2,3,5,9,10,12	3
CO2	Apply the knowledge of Fourier Series and Fourier Transform on signals and analyze their responses	1,2,3,5,9,10,12	3
CO3	Design the different types of filters based on their characteristics	1,2,3,5,9,10,12	3
CO4	Understand the process of sampling and the effects of under sampling, Analyze system properties based on impulse response and Fourier analysis	1,2,3,5,9,10,12	3

**Strength of mapping (Intensity Scale) – 1(Lightly mapped), 2(Moderately mapped), 3(Heavily mapped)

LIST OF EXPERIMENTS

S.No.	Name of the experiment	Skill
1.	Generation of Basic Signals	Understand, Apply
2.	Operations on Signals	Understand, Apply
3.	Trigonometric Fourier Series	Understand, Apply
4.	Parseval's Theorem	Understand, Apply
5.	Fourier Transform	Understand, Apply
6.	Design of Low Pass Filter	Understand, Apply
7.	Design of High Pass Filter	Understand, Apply
8.	Response of LTI System	Understand, Apply
9.	Verification of Sampling Theorem	Understand, Apply
10.	Reconstruction of Signal	Understand, Apply

Equipment & Software required:

1. Computer Systems with latest specifications.
2. Connected in LAN (Optional).
3. Operating system (Windows XP).
4. Simulation software (Simulink & MATLAB)

Text Books:

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.

Reference Books:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
2. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.
3. Signals & Systems- Narayan Iyer and K SatyaPrasad ,Cenage Pub

Course Code	Python Programming Lab	L	T	P	C
1012202110		0	0	3	1.5

COURSE OBJECTIVES:

1. To acquire programming skills in core Python.
2. To acquire Object Oriented Skills in Python
3. To develop the skill of designing Graphical user Interfaces in Python
4. To develop the ability to write database applications in Python

LIST OF EXPERIMENTS**Exercise 1- Basics**

- a) Running instructions in Interactive interpreter and a Python Script
- b) Write a program to purposefully raise Indentation Error and Correct it.

Exercise 2- Operations

- a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
- b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise 3- Control Flow

- a) Write a Program for checking whether the given number is a even number or not.
- b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10
- c) Write a program using a for loop that loops over a sequence. What is sequence?
- d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow - Continued

- a) Find the sum of all the primes below two million.
Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:
1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
- b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 - DS

- a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure. Eg: hello -> {"h":1,"e":1,"l":2,"o":1}
- b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise - 6 DS - Continued

- a) Write a program combine lists that combines these lists into a dictionary.
- b) Write a program to count frequency of characters in a given file.

Exercise -7 Functions

a) Write a function `ball collide` that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r) , r being the radius

If $(\text{distance between two balls centers}) \leq (\text{sum of their radii})$ then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 8 Functions - Continued

a) Write a function `nearly equal` to test whether two strings are nearly equal. Two strings `a` and `b` are nearly equal when `a` can be generated by a single mutation on `b`.

b) Write a function `dups` to find all duplicates in the list.

c) Write a function `unique` to find all the unique elements of a list.

Exercise - 9 - Functions - Problem Solving

a) Write a function `cumulative product` to compute cumulative product of a list of numbers.

b) Write a function `reverse` to reverse a list. Without using the `reverse` function.

c) Write function to compute `gcd`, `lcm` of two numbers. Each function shouldn't exceed one line.

Exercise 10 - Multi-D Lists

a) Write a program that define and print a matrix.

b) Write a program to perform addition of two square matrices.

c) Write a program to perform multiplication of two square matrices.

Exercise - 11 - Modules

a) Using PIP install packages `requests`, `flask` and explore them.

b) Write a script that imports `requests` and fetch content from the page. Eg.(Wiki).

c) Write a simple script that serves a simple HTTP Response and a simple HTML Page.

Write various test cases and implement specific test for a given case study.

Exercise - 12 OOP

a) Class variables and instance variable and illustration of the self-variable

i) Robot.

ii) ATM Machine.

Exercise - 13 Files

a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 14 File access

a) Create a CSV file (roll no, subject1, subject2, subject 3) with 100 rows. All the marks randomly generated having range (0-100), roll no are having range (1-100)

b) Read the above CSV file having(roll no,subject1, subject2,subject 3) and create new CSV (roll no,subject1, subject2,subject 3, average marks)

Exercise – 15 Introduction to ML/DS Libraries

a) Write a program to represent 2 – dimensional matrix using NUMPY and perform basic operations like addition, multiplication, transpose.

b) Develop a student dataset using PANDAS and perform some basic operations. Visualize the above student dataset using MATPLOTLIB

Course Code	Fundamentals of Networking (Skill Oriented Course)	L	T	P	C
1012202180		1	0	2	2

COURSE OBJECTIVES:

1. Understand network layers, structure/format, and role of each network layer.
2. Able to design and implement various network application such as data transmission between client and server, file transfer, real-time multimedia transmission.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Ability to implement error detection techniques.	PO1 PO3	3 3
CO2	Ability to apply appropriate algorithm for finding of shortest route.	PO1 PO2 PO3	2 3 3
CO3	Ability to configure the routing table. And Implement and compare the various routing algorithms.	PO1 PO2 PO3	2 3 3 3
CO4	Ability to implement client/server communication and Implementing connection oriented and connectionless protocols.	PO1 PO2 PO3 PO5	2 3 3 2

LIST OF EXPERIMENTS

S. No.	Name of the experiment	Skill
1	Exercise – 1 Implement the data link layer framing methods such as character stuffing and bit stuffing.	Understands different framing mechanisms.
2	Exercise – 2 Implementation of checksum error detection mechanism.	Can Applying error detection mechanism.
3	Exercise – 3 Implement the three CRC polynomials on a data set of characters– CRC 12, CRC 16 and CRC CCIP.	Can Applying error detection mechanism.
4	Exercise – 4 Implement Dijkstra's algorithm to compute the Shortest path through a graph.	Ability to identify the shortest path in the network transmission.
5	Exercise – 5	Identifying the route for

Detailed Syllabus (VR 20)

	Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table at each node using distance vector routing algorithm.	transmitting the data over the network.
6	Exercise – 6 Take an example subnet of hosts. Obtain broadcast tree for it.	Understands the concept of subnet and broadcasting
7	Exercise – 7 Implementation of Connection oriented concurrent service (TCP).	Implements virtual circuit mechanism.
8	Exercise – 8 Implementation of Connectionless Iterative time service (UDP).	Implements Datagram Subnets mechanism.
9	Exercise – 9 Implementation of FTP (File Transfer Protocol).	Implements File Transfer over the network
10	Exercise – 10 Implementation of HTTP (Hyper Text Transfer Protocol).	Implements Hypertext Transfer Protocol

Text Books:

1. Computer Networks (5th Edition) – Andrew S. Tanenbaum. Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu, 2010.
2. Computer Networks: A Top-Down Approach, Behrouz A. Forouzan, Firouz Mosharraf, McGraw Hill Education.

Reference Books:

1. Computer Networking: A Top-Down Approach (6th Edition) – Kurose and Ross
2. Internetworking with TCP/IP Vol.1: Principles, Protocols, and Architecture (4th Edition) – Douglas E. Comer.

Course Code	Environmental Science	L	T	P	C
1000202121		2	0	0	0

COURSE OBJECTIVES:

1. Classify, describe and explain the concepts of Ecosystems and environmental Studies.
2. Overall understanding of different types of natural resources and its conservation.
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
4. An understanding of the environmental impacts of developmental activities and the importance of environmental management.
5. Awareness on the social issues, environmental legislations and global treats.

COURSE OUTCOMES:

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.	1,6,7	2
CO2	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities.	1,6,7	2
CO3	Learn the management of environmental hazards and to mitigate disasters and have a clear understanding of environmental concerns and follow sustainable development practices.	1,6,7	2

UNIT I**(8 hrs)****Multidisciplinary nature of Environmental Studies:**

Definition Scope and its importance, Multidisciplinary nature of Environmental science.

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Energy flow in the ecosystem – Ecological pyramids - Ecological succession.

Social Issues and the Environment: Impacts of microbial toxins on human health. Urban problems related to energy- Water conservation, rain water harvesting and 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.

UNIT II -

(3 hrs)

BIODIVERSITY AND ITS CONSERVATION: Definition: genetic, species and ecosystem diversity –Value of biodiversity, Hot-spots of biodiversity, Threats to biodiversity, Endangered and endemic species of India – Conservation of biodiversity.

UNIT III:

(8 hrs)

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, 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 IV –

(9 hrs)

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of:

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Noise pollution
- e. Nuclear hazards

Role of an individual in prevention of pollution – Pollution case studies

Environmental Laws: Wildlife Protection Act 1972 –Water pollution prevention and control Act 1974 - Forest Conservation Act 1980n –Air pollution prevention and control Act 1981. Environmental Protection Act 1986 and 2006 - – Public awareness

SOLID WASTE MANAGEMENT: Causes, effects and control measures of urban and industrial wastes.

Sustainable Development: Goals of Sustainability, Conferences, Carbon credits and carbon footprints.

UNIT V –

(4 hrs)

Environmental Management:

EIA and EA: Introduction, definition, scope, objectives and methodology.

Disaster management: Definition, floods, earthquake, cyclone and landslides.

Ecotourism: Definition, principles, advantages and disadvantages
Environmental Diary

Field Trip

Field work/Environmental Visit: Visit to a local area to document environmental assets – reserve forest/ eco-tourist spot : Visit to a local polluted site - Study of local environment - common plants, insects, birds - Study of simple ecosystems –pond, river, hill slopes etc - Visit to industries/water treatment plants/effluent treatment plants.

Text Books:

1. Text book of Environmental Studies for Undergraduate courses by ErachBharuncha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson Education.
3. Environmental Studies by Dr. S. Azeem Unnisa, Academic Publishing Company

Reference Books:

1. Textbook of Environmental Science by Deeksha Dave and E. Sai Baba Reddy, Cengage Publications.
2. Text of Environmental Sciences and Technology by M. Anji Reddy, BS Publications.
3. Comprehensive Environmental studies by J.P Sharma, Laxmi Publications.
4. Environmental sciences and Engineering – J Glynn Henry and Gary W Heinke – Prentice hall of India Private Limited.
5. A textbook of Environmental Studies by G.R Chatwal, Himalaya Publishing house.
6. Introduction to Environmental engineering and science by Gilbert M Masters and Wendell P Ela – Prentice hall of India private limited.

E-Books: (Specify links)

NPTEL/MOOC: (Specify Links)

