

Branch Name:	B.Sc. (IT/DS/CS)
Program Code:	ET110/ET111/ET112
Course Title:	Python Programming
Course Code:	14-ITM208-2C
Pre-requisite Course:	Basic maths, logical thinking

Course Objectives:

1. To acquire programming skills in core Python.
2. To understand why Python is a useful scripting language for developers.
3. To learn how to design and program Python applications.
4. To learn how to use lists, tuples, and dictionaries in Python programs.
5. To learn how to identify Python object types.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)						
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)				Practical (Marks)		Total (Marks)
				University Assessment		Continuous Assessment		University Assessment	Continuous Assessment	
3	0	2	4	Min. 18	Max. 50	Min. 09	Max. 25	-	Min. 09 Max. 25	100

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Introduction: The Python Programming Language, History, features, Installing Python, Running Python program, Debugging: Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging, Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses	7	20
2	Variables and Expressions Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations. Conditional Statements: if, if-else, nested if –else Looping: for, while, nested loops Control statements: Terminating loops, skipping specific conditions	7	15
3	Functions: Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions? Importing with from, Return Values, Incremental Development, Composition, Boolean Functions, More Recursion, Leap of Faith	5	20
4	Strings: A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations.	5	15
5	Lists: Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation	5	15
6	Tuples and Dictionaries: Tuples, accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions Creating a Dictionary, Accessing Values in a dictionary	5	15

Text Books:

1. Introduction to Problem Solving with Python E. Balagurusamy TMH 1st 2015
2. Murach's Python programming Joel Murach, Michael Urban SPD 1st 2017
3. Object-oriented Programming in Python Michael H. Goldwasser, David Letscher Pearson Prentice Hall 1st 2008

Reference Books:

1. Think Python, 2nd Edition, 2017 Allen Downey, Green Tea Press
2. Core Python Programming, 2016 W.Chun, Pearson.
3. Introduction to Python, 2015 Kenneth A. Lambert, Cengages

Course Learning Outcomes (CLO):

COs	Statements	Bloom's Level
CO1	Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.	1. Remembering 2. Understanding
CO2	Express proficiency in the handling of strings and functions.	3. Applying
CO3	Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.	3. Applying 4. Analyze
CO4	Identify the commonly used operations involving file systems and regular expressions.	3. Applying 4. Analyze
CO5	Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.	4. Analyze 5. Evaluate

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	M	H	M	L	L	M			L		M	L	H	H	M	L
CLO2	M	H	M	L	L	M			L		M	L	M	H	M	M
CLO3	H	M	H	L	M	L			M		M	L	H	M	H	L
CLO4	H	M	M		L	L			M		L		M	M	M	L
CLO5	H	M	H	L	L	M			L		L	M	H	H	H	L

H:High, M:Medium, L:Low

List of Experiments:

- (1) Demonstrate about Basics of Python Programming.
- (2) Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)
- (3) Demonstrate the working of following functions in Python. i) id() ii) type() iii) range()
- (4) Write a Python program to demonstrate various base conversion functions.
- (5) Write a Python program to demonstrate various type conversion functions
- (6) Demonstrate the following Operators in Python with suitable examples. i) Arithmetic Operators ii) Relational Operators iii) Assignment Operator iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
- (7) Demonstrate the following Conditional statements in Python with suitable examples. i) if statement ii) if else statement iii) if – else if – else statement

Branch Name:	B.Sc. (IT/DS/CS)
Program Code:	ET110/ET111/ET112
Course Title:	Data Mining & Warehouse
Course Code:	14-ITM209-2C
Pre-requisite Course:	Fundamentals of DBMS and Computer Programming

Course Objectives:

- (1) To understand data warehouse concepts, architecture, business analysis and tools.
- (2) To understand data pre-processing and data visualization techniques.
- (3) To study algorithms for finding hidden and interesting patterns in data.
- (4) To understand and apply various classification and clustering techniques using tools.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)							
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)				Practical (Marks)			Total (Marks)
				University Assessment		Continuous Assessment		University Assessment	Continuous Assessment		
3	0	2	4	Min. 18	Max. 50	Min. 09	Max. 25	-	Min. 09	Max. 25	100

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Data Preprocessing and Data Warehouse – Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Warehouse – A Multidimensional Data Model, Data Warehouse Architecture	8	25
2	Association Rule Mining, Classification and Prediction – Frequent Item set Mining, Mining Various kinds of Association Rules, Various Classification Methods, Various Prediction Methods	8	25
3	Cluster Analysis and Outlier Analysis – Partitioning Methods, Hierarchical Analysis, Density based Methods, Distance Based Outlier Detection, Density Based Local Outlier Detection	8	25
4	Mining Data Stream, Text Mining and Spatial Data Mining – Mining Time Series Data, Mining Sequence Patterns in Biological Data, Text Retrieval Methods, Text Indexing Techniques, Query Processing Techniques, Spatial Classification and Spatial Trend Analysis, Spatial Clustering Methods	8	25

Text Books:

1. Jiawei Han and Micheline Kamber, —Data Mining Concepts and TechniquesI, Third Edition, Elsevier, 2012
2. Alex Berson and Stephen J.Smith, —Data Warehousing, Data Mining & OLAP, Tata McGraw – Hill Edition, 35th Reprint 2016.

Reference Books

1. K.P. Soman, Shyam Diwakar and V. Ajay, —Insight into Data Mining Theory and Practicel, Eastern Economy Edition, Prentice Hall of India, 2006.
2. Ian H.Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and TechniquesI, Elsevier, Second Edition.

Course Learning Outcomes (CLO):

COs	Statements	Bloom's Level
CO1	Design a Data warehouse system and perform business analysis with OLAP tools.	Understanding, Applying
CO2	Apply suitable pre-processing and visualization techniques for data analysis.	Understanding, Applying
CO3	Apply frequent pattern and association rule mining techniques for data analysis.	Applying
CO4	Apply appropriate classification and clustering techniques for data analysis	Applying, Evaluating

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M	M	M	L	M			L		M	L	H	H	M	L
CLO2	M	H	H	L	M	M			L		M	L	M	H	M	M
CLO3	H	M	M	L	M	L			M		L	L	H	M	H	L
CLO4	H	H	M	M	L	L			M		L		M	M	M	L

H:High, M:Medium, L:Low

List of Experiments:

Note: The experiment list provided beneath is for reference only. The course teacher may change/formulate it as per his/her methodology and requirement.

1. Listing applications for mining.
2. File format for data mining.
3. Conversion of various data files.
4. Training the given dataset for an application.
5. Testing the given dataset for an application.
6. Generating accurate models.
7. Data pre-processing – data filters.
8. Feature selection.
9. Web mining.
10. Text mining.
11. Design of fact & dimension tables.

Branch Name:	B.Sc. (DS/CS)
Program Code:	ET111/ET112
Course Title:	Computer Organization and Architecture
Course Code:	14-DSM202-2C
Pre-requisite Course:	--

Course Objectives:

1. How Computer Systems work & the basic principles
2. Instruction Level Architecture and Instruction Execution
3. The current state of art in memory system design
4. How I/O devices are accessed and its principles.
5. To provide the knowledge on Instruction Level Parallelism

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	50	25	-	25	100

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Computer Data Representation Basic computer data types, Complements, Fixed point representation, Register Transfer and Micro-operations: Floating point representation, Register Transfer language, Register Transfer, Bus and Memory Transfers (Tree-State Bus Buffers, Memory Transfer), Arithmetic Micro-Operations, Logic Micro Operations, Shift Micro-Operations, Arithmetic logical shift unit	6	10%
2	Basic Computer Organization and Design Instruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Inputoutput and interrupt, Complete computer description, Design of Basic computer, design of Accumulator Unit.	4	10%
3	Programming The Basic Computer Introduction, Machine Language, Assembly Language, assembler, Program loops, Programming Arithmetic and logic operations, subroutines, I-O Programming.	4	10%
4	Micro programmed Control: Control Memory, Address sequencing, Micro program Example, design of control Unit	3	5%
5	Central Processing Unit Introduction, General Register Organization, Stack Organization, Instruction format, Addressing Modes, data transfer and manipulation, Program Control, Reduced Instruction Set Computer (RISC)	4	15%
6	Pipeline And Vector Processing Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors	3	10%

7	Computer Arithmetic Introduction, Addition and subtraction, Multiplication Algorithms (Booth Multiplication Algorithm), Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit	4	10%
8	Input-Output Organization Input-Output Interface, Asynchronous Data Transfer, Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPU IOP Communication, Serial communication.	4	10%
9	Memory Organization Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.	2	10%
10	Multiprocessors Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence, Shared Memory Multiprocessors	4	10%

Text Books:

1. M. Morris Mano, Computer System Architecture, Pearson
2. Andrew S. Tanenbaum and Todd Austin, Structured Computer Organization, Sixth Edition, PHI

Reference Books:

1. M. Murdocca & V. Heuring, Computer Architecture & Organization, WILEY
2. John Hayes, Computer Architecture and Organization, McGrawHill

Course Learning Outcomes (CLO):

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

CLO	Description	Bloom's Taxonomy Level
CLO1	To understand the basic components and design of CPU, ALU and Control Unit (Comprehension)	Understanding
CLO2	To Design and implement micro programmed control units, instruction formats and addressing modes. (Synthesis)	Applying, Understanding
CLO3	To understand how to perform computer arithmetic operations . (Comprehension)	Applying
CLO4	To understand memory hierarchy and input output organization. (Comprehension)	Analyzing
CLO5	To understand the pipeline and vector processing and multiprocessors. (Comprehension)	Analyzing Creating
CLO6	To understand the background of internal communication of computer. (Comprehension)	Creating

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M	M	L	L	M			L		M	L	H	H	M	L
CLO2	M	H	M	L	L	M			L		M	L	H	M	H	M
CLO3	H	M	H	L	M	L			M		M	L	H	H	M	
CLO4	M	H	M		L	M			M		L		M	M	H	L
CLO5	H	M	H	L	L	M			L		L	M	M	H	H	
CLO6	M	H	M		M	L			M		M	L	M	M	M	L

H:High, M:Medium, L:Low

List of Experiments:

Note: The experiment list provided beneath is for reference only. The course teacher may change/formulate it as per his/her methodology and requirement.

- (1) Dive deep into each functional unit (CPU, ALU, Control Unit, Memory, Input/output) and understand their roles and interactions.
- (2) Understand the basics of assembly language and its role in low-level programming. Write programs to perform arithmetic operations, manipulate data in registers, and understand different addressing modes.
- (3) Create practical scenarios where data is transferred between different components through buses.
- (4) Understand how cache memory works and simulate cache operations, such as cache hits and misses.
- (5) Write how input and output operations are handled in assembly language.
- (6) Define and implement different instruction formats
- (7) Design data transfer mechanisms between registers and memory.
- (8) Experiment with various addressing mode
- (9) Process multiple data elements simultaneously using vector operations.
- (10) Study multiplication algorithms and simulate the multiplication circuit with different inputs.

Branch Name:	B.Sc. (DS/CS)
Program Code:	ET111/ET112
Course Title:	Advance Database Management System (Elective-I)
Course Code:	14-DSE201-2C
Pre-requisite Course:	Basic knowledge in Database Management Systems.

Course Objectives:

This course provides the basic concepts and terminology related to relational and nonrelational database management systems. The concept of advanced DBMS techniques and new generation databases like MongoDB, HBase and Cassandra are also introduced. This course serves as a prerequisite for many advanced courses in Data Science and Machine Learning areas.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	50	25	-	25	100

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Advanced SQL 1.1 Transactional Control: Commit, Save point, Rollback 1.2 DCL Commands : Grant and Revoke 1.3 Types of locks : i. Row level locks ii. Table level locks iii. Shared lock iv. Exclusive lock v. Deadlock 1.4 Synonym : Create synonym 1.5 Sequences: Create and alter sequences 1.6 Index : Unique and composite 1.7 Views : Create/Replace, Update and alter views	10	25
2	PL / SQL and Triggers 2.1 Basics of PL / SQL 2.2 Datatypes 2.3 Advantages 2.4 Control Structures : Conditional, Iterative, Sequential 2.5 Exceptions: Predefined Exceptions ,User defined exceptions 2.6 Cursors: Static (Implicit & Explicit), Dynamic 2.7 Procedures & Functions 2.8 Packages : Package specification, Package body, Advantages of package 2.9 Fundamentals of Database Triggers 2.10 Creating Triggers 2.11 Types of Triggers : Before, after for each row, for each statemen	10	25
3	Functional Dependency and Decomposition 3.1 Basics of Functional Dependency 3.2 Functional dependency diagram and examples 3.3 Full function dependency (FFD) 3.4 Lossy Decomposition 3.5 Lossless join decomposition	8	20
4	Normalization 4.1 Basics of Normalization 4.2 Normal Forms i. First Normal Form (1NF) ii. Second Normal Form (2NF) iii. Third Normal Form (3NF)	8	20

5	Transaction Processing 5.1 Introduction to transaction concepts 5.2 Introduction to Concurrency control	6	10
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Text Books:

1. R. Ramakrishnan, J. Gehrke, Database Management Systems, McGraw Hill, 2004
2. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, 5/e, McGraw Hill, 2008.

Reference Books:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition, 2019
2. Guy Harrison, Next Generation Databases: NoSQL and Big Data, Apress, 2015
3. Introduction to Database System: C. J. Date (7th edition) Low Price Edition
4. SQL, PL/SQL: Evan Bayross (2nd edition) BPB

Course Learning Outcomes (CLO):

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

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the fundamentals of relational database systems including: data models, database architectures and ER features	1. Remembering 2. Understanding
CLO2	Analyze and apply the different normalization techniques.	3. Applying 4. Analyzing
CLO3	Assess the basic issues of transaction processing and concurrency control.	3. Applying 4. Analyzing 5. Evaluate
CLO4	Understand the roles that databases play in organizations and familiarize with basic database storage, file organization, database accessing techniques.	2. Understanding 3. Applying
CLO5	Understand the basics of query processing, object-oriented, distributed databases.	3. Applying 4. Analyzing

Mapping of CLO with PO and PSO

Course	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1				L			M	L						M	L	
CLO2	H	H	H	M			M	M			L	M	L			
CLO3	L	M	M	M		M					L	M	L			
CLO4					L			L					M	L	M	M
CLO5	L			L									M			M

H: High, M: Medium, L: Low

List of Experiments:

Note: The experiment list provided beneath is for reference only. The course teacher may change/formulate it as per his/her methodology and requirement.

Sr. No.	Practical Exercise
1.	Perform queries for DCL Commands and Locks
2.	Implement authorization, authentication, privileges on database.
3.	Perform queries to Create synonyms, sequence and index
4.	Perform queries to Create, alter and update views
5.	Implement PL/SQL programmes using control structures
6.	Implement PL/SQL programmes using Cursors
7.	Implement PL/SQL programmes using exception handling.
8.	Implement user defined procedures and functions using PL/SQL blocks
9.	Perform various operations on packages.
10.	Implement various triggers
11.	Practice on functional dependencies
12.	Practice on Normalization – using any database perform various

Branch Name:	B.Sc. (DS/CS)
Program Code:	ET111/ET112
Course Title:	Optimization Techniques (Elective-I)
Course Code:	14-DSE202-2C
Pre-requisite Course:	Derivative, and integral calculus; applied/intro linear algebra; basic computer programming; probability/statistic

Course Objectives:

The course is designed to meet the objectives of:

1. To make the students introduction of the methods of Operations Research,
2. Emphasize the mathematical procedures of nonlinear programming search techniques,
3. A scientific approach to decision making, which seeks to determine how best to design and operate a system, usually under conditions requiring the allocation of scarce resources.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	50	25	-	25	100

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Introduction to Optimization: Classification of Optimization, Design vector and constraints, Constraint surface, Objective function, Classification of Optimization Problems	3	5
2	Classical Optimization Techniques: Single variable optimization, Multi-variable: Direct substitution method, Lagrange's method of multipliers, Karush-Kuhn-Tucker conditions	10	20
3	Linear Programming: Statement of an LP problem, Simplex method, Dual simplex method	5	10
4	Non-linear Programming: One-dimensional minimization: Unimodal function, Unrestricted search, Exhaustive search, Dichotomous search, Interval halving method, Fibonacci method, Golden section method, Direct root methods: Newton-Raphson and Quasi Newton methods	10	25
5	Non-linear Programming: Unconstrained Optimization Techniques: Direct Search Methods: Random search methods, Grid search method, Univariate method, Hookes and Jeeves' method, Powell's method	7	15
6	Modern Methods of Optimization: Genetic algorithms, simulated annealing, fuzzy optimization, neural-network-based methods	8	25

Reference Books:

1. Engineering Optimization Theory and Practice, S.S.Rao, New Age International (P) Ltd, Publishers
2. Kalyanmoy Deb Multi-objective optimization using evolutionary algorithms John Wiley Publications
3. Jasbir S. Arora Introduction to Optimum Design McGraw Hill Publication

List of Experiments:

Note: The experiment list provided beneath is for reference only. The course teacher may change/formulate it as per his/her methodology and requirement.

Sr. No.	Practical Exercise
1.	Introduction to Optimization
2.	Introduction to MATLAB
3.	Classical Optimization Techniques
4.	Unconstrained Optimization: Elimination Methods
5.	Unconstrained Optimization: Interpolation Method
6.	Unconstrained Optimization: Direct Root Methods
7.	Constrained Optimization: Equality Constraints
8.	Constrained Optimization: Inequality Constraints

Course Learning Outcomes (CLO):

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

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the basic principles for formulation of optimization models and its solution	1. Remembering 2. Understanding
CLO2	Apply optimization techniques to simple and moderate systems to for optimum performance of system.	2. Understanding 3. Applying
CLO3	Understand various algorithms with their comparative study for the utilization of Optimization problem solution	3. Applying 4. Analyzing 5. Evaluate
CLO4	Develop the ability to apply the concepts of linear and Non-Linear programming	2. Understanding 3. Applying 4. Analyzing
CLO5	Learn depth understanding of Genetic algorithms and fuzzy optimizations	1. Remembering 2. Understanding

Mapping of CLO with PO and PSO

Course	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1				L		M							M	M		
CLO2	H	H	H	M		M		L			L	L	L	M		
CLO3	L	M	M	M		M		M		L			L	M		
CLO4	L	M	H	M	L			L					M	L		
CLO5	L	L	H	L	M	H		M		L			L	M		

H: High, M: Medium, L: Low

Branch Name:	B.Sc. (DS/CS)
Program Code:	ET111/ET112
Course Title:	Computer Network (Elective-I)
Course Code:	14-DSE203-2C
Pre-requisite Course:	Derivative, and integral calculus; applied/intro linear algebra; basic computer programming; probability/statistic

Course Objectives:

The course is designed to meet the objectives of:

1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4. Independently understand basic computer network technology.
5. Identify the different types of network topologies and protocols.
6. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	50	25	-	25	100

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Basics of Computer Network: 1.1 Definition & history of networks 1.2 Usage of Computer Networks 1.3 Standard Organizations and Protocols 1.4 Line Configuration 1.5 Network Topology 1.6 Categories of network Based on Scope and Connection 1.7 Applications and features of different types of servers: File server, Print Server, Mail Server, Web Server, Proxy Server	8	20
2	The Reference Model for network communication: 2.1 OSI model & function of each Layer 2.2 TCP/ IP model 2.3 Connection oriented Vs Connectionless approach 2.4 Comparison of OSI & TCP/IP Models	9	20
3	Transmission Media: 3.1 Types of Transmission Media 3.2 Guided Media: Twisted Pair, Coaxial Cable, Fiber 3.3 Un Guided Media: Electromagnetic spectrum, Radio Transmission, Microwave Transmission, Infrared Transmission, Satellite Communication	8	20
4	Network devices and Network Management Software: 4.1 Repeaters 4.2 Hubs 4.3 Switches 4.4 Routers 4.5 Access Points 4.6 Gateways 4.7 Bridges 4.8 Difference between Layer 2 and Layer 3 Switches. 4.9 Introduction of Network Management software	8	20
5	IP Protocol and Network Applications: 5.1 Explain IP v4 and IP v6 protocol. 5.2 Select appropriate class for given network size. 5.3 Illustrate subnet and usage of subnet masking. 5.4 Explain DNS, Email and FTP, HTTP.	9	20

Reference Books:

1. Computer Networking- A Top-Down approach, 5th edition, Kurose and Ross, Pearson
2. Computer Networks (4th edition), Andrew Tanenbaum, Prentice Hall
3. Computer Networking and the Internet (5th edition), Fred Halsall, Addison Wesley
4. Data Communications and Networking (4th edition), Behrouz Forouzan, McGraw Hill
5. TCP/IP Protocol Suite (3rd edition), Behrouz Forouzan, McGraw Hill
6. E-Resources / Web Links:

1. <http://williamstallings.com/DataComm/>
2. <http://www.cs.vu.nl/~ast/>

List of Experiments:

Note: The experiment list provided beneath is for reference only. The course teacher may change/formulate it as per his/her methodology and requirement.

1. Install & Test Network Interface Card.
2. Prepare and Test Straight UTP Cable.
3. Prepare and Test Cross UTP Cable.
4. Develop a small Network. (Hands on Training)
5. Install Windows 2003/Windows 2008 Network operating System.
6. Install & Configure File Server.
7. Install & Configure Print Server.
8. Install & Configure Mail Server.
9. Install & Configure Proxy Server.
10. Install & Configure Web Server.
11. Install & Test Router, Repeater and Bridge.
12. Install a small wireless network using access points.
13. Set, Configure & Test Internet.

Course Learning Outcomes (CLO):

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

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe various protocols, models in networks.	1. Remembering 2. Understanding
CLO2	Explain operations of TCP, HTTP, and DNS.	2. Understanding
CLO3	Illustrate uses of Subnets, Ipv4 and Ipv6 in computer networks	3. Applying 4. Analyzing
CLO4	Design simple computer network	2. Understanding 3. Applying 4. Analyzing
CLO5	Establish and Commission simple computer networks.	3. Applying 4. Analyzing

Mapping of CLO with PO and PSO

Course	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	L	M	L	L									M	M		
CLO2	H	H	H	M									L	M		
CLO3	L	M	M	M									L	M		
CLO4	L	M	H	M									M	L		
CLO5	L	L	H	L									L	M		

H: High, M: Medium, L: Low

Branch Name:	B.Sc. (IT/DS/CS)
Program Code:	ET110/ET111/ET112
Course Title:	Environment Conservation & Disaster Management
Course Code:	14-AEC222-2C
Pre-requisite Course:	Basic knowledge of environmental issues

Course Objectives:

1. The students will learn basics of Environmental conservation and Disaster management concepts.
2. The students will explore different environmental issues and sustainable development in alignment with Sustainable Development Goals.
3. The students will examine the vital roles of ecosystems and assess the significance of biodiversity.
4. The students will explore different types of disaster and their conventional and advance management strategies in India.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)						
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)				Practical (Marks)		Total (Marks)
				University Assessment		Continuous Assessment		University Assessment	Continuous Assessment	
2	0	0	2	Min. 09	Max. 25	Min. 09	Max. 25	-	Min. Max.	50

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Introduction: Introduction to Environment, Environmental Pollution, Understanding the concept of disasters and their impact on the environment, Environmental laws such as Water Act 1974, Air act 1981, The Wildlife Protection Act 1972 and The Environment Protection Act 1986.	4	15
2	Environmental Issues and Challenges: Urbanization and its effect on society, Human Population growth, Population control methods, Environmental issues (Global Warming, Ozon depletion, etc.) and their effects on it, Control measures taken for Environmental issues, Sustainable development and it's principles, Sustainable Development Goals	6	20
3	Biodiversity Conservation: Ecosystem: Water Cycle, Carbon Cycle & Nitrogen Cycle; Importance of biodiversity in maintaining ecosystem health, Threats to biodiversity and endangered species, Conservation strategies and initiatives at local and global levels	4	15
4	Disaster Management Framework: Introduction to disaster management, Principles and frameworks of disaster management, Understanding the phases of disaster management (mitigation, preparedness, response, recovery).	4	15
5	Types of Disaster & Disaster Management in India: Geological Disasters, Hydro-Meteorological Disasters, Biological Disasters, Technological Disasters and Manmade Disasters, Disaster Profile of India, Mega Disasters of India, Role of Government (local, state and national), Disaster Management Act 2005 & Amendments, Publisher by Govt. of India Non-Government and Inter-Governmental Agencies.	6	20
6	Applications of Science and Technology for Disaster Management: Geo-informatics in Disaster Management (RS, GIS, GPS and RS); Disaster Communication System (Early Warning and Its Dissemination).	4	15

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharuch Second edition, 2013 Publisher: Universities Press (India) Private Ltd, Hyderabad.
2. Textbook of Environmental Studies by Deeksha Dave & S SKateva, Cengage Publishers

Reference Books

1. Environmental Sciences by Daniel B Botkin & Edward A Keller Publisher: John Wiley & Sons.
2. Environmental Studies by Anindita Basak, 2009 Publisher: Dring Kindersley (India) Pvt. Ltd. Pearson

Course Learning Outcomes (CLO):

COs	Statements	Bloom's Level
CO1	To acquire basic knowledge and understand about environment.	1. Remembering 2. Understanding
CO2	Basic idea about global environmental issues and control measures.	2. Understanding 3. Applying
CO3	Idea about Ecosystem and conservation strategies.	3. Applying 4. Analyze
CO4	To understand basic of disaster management.	3. Applying 4. Analyze
CO5	Get acquainted with types of disaster and management strategies.	4. Analyze 5. Evaluate
CO6	Get an overview of advance technologies used for disaster management.	4. Analyze 5. Evaluate

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	M	M	H	M	M	L	H		M		L	L	L	M	L	L
CLO2	M	L	M	M	M	L	H		L		L	L	M	M	L	L
CLO3	L	M	M	M	M	L	H		M		L	L	M	M	M	M
CLO4	L	L	M	L	L	M	H		L		M	M	L	L	L	L
CLO5	M	M	M	L	M	M	H		L		M	M	M	M	L	L
CLO6	M	M	M	M	L	L	H		L		L	L	L	L	L	L

H:High, M:Medium, L:Low

Branch Name:	B.Sc. (IT/DS/CS)
Program Code:	ET110/ET111/ET112
Course Title:	Data Analysis using Excel
Course Code:	14-SEC204-2C
Pre-requisite Course:	

Course Objectives:

- (1) To understand and identify the principles of data analysis.
- (2) To apply analysis techniques to datasets in Excel.
- (3) To become adept at using Excel functions and techniques for analysis.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)				Practical (Marks)				Total (Marks)
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
0	0	4	2					Min. 09	Max. 25	Min. 09	Max. 25	50

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Introduction to Excel - About Excel & Microsoft, Uses of Excel, Excel software, Spreadsheet window pane, Title Bar, Menu Bar, Standard Toolbar, Formatting Toolbar, the Ribbon, File Tab and Backstage View, Formula Bar, Workbook Window, Status Bar, Task Pane, Workbook & sheets	3	07
2	Columns & Rows - Selecting Columns & Rows, Changing Column Width & Row Height, Autofitting Columns & Rows, Hiding/Unhiding Columns & Rows, Inserting & Deleting Columns & Rows, Cell, Address of a cell, Components of a cell – Format, value, formula, Use of paste and paste special	5	15
3	Creating Formulas - Using Formulas, Formula Functions – Sum, Average, if, Count, max, min, Proper, Upper, Lower, Using AutoSum, Concatenate, Vlookup, Hlookup, Match, Countif, Text, Trim	7	20
4	Spreadsheet Charts and Data Analysis - Creating Charts, Different types of chart, Formatting Chart Objects, Changing the Chart Type, Showing and Hiding the Legend, Showing and Hiding the Data Table, Sorting, Filter, Text to Column, Data Validation	7	20
5	PivotTables - Creating PivotTables, Manipulating a PivotTable, Using the PivotTable Toolbar, Changing Data Field, Properties, Displaying a PivotChart, Setting PivotTable Options, . Adding Subtotals to PivotTables	5	15
6	Spreadsheet Tools - Moving between Spreadsheets, Selecting Multiple Spreadsheets, Inserting and Deleting Spreadsheets Renaming Spreadsheets, Splitting the Screen, Freezing Panes, Copying and Pasting Data between Spreadsheets, Hiding , Protecting worksheets	5	15
7	Making Macros - Recording Macros, Running Macros, Deleting Macros	3	08

Text Books:

Data Analysis with Microsoft Excel By Berk and Carey

Course Learning Outcomes (CLO):

COs	Statements	Bloom's Level
CO1	Understand and Identify the principles of data analysis.	1. Remembering 2. Understanding
CO2	Build presentation ready dashboards in Excel.	2. Understanding 3. Applying
CO3	Apply analysis techniques to datasets in Excel.	3. Applying 4. Analyze
CO4	Become adept at using Excel functions and techniques for analysis.	4. Analyze 5. Evaluate
CO5	Learn how to use Pivot Tables and Pivot Charts to streamline your workflow in Excel.	4. Analyze 5. Evaluate

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	H	H	M	M	M			L		L		H	H	M	M
CLO2	M	M	M	L	L	L			L		L		M	M	L	L
CLO3	H	M	M	L	L	L			L		L		M	L	L	L
CLO4	M	L	M	L	L	L			L		L		M	M	L	L
CLO5	M	M	M	M	M	M			M		M		M	M	M	M

H:High, M:Medium, L:Low

List of Experiments: Experiments should includes all theory contents.

Branch Name:	B.Sc. (IT/DS/CS)
Program Code:	ET110/ET111/ET112
Course Title:	Human Values and Ethics
Course Code:	14-VAC211- 2C
Pre-requisite Course:	

Course Objectives:

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
1	1	-	2	25	25	-	-	50

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education. Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration-what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, the basic requirements for fulfillment of aspirations of every human being with their correct priority, A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	8	25
2	Understanding Harmony in the Human Being - Harmony in Myself Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.	8	25
3	Understanding Harmony in the Nature and Existence - Whole existence as Co-existence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.	6	20

4	Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.	10	30
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Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

Reference Books:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.

Course Learning Outcomes (CLO):

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

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society.	1 Remembering 2 Understanding
CLO2	Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.	2 Understanding
CLO3	Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society.	2 Understanding
CLO4	Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.	3 Applying 2 Understanding
CLO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.	3 Applying 4 Analyze 5 Evaluate

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	M	L	M				M	H		M		H	M	M	M	H
CLO2	L	L	L				M	H		M		H	L	L	L	H
CLO3	M	M	M				L	H		M		M	M	L	M	M
CLO4	L	L	L				L	H		M		M	L	L	M	M
CLO5	M	M	M				M	H		M		M	L	M	M	M

H: High, M:Medium, L:Low