Semester-3

DC528T301:DATA SCIENCE USING PYTHON
Course Requisite: Basic knowledge of Programming Language.
Course Objective: 1. To get comfortable with the main elements of Python programming with basic statistics analysis   2. Aim to import, clean, enrich, transform, visualize and output the analysis of a large dataset   3. Reshape and merge data to prepare for advanced analytics
Course Outcome: After completion of the course students must be able to   1. Describe the concepts to write, test and debug Python 3 code with confidence   2. Discuss on including working with Containers, Conditionals & Loops, Functions & Modules and Error Handling.   3. Identify the fundamentals of some of the most widely used Python Packages; including NumPy, Pandas and Matplotlib   4. Apply these concepts to Data Analysis and Data Visualization projects.   5. Build and code a Graphical User Interface (GUI) to run a program.

	DATA SCIENCE USING PYTHON	L
Unit-1:	Introduction: Data Science and Business Buzzwords, Difference between Analysis and Analytics, Data Science Info graphic, Tools in Data Science, Applications	9
Unit-2:	Basics Of Python Spyder (Tool): Introduction Spyder, Setting working Directory, Creating and saving a script file, File execution, clearing console, removing variables from environment, clearing environment, Commenting script files, Variable creation, Arithmetic and logical operators, Data types and associated operations	9
Unit-3:	Data Structures: Lists, Tuples, Dictionary, Sets, Numpy, Array, Matrix and associated operations, Linear algebra and related operations Control Structures: Control structures using Toyota Corolla dataset, if-else, for loop, for loop with if break, while loop	9
Unit-4 :	Pandas Dataframe: Pandas dataframe and dataframe related operations, Reading files, exploratory data analysis, Data preparation and preprocessing Data Visualization: Data visualization on Toyoto Corolla dataset using matplotlib and seaborn libraries Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot	9
Unit-5:	Regression: Predictive Modeling, Linear Regression, Model Assessment, Diagnostic to implement linear fit model Classification: Cross validation, Classification, Logistic regression, Performance measure ,Clustering: KNN, K-means clustering Multiple Regression: Multiple Regression, Decision Tree Case Studies	9

Text Books:
   1. Practical Data Science with Python 3, Varga, Ervin, ISBN 978-1-4842-4859-1, Publisher- Apress
   2. Python for Data Science For Dummies 2nd Edition by John Paul Mueller, Luca Massaron, Wiley, ISBN 9781119547624

References:
     1. Python Data Science Handbook, ISBN-13: 978-1491912058 , Publisher- O'Reilly Media
     2. Python Data Science Essentials, By Boschetti Alberto, ISBN: 9781785280429, 9781785280429, Publisher: Packt Publishing Limited

DC528T302:SYSTEM ANALYSIS AND DESIGN		
Course Requisite: Basic knowledge of Programming Language.		
Course Objective: Upon the completion of the course students must be able to:		
1. Recognize the role of Management Information System in industry. 2. Evaluate the role of information systems in today's competitive business environment. 3. Assess the relationship between organizations, information systems and business processes, including the processes for customer relationship management and supply chain management. 5. Understand and apply technology in Management Information System 6. Learn relevance of IT, MIS & BPR.		
	SYSTEM ANALYSIS AND DESIGN	**L**
Unit-1:	Introduction:- Systems and computer based systems, types of information system, System analysis and design, Role, task and attribute of the system analyst. Approaches to System development:- SDLC, Explanation of the phases, Different models their advantages and disadvantages, Waterfall approach, Iterative approach, Extreme programming, RAD model, Unified process, Evolutionary software process model, Incremental model, Spiral model, Concurrent development model.	**9**
Unit-2:	Analysis: Investigating System Requirements, Activities of the analysis phase, Fact finding methods, Review existing reports, forms and procedure descriptions, Conduct interviews, Observe and document business processes, Build prototypes, Questionnaires, Validate the requirements, Structured walkthroughs. Feasibility Analysis: Feasibility Study and Cost Estimates, Cost benefit analysis, Identification of list of deliverables.	**9**
Unit-3:	Modelling System Requirements:- Data flow diagram logical and physical, Structured English, Decision tables, Decision trees, Entity relationship diagram, Data dictionary. Design:- Design phase activities, Develop System Flowchart, Structure Chart, Transaction, Analysis, Transform Analysis, Software design and documentation tools, Hipo chart, Designing databases, Entities, Relationships, Attributes, Normalization.	**9**
Unit-4 :	Designing input, output and interface:- Input design, Output design, User interface design Testing:- Strategic approach to software testing, Test series for conventional software Test strategies for object – oriented software, Validation testing, System testing, Debugging.	**9**
Unit-5:	Implementation and Maintenance, Activities of the implementation and support phase. Documentation, Use of case tools, Documentation – importance, types of documentation	**9**

Text Books:
  1. "Analysis and Design of Information Systems" : Senn, TMH.
  2. "System Analysis and Design" : Howryskiewycz, PHI.
  3. "System Analysis and Design" : Awad.
  4. "Software Engineering A practitioners Approach" : Roger S. Pressman TMH.		

References:
  1. "System Analysis and Design Methods" :Whitten, Bentley.
  2. "Analysis and Design of Information Systems": Rajaraman, PHI.		

DC528T303:ARTIFICIAL INTELLIGENCE		
Course Requisite: Basic knowledge of Computer Application.		

	Course Objective:
	1. To get comfortable with the main elements of AI.
	2. Aim to apply suitable 'Intelligent Agents for various AI applications.
	3. Identify knowledge statement and represent it.

Course Outcome: After completion of the course students must be able to
1. Adopt an approach in view of Problem solving with AI.
2. Identify and apply suitable 'Intelligent Agents for various AI applications.
3. Identify knowledge statement and represent it.
4. Empower students for path planning of a robotic system.
5. To develop and survey embedded systems applications using machine learning.

	ARTIFICIAL INTELLIGENCE	L
Unit-1:	Introduction: Definition of AI, AI Techniques, Pattern Recognition, Level of the model, Critical for Success, Problems and Problem Specifications, Defining the Problems, Production Systems, Control Strategies, Futuristic Search, Problem Characteristics, Decomposition of Problems, Solution steps, Predictability, Absolute & Relative Solutions.	9
Unit-2:	Basic Problem Solving methods: Reasoning, Problem trees and graphs, Knowledge Representation, Matching indexing with variables, Heuristic Functions, Weak Methods, Problem reduction, Constraints Satisfaction, Means-ends analysis, Analysis of Search Algorithms.	9
Unit-3:	Knowledge Representation using Predicate Logic: Representing simple facts in logic, augmenting the representation, resolution, conversion to clause form, Resolution in Propositional Logic and Predicate Logic, Unification Algorithms, Question Answering and Natural Deduction.	9
Unit-4 :	Structural representation of knowledge: Some common known structures, choosing the level of representation, finding the right structure as needed, declarative representation, semantic nets, Conceptual Dependency, Frames, Scripts, Spectrum and procedural representation	9
Unit-5:	Natural Language Understanding: Concepts of Understanding, Keyword matching, Syntactic and Semantic analysis, Understanding single and multiple sentences, Using Four, Cover structures, Schemes and Scripts in Understanding, Dialogue Understanding.	9

Text Books:
Elaine Rich & Knight: "Artificial Intelligence", McGraw Hill. 2. Charniak, E. : Introduction of Artificial Intellegence, Narosa publ. House.

References:
1. Nils Nilson: " Principles of Artificial Intelligence".(Addison-Wesley)
2. R. J. Winston: " Artificial Intelligence".(Wiley)
3. Patterwson "Introduction to Artificial Intelligence and Expert Systems" (PHI).
4. Rolston "Principles of Artificial Intelligence and Expert Systems", McGraw Hill.

DE528T304: CYBER SECURITY		

Course Requisite:
Basic knowledge of Network Security.

Course Objective:
1. To learn about cyber crimes and how they are planned
2. 2. To learn the vulnerabilities of mobile and wireless devices
3. 3. To learn about the crimes in mobile and wireless devices

Course Outcome: After completion of the course students must be able to
1. Understand the concepts and foundations of Cyber Security
2. Identify security risks
3. Ability to take preventive steps
4. Investigate Cyber Crime and analysis of evidences
5. Acquire knowledge of Digital Forensics.

	CYBER SECURITY	L
Unit-1:	Introduction: Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Internetwork Security, Internet Standards and the Internet Society. Symmetric Encryption and Message Confidentiality.	**9**
Unit-2:	Public-Key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions and HMAC, Public Key Cryptography Principles, Public Key Cryptography Algorithms, Digital Signatures, Key Management.	**9**
Unit-3:	Authentication Applications: Kerberos, X.509 Authentication Service, Public-Key Infrastructure, Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME.	9
Unit-4 :	Network Management Security: Basic Concepts of SNMP, SNMPv1 Community Facility, SNMPv3, Intruders: Intruders, Intrusion Detection, And Password Management.	**9**
Unit-5:	Malicious Software: Viruses and Related Threats, Virus Countermeasures, Distributed Denial of Service Attacks Firewalls: Firewall Design Principles, Trusted Systems, And Common Criteria for Information Technology Security Evaluation.	**9**

Text Books:
William Stallings: "Network Security Essentials Applications and Standards", Pearson Education, Third Edition.

References:
1. AtulKahate: "Cryptography and Network Security" McGraw Hill.
2. Forouzan and Mukhopahyay: "Cryptography and Network Security" McGraw Hill.
3. Matt Bishop: "Computer Security: Art & Science" Pearson Education.
4. Brijendra Singh: "Network Security & Management" PHI.

DE528T305: INTERNET OF THINGS

Course Requisite: Basic knowledge of Internet.

Course Objective: Define and explain basic issues, policy and challenges in the IoT 2. Illustrate Mechanism and Key Technologies in IoT 3. Explain the Standard of the IoT 4. Explain resources in the IoT and deploy of resources into business 5. Demonstrate data analytics for IoT

Course Outcome: After completion of the course students must be able to
    1. Identify the use of IoT from a global context.
    2. Design application using IoT.
    3. Analyze the IoT enabling Technologies
    4. Determine the real world problems and challenges in IoT .

	INTERNET OF THINGS	L
Unit-1:	Introduction: What is the Internet of Things? History of IoT, About IoT, Overview and Motivations, Examples of Applications, Internet of Things Definitions and Frameworks: IoT Definitions, IoT Architecture, General Observations, ITU-T Views, Working Definition, IoT Frameworks, Basic Nodal Capabilities	9
Unit-2:	Fundamental IoT Mechanisms and Key Technologies: Identification of IoT Objects and Services, Structural aspects of IoT, Environment Characteristics, Traffic Characteristics: Scalability, Interoperability, Security and Privacy, Open Architecture, Key IoT Technologies, Device Intelligence, Communication Capabilities, Mobility Support, Device Power, Sensor Technology, RFID Technology, Satellite Technology	9
Unit-3:	Resource Management in Internet of Things: Clustering, Software Agents, Clustering Principles in an Internet of Things Architecture, Design Guidelines, Software Agents for Object Representation, Data Synchronization, Identity portrayal, Identity management, Various identity management models: Local, Network, Federated and global web identity, User-centric identity management, Device centric identity management, Hybrid-identity management, Identity and trust.	9
Unit-4 :	Internet of Things Privacy, Security and Governance: Vulnerabilities of IoT, Security requirements, Threat analysis, Use cases and misuse cases, IoT security tomography and layered attacker model, Identity establishment, Access control, Message integrity, Non-repudiation and availability, Security model for IoT.	9
Unit-5:	Business Models for Internet of Things: Business Models and Business Model Innovation, Value Creation in the Internet of Things, Business Model Scenarios for the Internet of Things, Internet of Things Applications: Smart Metering Advanced Metering Infrastructure, e-Health Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards	9

Text Books: 1. From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Jan Holler Vlasios Tsiatsis Catherine Mulligan Stefan Aves & Stamatis Karnouskos David Boyle

2) Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Ed., VPT, 2014

References:

DE528T306: MACHINE LEARNING

Course Requisite: Basic knowledge of Internet.	

Course Objective:
1. The objectives of the course is to introduce students about the basic of machine learning algorithms.
2. To understand nature of the problem and apply suitable machine learning algorithm.
3. Implement Machine Learning Algorithms on various datasets.

Course Outcome: After completion of the course students must be able to
CO1: Understand modern notions in machine learning and computing.
CO2: Understand a wide variety of learning algorithms.
CO3: Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own.
CO4: Evaluate Machine Learning Models generated from data.
CO5: Apply the algorithms to a real problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

	MACHINE LEARNING	L
Unit-1:	Introduction: Basic Definitions, Types of learning- Supervised Learning, Unsupervised Learning, Reinforcement Learning, Hypothesis Space and Inductive Bias, Evaluation and Cross-validation	9
Unit-2:	Regressions: Linear regression, Decision trees, Over Fitting, Instance based learning, Feature Reduction, Collaborative filtering-based Recommendation Systems.	9
Unit-3:	Probability, Bayes Learning, Logistic Regression, Support Vector Machine, Kernel Function, Classification Algorithms: K-nearest neighbor, classification Decision Trees.	9
Unit-4 :	Computational Learning: Theory and applications, Principal Component Analysis (PAC) Learning Model, Sample Complexity, VC Dimension, Ensemble Learning.	9
Unit-5:	Unsupervised Learning: k-Means, Hierarchical Clustering, Gaussian Mixture Model, Introduction to reinforcement learning, various application of machine learning.	9

Text Book: Mitchell Tom, Machine Learning. McGraw Hill, 1997.

References:
1. Introduction to machine learning, Ethem Alpaydin. —2nd ed., The MIT Press, Cambridge, Massachusetts, London, England.
2. Chris Bishop, Pattern Recognition and Machine Learning

Students are expected to present a seminar & submit a mini-project with report for assessment & evaluation.