Semester III			
CORE IX - SOFTWARE TESTING			
Course Code: 21PCSC31	Hrs / week : 4	Hrs / Sem: 60	Credits :4

- To provide basic understanding of the software development life cycle including testing, test planning &design and test team organization.
- To study the various types of test in the life cycle of the software product.
- To build design concepts for system testing and execution

Course Outcomes:

CO.No	Upon Completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the fundamental concepts and techniques in Software Testing	1	Un
CO-2	identify and apply the functional and system testing methods in commercial environment	3	Ар
CO-3	design Test Planning	3	Ар
CO-4	understand the categories of the system testing methods	3	Un
CO-5	distinguish between methods of judging test case adequacy and how to design tests that will accomplish the obligations of such methods.	1	An
CO-6	apply and manage the test process in real-time applications	1	Ар
CO-7	demonstrate the process of validation and verification and write code to automate test execution and analysis	1	Ар
CO-8	implement various test processes for quality improvement	1	Ap

UNIT- I Basic Concepts, Issues and Techniques

Quality Revolution- Verification and Validation-Failure, Error, Fault, and Defect- Objectives of Testing- Testing Activities-Sources of Information for test Case Selection - White-Box and Black-Box Testing-Test Planning and design-Test Tools and Automation- Test Team Organization and Management.

UNIT - II System Testing

System Integration Testing: System Integration Techniques- Software and Hardware Integration-Test Plan for System Integration-Built- in Testing. Functional Testing:Testing a Function in Context- Boundary Value Analysis- Decision Tables. Acceptance Testing - Selection of Acceptance Criteria-Acceptance Test Plan-Acceptance Test Execution. Software Reliability: Fault and Failure-Factors Influencing Software Reliability- Reliability Models.

UNIT - III System Test Categories

System Test Categories: Taxonomy of System Tests-Command Line Interface Tests, Functionality Tests- GUI Tests-Security Tests-Feature Tests, Robustness Tests- Boundary Value Tests, Power Cycling Tests, Interoperability Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Regulatory Tests. Test Generation from FSM models: State-Oriented Model- Finite-State Machine Transition Tour Method-Testing with State Verification-Test Architectures.

UNIT – IV System Test Design and Execution

System Test Design: Test Design Factors-Requirement Identification-Modeling a Test Design Process-Test Design Preparedness Metrics- Test Case Design Effectiveness. System Test Execution: Modeling Defects- Metrics for Tracking System Test-Metrics for Monitoring Test Execution- Metrics for Monitoring Defect Reports-Defect Causal Analysis-Beta testing-Measuring Test Effectiveness.

UNIT - V Software Quality

Software quality: Five Views of Software Quality-McCall's Quality Factors and Criteria- ISO 9000:2000 Software Quality Standard .Maturity Models: Capability Maturity Model-Test Process Improvement-Testing Maturity Model

Text Book:

1. Kshirasagar. *Software Testing and Quality Assurance, Theory and Practice*. John Wiley & Sons, Inc., Hoboken, New Jersey, 2008.

Reference Books:

- 1. Srinivasan Desikan and Gopalswami Ramesh. Software Testing: Principles and Practices. Pearson Education, 1st Edition, 2008.
- 2. Paul C. Jorgensen. *Software Testing: A Craftman's Approach.*, Auerbach Publications, 4th Edition, 2008.

SEMESTER III				
CORE XI - DATA SCIENCE USING PYTHON				
Course Code: 21PCSC33	Hrs / week :4	Hrs / Sem: 60	Credits : 4	

- To enable the students to understand the concepts of data science and apply data analysis in various application areas
- To provide comprehensive knowledge of python programming paradigms required for Data Science.
- To perform a wide variety of mathematical operations on arrays using NumPy

Course Outcomes:

CO.No	Upon Completion of this course, students will be able to	PSO	CL
		Addressed	
CO-1	explore the fundamental concepts of data science	4	An
CO-2	explain how data is collected, managed and stored for data science	4	Un
CO-3	visualize and present the inference using various tools	4	Ap
CO-4	evaluate the data analysis techniques for applications handling large data	4	Ар
CO-5	implement numerical programming, data handling and visualization through NumPy and Pandas	1	Ар
CO-6	understand and demonstrate the usage of universal functions and list of Arrays in Python	1	Ap
CO-7	understand the working of different data types and their related functions	1	Ap
CO-8	analyze the significance of python program development environment and apply it to solve real world applications	1,3	Un

UNIT – I

Introduction: What Is Data Science?- How Does Data Science Relate to Other Fields?- The Relationship between Data Science and Information Science- Data: Introduction- Data Types-Data Collections- Data Pre-processing–Techniques: Introduction – Data analysis and Data analytics- Descriptive Analysis- Diagnostic analytics-predictive analytics- prescriptive analytics- exploratory analysis – mechanistic analysis

UNIT – II

Tools for Data Science: UNIX: Introduction- Getting access to UNIX- Connecting to a UNIX server- Basic commands- Editing on UNIX- Redirecting and piping-Python: Introduction-Getting access to Python- Examples- Control structures- statistics essentials

UNIT – III

Introduction to NumPy: Understanding Data Types in Python- The Basics of NumPy Arrays-Computation on NumPy Arrays: Universal Functions- Aggregations: Min, Max, and Everything in Between- Computation on Arrays: Broadcasting- Comparisons, Masks, and Boolean Logic- Fancy Indexing- Sorting Arrays- Structured Data: NumPy's Structured Arrays

$\mathbf{UNIT} - \mathbf{IV}$

Data Manipulation with Pandas: Installing and using Pandas- Data Indexing and Selection-Operating on Data in Pandas- Handling Missing Data-Hierarchical Indexing-Combining Datasets-

UNIT – V

Data Manipulation with Pandas: Aggregation and Grouping – Pivot Tables – Vectorized String Operations- Working with Time Series- High performance Pandas: eval() and query()

Text Books:

1. Chirag Shah. A Hands-on Introduction to Data Science. Cambridge University Press, 1st Edition 2020.

2. Jake VanderPlas. *Python Data Science Handbook Essential Tools for Working with Data*, O'Reilly Media, Inc., 1st Edition, 2016.

Reference Books:

1. Wes McKinney. *Python for Data Analysis*. O'Reilly Media, Inc., 1st Edition 2012.

2. Luca Massaron and John Paul Mueller. *Python for Data Science for dummies*. John Wiley & Sons, 2019.

3. Davy Cielen, Arno D.B. Meysman and Mohamed Ali. *Introducing Data Science: Big Data, Machine Learning, and More, using Python Tools.* Manning Publications, 2016.

SEMESTER – III			
CORE PRACTICAL V DATA SCIENCE USING PYTHON LAB			
Course Code : 21PCSCR5	Hrs / Week : 4	Hrs / Sem : 60	Credits : 2

- 1. Given two NumPy arrays as matrices, output the result of multiplying the two matrices and its transpose of a matrix (as a NumPy array).
- 2. Calculate the difference between the maximum and the minimum values of a given NumPy array along the second axis.
- 3. Calculate the Average, Variance and Standard Deviation using NumPy.
- 4. Using a NumPy module create array and check the following:
 - Reshape 3x4 array to 2x2x3 array
 - Sequence of integers from 0 to 30 with steps of 5
 - Join two Arrays.
 - Split two Arrays.
- 5. Write a NumPy program that allows you to read and convert written data in a file into an array.
- 6. Create a Data Frame and List the attributes of a Data Frame.
- 7. Create a Data frame and list the functions that help in selecting the subset of the Data Frame.
- 8. Write a program to read .CSV file into the Data Frame and then convert it into Pandas Series.
- 9. Write a Pandas program for Handling Missing Data, i.e. is NaN.
- 10. Write a program to create data frame for 3 student including name and roll numbers. and add new columns for 5 subjects and 1 column to calculate percentage. It should include random numbers in marks of all subjects.
- 11. Draw the histogram based on the Production of Wheat in different Years Year:2000,2002,2004,2006,2008,2010,2012,2014,2016,2018 Production:4,6,7,15,24,2,19,5,16,
- 12. Write Panda function for Data Analysis and Manipulation.

SEMESTER- III			
ELECTIVE I A- ORGANIZATIONAL BEHAVIOUR			
Course Code: 21PCSE31	Hrs / week :4	Hrs / Sem: 60	Credits :4

- To develop a basic understanding of individual behaviour and organisational change.
- To help the students to develop cognizance of the importance of human behaviour.
- To provide the students with the tools to understand and evaluate individual, group and organizational processes.

Course Outcomes:

CO.No	Upon Completion of this course, students will be able to	PSO addressed	CL
CO-1	analyse the behaviour of individuals and groups in organisations in terms of the key factors that influence organizational behaviour	7	An
CO-2	evaluate personality types, perception and learning process on human behavior	7	Ар
CO-3	analyze the importance of Attitudes, Values, Job satisfaction	7	An
CO-4	describe the key components of Group formation and Group behaviour	7	An
CO-5	identify different motivational theories and evaluate motivational strategies used in a variety of organizational settings	7	Un
CO-6	analyze about human stress and the consequences of stress in an organization	7	An
CO-7	identify the various leadership styles and the role of leaders in a decision making process	7	Un
CO-8	assess the potential effects of organizational-level factors (structure and culture) on organizational behaviour	7	An

UNIT – I

Introduction: Definition – Key Elements of OB – Nature and Scope of OB – Need for studying Organisational Behaviour – Evolution of OB – Development of OB – Foundations of Individual Behaviour – Personality

UNIT – II

Perception: Introduction – Perception – Perception Differs from Sensation – Perceptual Process – Factors Affecting Perception – Impression Management – Attitudes: Concept – Formation – Types – Measurements – Change – Values: Concept – Types – Formation – Values and Behaviour – Job Satisfaction: Concept – Determinants – Measuring – Effects – Job Dissatisfaction – Learning

UNIT – III

Motivation: Meaning –Nature – Motivation Cycle or Process – Need – Theories - Foundation of Group Behaviour: Definition and Characteristics of Group – Types of Groups – Stages of Group formation – Group Behaviour – Group Decision-Making – Organisational Conflicts

$\mathbf{UNIT} - \mathbf{IV}$

Stress Management: Stress – Symptoms of Stress – Measurement of Stress – Causes or Sources of Stress – Consequences of Stress – Communication – Nature and Need for Communication – Process of Communication – Channels of Communication – Communication Networks – Leadership – Power and Politics

$\mathbf{UNIT} - \mathbf{V}$

Organisation: Organisational Structure – Organisational Theory – Organisational Culture – Organisational Development – Organisational Effectiveness – Quality of Working Life

Text Book:

1. S. S. Khanka. Organisational Behaviour. S. Chand Publishing, 2003.

Reference Books:

- 1. Stephen P. Robins. *Organisational Behavior*. PHI Learning / Pearson Education, 11th edition, 2008.
- 2. Aswathappa, K. Organisational Behaviour. Himalaya Publication, 7th Edition, 2007.
- 3. Mrs. Amruta S. Oke, Sunil P. Ujagare, Mrs. Gauri M. Kulkarni and Vilas D. Nandavadekar. *Principles & Practice of Management&Organizational Behaviour*.Nirali publication, 2015.
- 4. Fred Luthans. Organisational Behavior.McGraw Hill, 11th Edition, 2001.

Semester III		
SELF-STUDY COURSE – COURSE ON COMPETITIVE EXAMS		
Course Code: 21PCSSS1	Credits: 2	

- To provide a platform to the students for building the fundamentals of basic mathematics for competitive examinations preparation strategy
- Establish a framework to help students acquire knowledge and expertise necessary to secure employment opportunities in the government sector

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Solve real life problems requiring interpretation and comparison of various representations of ratios.	2,6	Ap
CO-2	Distinguish between proportional and non-proportional situations and when appropriate apply proportional reasoning	6	An
CO-3	Solve problems applying probabilistic reasoning to make decisions	2	Ар
CO-4	Evaluate claims based on empirical, theoretical and subjective probabilities	6,4	Re
CO-5	Create and use visual displays of data	4	Cr
CO-6	Solve problems using high speed mental calculations	6	Ар
CO-7	Understand the basic concepts of logical reasoning skills.	1,4	Un
CO-8	Acquire satisfactory competency in use of data analysis	7	Un

Course Outcomes:

UNIT - I

Number System (Including divisibility) – HCF and LCM (Including Factors, Multiples and Prime Factorization) (Chapter: 1&2, pages 1 – 46)

UNIT - II

Fractions and Decimals – Square and Square roots, Cube and Cube Roots, Indices and Surds. (Chapter: 3 &4, pages 47 – 94)

UNIT - III

Time, Work and Wages (Including Pipes & Cistern) – Time, Speed and Distance (Including Trains, Boats and Stream, Circular Motion, Races and Games. (Chapter: 15 & 16, pages 317 - 374)

UNIT - IV

Permutations & combinations and Probability. (Chapter: 18, pages 391 - 416)

UNIT - V

Set Theory (Including Venn Diagram) – Data Analysis and Data Interpretation (Including Caselet, Table, Line Graph, Bar Graph, Mixed Bar) (Chapter: 24 & 27, pages 559 – 570, 615 – 648)

Text Book:

1. Er.Deepak Agarwal and Mr.D.P.Gupta:Rapid Quantitative Aptitude with Shortcuts and Tricks for Competitive Exam, Disha Publication.

Reference Books:

- 1. Dr.R.S.Aggarwal: Quantitative Aptitude for Competitive Examinations, S.Chand Publication.
- 2. Rajesh Verma, Fast Track Objective Arithemetic, Arihant Publication.