Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Information Technology
Choice Based Credit System (CBCS) in the light of NEP-2020
Bachelor of Technology (CSE with Specialization in Enterprise System (Red Hat))
SEMESTER-V(2023-2027)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS501N	DCC	Theory of Computation	60	20	20	-	-	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:
The student will have ability to:
1. To introduce concepts in automata theory and theory of computation.
2. To identify different formal language classes and their relationships.
3. To design grammars and recognizers for different formal languages.

COURSE OUTCOMES:
Upon completion of the subject, students will be able to:
1. Ability to relate practical problems to languages, automata, and computability.
2. Ability to demonstrate an increased level of mathematical sophistication.
3. Ability to apply mathematical and formal techniques for solving problems.

SYLLABUS
UNIT I — 10 HOURS
Introduction: Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem.

UNIT II — 8 HOURS
Regular Expression (RE): Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden's Theorem, Non-Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT III — 9 HOURS
Context Free Grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT IV — 7 HOURS
Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

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BTCS501N	DCC	Theory of Computation	60	20	20	-	-	3	1	0	4

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UNIT V **8 HOURS**

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to undecidability, undecidable problems about TM, NP hard and NP complete problem, Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

TEXTBOOKS:

1. J. E. Hopcraft, R. Motwani and J. D. Ullman, *Introduction to Automata Theory, Languages, and Computation*, 3rd Ed., Pearson, 2013.
2. P. Linz, S. H. Rodger, *An Introduction to Formal Languages and Automata*, 7th Ed., Jones & Bartlett Learning, 2023.

REFERENCE:

1. J. C. Martin, *Introduction to Languages and Theory of Computations*, 4th Ed., Tata McGraw Hill, 2010.
2. C. Papadimitriou, and C. L. Lewis, *Elements of the Theory of Computation*, PHI, 1997.
3. Michael Sipser, *Introduction to Theory of Computation*, 3th Ed., Cengage Learning, 2013.
4. K. L. P Mishra & N. Chandrasekaran, *Theory of Computer Science*, 3th Ed., PHI Learning, 2006

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			THEORY			PRACTICAL					
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BTCS502N	DCC	**Introduction to Artificial Intelligence**	**60**	**20**	**20**	**30**	**20**	**3**	**0**	**2**	**4**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

The student will have ability to:

1. Know how computer system adapts, evolves and learns.
2. To gain expertise in one of fastest growing areas of Computer Science that covers topics related to human intelligence and its applications in industry, defense, healthcare, agriculture and many other areas.
3. Provides a rigorous, advanced and professional graduate-level foundation in Artificial Intelligence

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Build intelligent agents for search and games
2. Solve AI problems through programming with Python
3. Learning optimization and inference algorithms for model learning
4. Design and develop programs for an agent to learn and act in a structured environment.

SYLLABUS

UNIT I — 10 HOURS

Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

UNIT II — 9 HOURS

Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search.

UNIT III — 8 HOURS

Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.

UNIT IV — 7 HOURS

Markov Decision process: MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

UNIT V — 8 HOURS

Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

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BTCS502N	DCC	**Introduction to Artificial Intelligence**	**60**	**20**	**20**	**30**	**20**	**3**	**0**	**2**	**4**

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TEXTBOOKS:

1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 3rd Ed., Prentice Hall.
2. Elaine Rich and Kevin Knight, *Artificial Intelligence*, Tata McGraw Hill.

REFERENCE:

1. M. C. Trivedi, *A Classical Approach to Artificial Intelligence*, Khanna Publishing House, Delhi.
2. Saroj Kaushik, *Artificial Intelligence*, Cengage Learning India, 2011.
3. David Poole and Alan Mackworth, *Artificial Intelligence: Foundations for Computational Agents*, Cambridge University Press, 2010.
4. https://nptel.ac.in/courses/106105077
5. https://nptel.ac.in/courses/106106126
6. https://aima.cs.berkeley.edu
7. https://ai.berkeley,edu/project_overview.html (for Practical)

LIST OF PRACTICALS

1. Write a program to conduct uninformed and informed search.
2. Write a program to conduct game search.
3. Write a program to construct a Bayesian network from given data.
4. Write a program to infer from the Bayesian network.
5. Write a program to run value and policy iteration in a grid world.
6. Write a program to do reinforcement learning in a grid world.
7. Mini Project work.

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BTCS503M	DCC	Network Security & Cryptography	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

The student will have ability to:

1. Understand and describe the fundamental concepts of network security.
2. Explain and analyze key cryptographic concepts.
3. Demonstrate and apply knowledge of symmetric key algorithms.
4. Evaluate and compare the effectiveness of asymmetric key algorithms.
5. Assess and create an understanding of industry-standard internet security protocols.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Identify and explain the key principles of network security.
2. Summarize and differentiate between various cryptographic techniques.
3. Execute and demonstrate encryption and decryption processes.
4. Critically evaluate the strengths and weaknesses of different asymmetric key algorithms.
5. Design and implement a secure communication protocol.

SYLLABUS

UNIT I — 8 HOURS

Introduction to Network Security: Computer Security Concept, Need for Security, Security in Networks: Threats in networks, Network Security Controls– The OSI Security Architecture, Fundamental Security Design Principle, Security Attacks, Security Services, Security mechanism, Attack Surface and Attack trees, A Model of Network Security Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honey pots. Proxy Servers and Anonymizers, Firewall, Types of firewall, Password Cracking Techniques.

UNIT II — 9 HOURS

Cryptography Concepts & Techniques: Introduction, Plaintext & Cipher text, Creaser Cipher, Substitution Techniques, Substitution Boxes (S-Boxes), Permutation Cipher, Transposition Techniques, Encryption & Decryption, Symmetric & Asymmetric key Cryptography, Key Range & Key Size, Cryptographic Attacks.

UNIT III — 8 HOURS

Symmetric Key Algorithm: Introduction of Block Ciphers, Overview of Symmetric Key Cryptography, DES (Data Encryption Standard) algorithm, Double DES Triple DES, AES, IDEA (International Data Encryption Algorithm) algorithm.

UNIT IV — 10 HOURS

Asymmetric Key Algorithm: Overview of Asymmetric key Cryptography, RSA algorithm, Symmetric & Asymmetric key Cryptography together, Random Oracle Model, Diffie-Hellman Key Exchange, Digital Signature, Basic concepts of Message Digest and Hash Function. Man in Middle Attack, DoS and DDoS Attacks.

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BTCS503M	DCC	Network Security & Cryptography	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

UNIT V 9 HOURS

Internet Security Protocols: User Authentication Basic Concepts, SSL Architecture, SSL protocol Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication. Steganography its importance. Basics of mail security, Pretty Good Privacy, S/MIME, ISAKMP.

TEXTBOOKS:

1. William Stallings, *Cryptography and Network Security*, 2nd Ed., Pearson Education Asia.
2. C. Kaufman, R. Perlman and M. Speciner, *Network Security private communication in a public world*, Pearson.

REFERENCE:

1. William Stallings, *Cryptography And Network Security Principles And Practice*, 4th Ed., Pearson Education
2. Wenbo Mao, *Modern Cryptography: Theory and Practice*, Prentice Hall PTR
3. William Stallings, *Network Security Essentials: Applications and Standards*, Prentice Hall
4. Douglas R. Stinson, *Cryptography: Theory and Practice*, CRC press.
5. Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, *Building Internet Firewalls*, 2nd Ed., O'Reilly.
6. Atul Kahate, *Cryptography & Network Security*, Tata McGraw Hill.
7. http://nptel.ac.in/

LIST OF PRACTICALS

1. Write a Program to implement Ceaser Cipher
2. Write a Program to implement Substitution Cipher with equation c=3x+12
3. Write a Program to implement poly alphabetic Cipher
4. Write a Program to implement Rail fence technique
5. Write a Program to implement Simple Columner Transposition technique
6. Write a Program to implement Advanced Columner Transposition technique
7. Write a Program to implement Rotation Cipher
8. Create a Virtual Private Network.
9. Write a Program to implement Simple RSA Algorithm with small numbers.
10. Write a Program to implement Simple Diffie- Hellman Key Exchange Algorithms with small numbers.

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BTDSE511M	DSE	Image Processing	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

The student will have ability to:

1. Understand the image processing system.
2. Analyze different transformation and segmentation techniques
3. Apply feature extractions from images.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Define key concepts and terminologies related to image processing systems and their applications
2. Apply intensity transformations for image enhancement
3. Develop a comprehensive understanding of image processing theories and techniques
4. Demonstrate an understanding of transform and similarity measures

SYLLABUS

UNIT I — 8 HOURS

Introduction: Image processing systems and its applications. Basic image file formats, Image formation: Geometric and photometric models; Digitization - sampling, quantization; Image definition and its representation, neighborhood metrics.

UNIT II — 8 HOURS

Intensity transformations and spatial filtering: Enhancement, contrast stretching, histogram specification, local contrast enhancement; Smoothing, linear and order statistic filtering, sharpening, spatial convolution, Gaussian smoothing, DoG, LoG.

UNIT III — 10 HOURS

Segmentation: Pixel classification; Grey level thresholding, global/local thresholding; Optimum thresholding - Bayes analysis, Otsu method; Derivative based edge detection operators, edge detection/linking, Canny edge detector; Region growing, split/merge techniques, line detection, Hough transform.

UNIT IV — 10 HOURS

Image/Object features extraction: Textural features - gray level co-occurrence matrix; Moments; Connected component analysis; Convex hull; Distance transform, medial axis transform, skeletonization/thinning, shape properties. Registration: Mono-modal/multimodal image registration; Global/local registration; Transform and similarity measures for registration; Intensity/pixel interpolation.

UNIT V — 8 HOURS

Colour image processing: Fundamentals of different colour models - RGB, CMY, HSI, YCbCr, Lab; False colour; Pseudocolour; Enhancement; Segmentation. Morphological Filtering Basics: Dilation and Erosion Operators, Top Hat Filters.

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BTDSE511M	DSE	Image Processing	60	20	20	30	20	3	0	2	4

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TEXTBOOKS:

1. R. C. Gonzalez and R. E. Woods, *Digital Image Processing*, Prentice Hall.

REFERENCE:

1. Maria Petrou and Panagiota Bosdogianni, *Image Processing: The Fundamentals*, John Wiley & Sons, Ltd.
2. K. R. Castleman, *Digital Image Processing*, Prentice Hall, Englewood Cliffs.
3. A. Blake and A. Zisserman, *Visual Reconstruction*, MIT Press, Cambridge.
4. A. N. Netravali and B. G. Haskell, *Digital Pictures*, Plenum Press.
5. A. B. Watson, *Digital Images and Human Vision*, MIT Press, Cambridge.

LIST OF PRACTICALS

1. Image File Format Comparison Load, display, and save images in different formats (JPEG, PNG, BMP) using a programming library. Analyze and compare the compression quality and file size.
2. Histogram Equalization Implement histogram equalization to enhance the contrast of a given image. Visualize the original and equalized histograms to show the effect of the transformation.
3. Spatial Filtering: Smoothing and Sharpening Apply various spatial filters (mean, median, Gaussian) for smoothing and different sharpen filters (Laplacian, Sobel) to an image. Compare and analyze the results.
4. Image Segmentation Using Thresholding Implement global and adaptive thresholding to segment an image. Use Otsu's method to determine the optimal threshold and evaluate the effectiveness of the segmentation.
5. Edge Detection Techniques Implement several edge detection operators (e.g., Sobel, Prewitt, Canny) on the same image. Compare their performance visually and quantitatively (e.g., using precision and recall).
6. Texture Feature Extraction Use the gray level co-occurrence matrix to extract texture features from an image (contrast, correlation). Compare textures from different regions of the same image.
7. Image Registration Perform mono-modal image registration by aligning two images of the same scene taken at different times. Implement a technique to measure similarity (SSD, correlation) using transformations.
8. Color Space Conversion Convert a color image from RGB to different color spaces (HSV, YCbCr, Lab). Visualize the changes and select one space to perform color-based segmentation.
9. Morphological Operations: Dilation and Erosion Apply morphological operations (dilation and erosion) on binary images. Analyze how these operations affect the structure of the objects in the images.
10. Canny Edge Detector Implementation Implement the Canny edge detection algorithm from scratch. Break down the steps involved.

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BTDSE512N	DSE	Software Testing and Quality Assurance	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:

The student will have ability to:

1. Develop a skill in developing good quality in the software product.
2. Develop methods and procedures for software development that can scale up for large systems and that can be used to consistently produce high-quality software at low cost and with a small cycle time
3. Learn systematic approach to the operation, maintenance, and retirement of software.
4. Learn how to use available resources to develop software, reduce cost of software and how to maintain quality of software
5. Methods and tools of testing and maintenance of software

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Apply approach of Software Testing & QA concepts.
2. Apply modern software testing processes in relation to software development and project management.
3. Create test strategies and plans, design test cases prioritize and execute them.
4. Manage defects within a project.
5. Contribute to efficient delivery of software solutions and implement improvements in the software development processes.

SYLLABUS

UNIT I — 10 HOURS

BASIC CONCEPTS: Basic Testing Vocabulary, Quality Assurance versus Quality Control, The Cost of Quality, Software Quality Factors, Software Defect, The Multiple Roles of the Software Tester(People Relationships), Scope of Testing, Testing Constraints, Various software development Life cycles (SDLC), Independent Testing, QA Process, Levels of Testing, The "V" Concept of Testing.

UNIT II — 9 HOURS

WHITE BOX TESTING: White box testing techniques - Statement coverage - Branch Coverage - Condition coverage - Decision/Condition coverage - Multiple condition coverage - Dataflow coverage - Mutation testing - Automated code coverage analysis.

UNIT III — 8 HOURS

BLACK BOX TESTING: Black box testing techniques - Boundary value analysis - Robustness testing - Equivalence partitioning -Syntax testing - Finite state testing - Levels of testing – Unit testing- Integration Testing

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BTDSE512N	DSE	Software Testing and Quality Assurance	60	20	20	30	20	3	0	2	4

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UNIT IV **7 HOURS**

SYSTEM TESTING - Functional testing-non-Functional testing-acceptance testing-performance testing –Factors and Methodology for Performance testing, Regression testing-Methodology for Regression-testing. Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors, Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, Quality Characteristics, Software Quality Standard

UNIT V **8 HOURS**

ADVANCE SOFTWARE TESTING METHOD (OBJECT ORIENTED TESTING): Syntax testing - Finite State testing - Levels of testing - Unit, Integration and System Testing. Challenges - Differences from testing non-OO Software - Class testing strategies - State-based Testing Software quality Assurance: ISO 9000; CMM and Test Management Issues; Quality Assurance personnel Issues.

TEXTBOOKS:

1. Kshirasagar Naik & Priyadarshi Tripathy, *Software Testing & Quality Assurance*, John Wiley & Sons, Inc. Publication.
2. R S. Pressman, *Software Engineering: A Practitioner's Approach*, 6th Ed., McGraw-Hill, 2006.

REFERENCE:

1. Waman S. Jawadekar, *Software Engineering*, Tata McGraw Hill.
2. Sommerville, *Software Engineering*, Pearson Education.
3. http://www.softwaretestinghelp.com/online-software-testing-course-syllabus/
4. https://amizone.net/AdminAmizone/WebForms/Academics/NewSyllabus/1217201473127725pdf
5. http://www.tutorialspoint.com/uml/

LIST OF PRACTICALS

1. Design test cases using Boundary value analysis by taking quadratic equation problem.
2. Design test cases using Equivalence class partitioning taking triangle problem.
3. Design test cases using Decision table taking triangle problem.
4. Design independent paths by calculating cyclometer complexity using date problem.
5. Design independent paths by taking DD path using date problem.
6. Design the test cases for login page of AMIZONE.
7. Manual Testing for PAN card verification.
8. Generate test case for ATM machine.
9. Overview of Testing process using Rational Robot.
10. Write a script to record verification point using Rational Robot (For GUI testing of single click on window OS).
11. Write a script to record verification point for Clip Board and alphanumeric values using Rational Robot.

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BTDSE513N	DSE	**Next Generation Telecommunication Networks**	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit; ***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:
The student will have ability to:
1. Understand the importance of QoS and resource management in next generation wireless networks.
2. Describe and compare the network and protocol architectures of GPRS and EDGE and the two principle 3G cellular based wireless standards: UMTS and cdma2000.
3. List and provide a high-level discussion on the key enabling technologies for next generation wireless networks.
4. Identify the relationship between WiFi, WiMAX, and 3G cellular-based wireless networks. In addition, the student will be able to outline and discuss the potential impact of these technologies upon wireless network evolution.

COURSE OUTCOMES:
Upon completion of the subject, students will be able to:
1. Understand and explain the drivers of service conversion.
2. Define the term “Next Generation Network” and outline its main characteristics.
3. Outline the main architectural elements of a Next Generation Network and explain the logic behind it.
4. Understand the concept of Voice over IP (VoIP) and explain how full featured telephony can be provisioned over an IP network.
5. Understand the portfolio of broadband access mechanisms in a fixed network and be able to explain the relative merits of each type.
6. Understand the principles of connection-orientated and connectionless packet switching and the protocols available to enable such networks.
7. Understand the principles of mobile networks and they relate to NGN.

SYLLABUS
UNIT I — 10 HOURS
Basic history of Mobile Computing Architecture for mobile computing, Three tier architecture, design considerations for mobile computing, mobile computing through internet, Wireless network architecture, Applications, Security, Concerns and Standards, Benefits, Future. Evolution of mobile computing.

UNIT II — 9 HOURS
Next Generation Networks (NGN), Principles and definition of an NGN, The NGN architecture, Outline of technology choices, Network and implementation issues with NGN, Numbering & Addressing

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Bachelor of Technology (CSE with Specialization in Enterprise System (Red Hat))

SEMESTER-V(2023-2027)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTDSE513N	DSE	**Next Generation Telecommunication Networks**	60	20	20	30	20	3	0	2	4

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UNIT III **8 HOURS**

Wireless n/w. and Technologies Introduction, Different generations. Introduction to 1G, 2G, 3G and 4G, Bluetooth, Radio frequency identification(Rfid),Wireless Broadband, Mobile IP: Introduction, Advertisement, Registration, TCP connections, two level addressing, abstract mobility management model, performance issue, routing in mobile host, Adhoc networks, Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction oriented TCP. ,IPv6.

UNIT IV **7 HOURS**

Next Generation Core Network The role of the core network, Enabling Control and Reconfigurability, Packet Switching (ATM, IP, MPLS, Ethernet), IP Multi-Media System (IMS), Principles of control for IP networks, Concept of IMS

UNIT V **8 HOURS**

NGN Service Aspects Services on an NGN, Service compatibility with PSTN and IN, Use of APIs and service provider interfaces, Brief review of the principles of mobile networks, Relationship of mobile developments to NGN

TEXTBOOKS:

1. A. R. VALDAR, *Understanding Telecommunications Networks*, IET Telecommunications Series 52, 2006
2. Jeffrey Bannister, Paul Mather, and Sebastian Coope, *Convergence Technologies for 3G Networks: IP, UMTS, EGPRS and ATM*, John Wiley & Sons, Ltd. ISBN 0-470-86091-X (HB)

REFERENCE:

1. Asoke K Telukder, Roopa R Yavagal, *Mobile Computing* , Tata McGraw Hill.
2. Saha Misra, *Wireless Communications and Networks, 3G and beyond, ITI*, Tata McGraw Hill.
3. M Carugi, *Introduction to the ITU-T NGN focus group release 1: target environment, services, and capabilities*, Communications Magazine, IEEE, vol.43, no.10, pp. 42- 48, Oct. 2005
4. Chae-Sub Lee, D. Knight, *Realization of the next-generation network*, Communications Magazine, IEEE, vol.43, no.10, pp. 34- 41, Oct. 2005.

LIST OF PRACTICALS

1. Selection and study of various PN code (MLS, GOLD, BARKER).
2. Generate (spreading) DS-SS modulated signal.
3. To demodulate (dispreading) DS-SS modulated signal.
4. Selection & comparative study of various code modulation techniques: BPSK/ QPSK/OQPSK.
5. Modulation and Demodulation using internal generation of 2047 bit PN sequence as modulator Input and Unmodulated carrier.
6. Spreading and Dispreading using Additive white Gaussian Noise Generator and frequency offset.
7. Voice communication using DSSS.

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BTIT507N	SEC	**Programming with Python**	0	0	0	60	40	0	0	4	2

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COURSE OBJECTIVES:

The student will have ability to:

1. To develop proficiency in creating based applications using the Python Programming Language.
2. To be able to understand the various data structures available in Python programming language and apply them in solving computational problems.
3. To be able to do testing and debugging of code written in Python.
4. To be able to draw various kinds of plots using PyLab.
5. To be able to use generators for generating series like fibonacci.

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

1. Ability to create robust applications using the Python programming language.
2. Ability to test and debug applications written using the Python programming language.
3. Ability to create applications for solving computational problems using the Python Programming Language.

SYLLABUS

UNIT I — 10 HOURS

Introduction to Python: The basic elements of Python, Branching programs, Strings and Input, Iteration. Functions, Scoping and Abstraction: Functions and Scoping, Specifications, Recursion, Global variables, Modules, Files.

UNIT II — 9 HOURS

Testing and Debugging: Testing, Debugging. Structured Types, Mutability and Higher order Functions: Tuples, Lists and Mutability, Functions as Objects, Strings, Tuples and Lists, Dictionaries.

UNIT III — 8 HOURS

Exceptions and assertions: Handling exceptions, Exceptions as a control flow mechanism, Assertions. Classes and Object oriented Programming: Abstract Data Types and Classes, Inheritance, Encapsulation and information hiding.

UNIT IV — 10 HOURS

Numpy and Pandas: Python list vs NumPy arrays, Creating a NumPy Array, Basic ndarray, Shape of NumPy array, Size of NumPy array, Random numbers in ndarray, The Shape and Reshaping of NumPy Array, Dimensions of NumPy array, Reshaping a NumPy array, Flattening a NumPy array, Transpose of a NumPy array, Indexing and Slicing of NumPy Array. Pandas Series, Pandas Data Frames, Common Operations in Pandas, How to Deal With Missing Data in Pandas, How To Merge Data Frames in Pandas, How To Join Data Frames in Pandas, How to Concatenate Data Frames in Pandas. Data Input and Output in Pandas, How to Save Pandas Data Frames. Data

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UNIT V **8 HOURS**

Matplotlib: Matplotlib Introduction, Line Chart, Scatter Plot, Bar Graph, Histogram, Subplots, Pie Chart , Pyplot, Matplotlib with Pandas and Numpy. Specify Color, Markings and Lline Styles, Adjust Thickness, Label Tilte, and Legend

TEXTBOOKS:

1. John V Guttag, *Introduction to Computation and Programming Using Python*, Prentice Hall of India
2. Allen Downey, Jeffrey Elkner and Chris Meyers, *How to think like a Computer Scientist, Learning with Python*, Green Tea Press.

REFERENCE:

1. Mark Lutz, *Learning Python*, 5th Ed., O'Reilly Media.
2. David Beazley, *Python Cookbook*, 3rd Ed., O'Reilly Media.
3. *Python Essential Reference*, 4th Ed., Addison-Wesley Professional.
4. Mark Lutz, *Programming Python: Powerful Object-Oriented Programming, David Beazley, Python Cookbook*, 3rd Ed., O'Reilly Media

LIST OF PRACTICALS

1. Write a Python Program to Print Hello world!
2. Write a program to demonstrate different number data types in Python.
3. Write a program to perform different Arithmetic Operations on numbers in Python.
4. Write a Program to Swap Two Variables.
5. Write a Program to Convert Celsius to Fahrenheit.
6. Write a Program to Find the Largest Among Three Numbers.
7. Write a Program to Check Prime Number.
8. Write a Program to Find the Factorial of a Number.
9. Write a Program to Print the Fibonacci sequence.
10. Write a program to create, append, and remove lists in python.
11. Write a program to demonstrate working with tuples in python.
12. Write a program to demonstrate working with set in python.
13. Write a program to demonstrate working with dictionaries in python.
14. Write a program to find reverse of given number using function.
15. Write a python Program to call data member and function using classes and objects
16. Write a program to read 3 subject marks and display pass or failed using class and object.
17. Write a program in Python to handle user defined exception for given problem
18. Write a program using a Numpy module to create an array and check the following:
    Type of array b. Axes of array c. Shape of array c. Type of elements in array
19. Write a python program to concatenate the data frames with two different objects
20. Write a Python program to Demonstrate how to Draw a Scatter Plot, Bar Graph and Pie Chart using Matplotlib.

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DO180	DCC	**RedHat OpenShift : Containers & Kubernetes**	-	-	-	-	100	0	0	2	1

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COURSE OBJECTIVES:
The student will have ability to:
1. Understand container and Open Shift architecture.
2. Deploy containerized applications on Red Hat Open Shift.
3. Create, Deploy and monitor microservice-based applications.
4. Deploying multi-container applications.

COURSE OUTCOMES:
Upon completion of the subject, students will be able to:
1. Create containerized services using Podman.
2. Manage containers and container images.
3. Create custom container images.
4. Deploy containerized applications on Open Shift.
5. Deploy multi-container applications.

SYLLABUS
UNIT I
Introduce container technology, Orchestration : Need, Red Hat OpenShift Container Platform, Red Hat OpenShift Architecture.

UNIT II
Creating containerized services, Managing containers, Managing container images, Creating custom container images.

UNIT III
Deploying containerized applications on OpenShift, Deploying multi-container applications.

UNIT IV
Troubleshooting containerized applications, Errors and Solutions.

UNIT V
Comprehensive review of introduction to container, Kubernetes, and Red Hat Open Shift.

REFERENCE:

1. https://www.redhat.com/en/services/training/do180-red-hat-openshift-I-containers-kubernetes.
2. Introduction to Containers, Kubernetes, and Red Hat Open Shift: Student Workbook, Ravi Shankar Srinivasan, Fernando Lozano, Richard Allred, Ricardo Taniguchi, Jim Rigsbee, 2017.