

SANKALCHAND PATEL UNIVERSITY, VISNAGAR

Faculty of Engineering and Technology



Structure, Teaching Scheme and Syllabus of B.Sc. in Information Technology

Program Code: ET110

With effect from: 2023-24

Program Outcomes:

Program Outcomes POs

PO	Details
1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specification Out Comes:

Program Specific Outcomes PSOs

PSO1	Develop Information Technology-based solutions into the competitive environment.
PSO2	Possess professional skills of software design using cutting-edge technologies.
PSO3	Apply concepts of core areas of Information Technology– Data Structures, Database Management Systems, Operating Systems, Computer Network and Software Engineering to for innovative solutions.
PSO4	Develop effective oral and written communication skills and to introduce them to write ethical codes and guidelines, show leadership, can work as a team leader/team member and communicate efficiently with a team in developing software of multidisciplinary nature.

Semester- IV

Branch Name:	B.Sc. (IT)
Program Code:	ET110
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, Repet	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, Updating	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)
Program Code:	ET110
Course Title:	Data Mining & Warehouse
Course Code:	14I-TM209-2C
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 Techniques, 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 Practice, Eastern Economy Edition, Prentice Hall of India, 2006.
2. Ian H. Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques, 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.
12. Generating graphs for star schema.

Branch Name:	B.Sc. (IT)
Program Code:	ET110
Course Title:	Usability Design for Software Application
Course Code:	14-ITM210-2C
Pre-requisite Course:	

Course Objectives:

Usability in software engineering refers to the levels to which a design can be used by a certain number of users to attain the set objectives with efficiency, effectiveness and high level satisfaction in a particular context. The 5 Es – efficient, effective, engaging, error tolerant and easy to learn – describe the multi-faceted characteristics of usability.

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	Usability Fundamentals and Quality - Usability and utility, Ease of use, necessity of usability considerations, cost and time considerations, Quality concepts, internal and external quality criteria, Industry quality standards	5	15
2	User Interface and the User Experience - Software Development Life Cycle, User Interface development process, User Experience design principles, Design thinking and problem solving approach	5	15
3	User Experience Analysis and Design - Understanding users, requirements, perceptions, abilities and constraints, Human-Computer Interaction (HCI), Constant iterative optimization and prototyping, Five dimensions of interaction design	7	20
4	Usability Design of Mobile Applications - Defining Mobile Learning (m-learning), Pedagogy of m-learning, Cognitive Load Theory (CLT), Design considerations for mobile devices and optimization with responsive design	5	15
5	Information Visualization - Understanding visualization, Common uses for information visualization, Design scenarios, Use cases on information visualization	5	15
6	Usability Heuristics and Smart Design - Heuristic evaluation and visibility (feedback), Severity rating and methods for evaluating the usability, Ergonomic design with navigation structure and enlarger methods, Digital Human Model (DHM) software and Biophilic design	7	20

Text Books:

- (1) Handbook of Usability Testing: How to Plan, Design and Conduct Effective Tests (2008)
- (2) Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics, 2nd edition (2008)

Reference Books

(1) Don't Make Me Think: A Common Sense Approach to Web Usability by Steve Krug

Course Learning Outcomes (CLO):

COs	Statements	Bloom's Level
CO1	Comprehend the usability concept, considerations and generations of usability.	Understanding
CO2	Employ usability engineering lifecycle for designing a user friendly software and user experience analysis and design	Understanding, Applying
CO3	Understand usability design of mobile applications.	Understanding, Applying
CO4	To understand information visualization and Usability Heuristics and Smart Design.	Analyzing, 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	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.

Study the complete Software Development Life Cycle (SDLC) and analyze various activities conducted as a part of various phases. For each SDLC phase, identify the objectives and summaries outcomes. Consider any project to be developed in any technology as a Software Architect or Project Manager. Consider all phases of SDLC.

Branch Name:	B.Sc. (IT)
Program Code:	ET110
Course Title:	Fundamentals of Cyber Security
Course Code:	14-ITE203-2C
Pre-requisite Course:	Linux, cyber crime awareness

Course Objectives:

1. Reasonable understanding of the fundamentals of the cyber security domain and related issues.
2. Practical knowledge of various tools, processes and methods to ensure security of systems through a minimum of two hands-on assignments involving attack and protection in a virtual environment.
3. An understanding of the inter-disciplinary nature of cyber security domain.
4. Adequate level of cross-disciplinary knowledge of design, implementation, evaluation and testing of secure protocols, systems or applications.
5. Basic knowledge to be able to build bug-free systems, dependable during malice or error.
6. Foundational skills for developing expertise in one or more sub-domains of cyber-security.

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 to cyber security: Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.	7	20
2	Cyber crime and law : Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi , Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organisations dealing with Cyber crime and Cyber security in India, Case studies.	9	25
3	Social media and its security: Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.	9	25
4	E-commerce and digital payments: Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, E-Commerce security best practices, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled	11	30

	payments, Digital payments related common frauds and preventive measures. RBI guidelines on digital payments and customer protection in unauthorised banking transactions. Relevant provisions of Payment Settlement Act,2007		
--	---	--	--

Text Books:

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd.
2. Information Warfare and Security by Dorothy F. Denning, Addison Wesley.

Reference Book:

1. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform.
2. Data Privacy Principles and Practice by Natraj Venkataramanan and Ashwin Shriram, CRC Press.
3. Information Security Governance, Guidance for Information Security Managers by W. KragBrothy, 1st Edition, Wiley Publication.

Course Learning Outcomes (CLO):

COs	Statements	Bloom's Level
CO1	Learn the foundations of Cyber security and threat landscape.	1. Remembering 2. Understanding
CO2	To equip students with the technical knowledge and skills needed to protect and defend against cyber threats.	2. Understanding 3. Applying
CO3	To develop skills in students that can help them plan, implement, and monitor cyber security mechanisms to ensure the protection of information technology assets.	3. Applying
CO4	To expose students to governance, regulatory, legal, economic, environmental, social and ethical contexts of cyber security.	3. Applying 4. Analyze
CO5	To systematically educate the necessity to understand the impact of cybercrimes and threats with solutions in a global and societal context.	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	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	L	M	M	M	L
CLO5	M	M	M	M	M	M					L	H		M	M	L

H: High, M: Medium, L: Low

List of Experiments:

1. Setting, configuring and managing three password policy in the computer (BIOS, Administrator and Standard User).
2. Setting and configuring two factor authentications in the Mobile phone.
3. Security patches management and updates in Computer and Mobiles.
4. Managing Application permissions in Mobile phone.
5. Installation and configuration of computer Anti-virus.
6. Installation and configuration of Computer Host Firewall.
7. Wi-Fi security management in computer and mobile.
7. Platforms for reporting cyber crimes.
8. Checklist for reporting cyber crimes online

Branch Name:	B.Sc. (IT)
Program Code:	ET110
Course Title:	Machine Learning for Data Analysis
Course Code:	14-ITE204-2C
Pre-requisite Course:	Python, basic math, statistics

Course Objectives:

Objectives of the course is to introduce the concepts of data modeling techniques using Machine Learning for Data Analytics to increase the job opportunities of B. Tech. students in corporate sectors as well as government agencies, and they can take up their project work from the seventh semester in this field of emerging technologies. Students will learn about state-of-the-art Machine Learning techniques and how to apply them in real life problems.

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 to Data Analysis with Python- What is data analysis? Overview of Python and its data analysis libraries (NumPy, pandas, Matplotlib, Seaborn), Setting up your Python environment	10	25
2	Data Preprocessing and Cleaning - Importing data from various sources (CSV, Excel, SQL), Exploring and understanding the dataset, Handling missing data: imputation techniques, Dealing with outliers and anomalies, Data transformation: normalization, standardization, Data integration and manipulation using pandas.	8	25
3	Exploratory Data Analysis (EDA) - Descriptive statistics: mean, median, mode, variance, etc., Histograms, box plots, scatter plots, Correlation analysis and heatmaps, Univariate and bivariate analysis, Data visualization using Matplotlib and Seaborn.	5	25
4	Machine Learning algorithms for Data Analysis - Introduction to machine learning, Feature engineering and selection, Linear regression: simple and multiple regression, Logistic regression for classification, Decision trees and random forests, Model evaluation metrics: R-squared, MAE, RMSE, accuracy, precision, recall, F1-score, Model assumptions and diagnostics.	10	25

Text Books

- [1] Montgomery, Douglas C., and George C. Runger. Applied Statistics and Probability for Engineers. John Wiley & Sons, 2010
- [2] Artificial Intelligence: A Modern Approach, Stuart Russel & Peter Norvig, Pearson, 2009
- [3] Machine Learning: A probabilistic perspective ,kevin P. Murphy
- [4] Pattern Recognition and Machine Learning, Chris Bishop
- [5] The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Trevor Hastie, Robert Tibshirani, Jerome Friedman

Reference Books

- [1] Business Intelligence: A Managerial Perspective on Analytics, Ramesh Sharda, Dursun Delon, Efraim Turbal, David King, Prentice Hall
- [2] Modellind Techniuques in Predictive Analytics, Thomas W Miller, Pearson
- [3] Introduction to Machine Learning with Python, A. C. Muller & S. Guido, O'Reilly.

Course Learning Outcomes (CLO):

COs	Statements	Bloom's Level
CO1	Learn the foundations of Python and Machine Learning.	1. Remembering 2. Understanding
CO2	To equip students with the technical knowledge and skills needed develop skill for ML algorithm for analysis	2. Understanding 3. Applying
CO3	Apply basic principles of Regression Algorithms for building an adaptive system (Linear, Multilinear, Polynomial, Support Vector, Decision Tree, Random Forest)	3. Applying 4. Analyze
CO4	To expose students technical strong for applying to new problem for data analysis	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	M	M	M	L	M			L		M	L	H	H	M	L
CLO2	M	H	H	LM	M	L			L		M	L	M	M	H	M
CLO3	M	H	M	L	M	L			L		L	L	H	M	H	L
CLO4	H	H	M	M	L	M			M		L	L	M	M	M	L

H:High, M:Medium, L:Low

List of Experiments:

1. Write a python program to import and export data using Panda's library functions.
2. Demonstrate various data pre-processing techniques for a given dataset.
3. Implement Dimensionality reduction using Principal Component Analysis (PCA) method.
4. Write a Python program to demonstrate various Data Visualization Techniques.
5. Implement Simple and Multiple Linear Regression Models.
6. Develop Logistic Regression Model for a given dataset.
7. Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.
8. Implement Naïve Bayes Classification in Python.
9. Build KNN Classification model for a given dataset.
10. Build Artificial Neural Network model with back propagation on a given dataset.
11. a) Implement Random Forest ensemble method on a given dataset.
b) Implement Boosting ensemble method on a given dataset.

Branch Name:	B.Sc. (IT)
Program Code:	ET110
Course Title:	Fundamentals of Internet of Things
Course Code:	14-ITE205-2C
Pre-requisite Course:	Basics of Computer Networking 2. Programming Knowledge in C.

Course Objectives:

1. To study Vision and Introduction to IoT.
2. To understand IoT Market perspective.
3. To understand Data and Knowledge Management and use of Devices in IoT Technology.
4. To understand State of the Art – IoT Architecture.
5. To learn Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

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	IoT & Web Technology The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.	7	20
2	IoT Architecture -State of the Art – Introduction, State of the art Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views	7	20
3	Design And Development - Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry, Pi with Python Programming.	9	25
4	IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN, Protocols: Zigbee, LoRa WAN, RPL, CORPL, : 6LoWPAN, CoAP and MQTT	7	20
5	IoT Applications for Value Creations: Home automation, Industry applications, Surveillance applications, Other IoT applications	6	15

Text Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatias Karnouskos, David Boyle: “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1 st Edition, (Chapters 1-4,8-10), Academic Press, 2014, ISBN: 9780080994017.
2. Dr. Ovidiu Vermesan, Dr. Peter Friess, “Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publisher

Reference Books:

1. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013
2. Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1 st Edition, VPT, 2014

Course Learning Outcomes (CLO):

COs	Statements	Bloom's Level
CO1	Explain the vision of IoT from a global context.	1. Remembering 2. Understanding
CO2	Determine the Market perspective of IoT.	2. Understanding 3. Applying
CO3	Examine Devices, Gateways and Data Management.	3. Applying 4. Analyze
CO4	Apply IoT in Industrial and Commercial Building Automation and Real-World Design Constraints.	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	M	M	M	L	M			L		M	L	H	H	M	L
CLO2	M	H	H	L	M	M			L		M	L	M	M	M	L
CLO3	M	M	H	L	M	M			M		L	L	H	H	H	M
CLO4	H	M	M	M	L	L			M		L	L	M	M	M	L

H:High, M:Medium, L:Low

List of Experiments

1. Experiment on Eclipse IoT Project.
3. Experiment on architecture of Iot Toolkit.
4. Exercise on smart object API Gateway service reference implementation in IoT Toolkit.
5. Experiment on HTTP-to-CoAP semantic mapping Proxy in IoT Toolkit.
6. Experiment on Gate way as a service deployment in IoT Toolkit.
7. Experiment on application framework and embedded software agents for IoT Toolkit.
8. Excercise on working principle of Rasberry Pi.
9. Experiment on connectivity of Rasberry Pi with existing system components.

Branch Name:	B.Sc. (IT)
Program Code:	ET110
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: Drling 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)
Program Code:	ET110
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	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	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)
Program Code:	ET110
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	10	30

	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.		
--	---	--	--

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