Shri Vaishnav Vidyapeeth Vishwavidyalaya

B.Tech.(CSE- Artificial Intelligence -IBM)
Choice Based Credit System (CBCS) 2019-20
SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCS501	UG	Theory of Computation	3	1	0	4	60	20	20	0	0

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based on 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
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
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
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
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.

UNIT–V
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.

TEXT BOOKS:
1. Hopcroft and Ullman, –Introduction to Automata Theory, Languages and Computation‖, Pearson Education, 3rd edition, 2014
2. Peter Linz, "An Introduction to Formal Language and Automata", NarosaPub.House, 2011.
3. K.L.P Mishra & N.Chandrasekaran,―Theory of Computer Science‖, PHI Learning, 3rd edition, 2006

REFERENCES:
1. Martin J. C., –Introduction to Languages and Theory of Computations‖, TMH, 4th edition, 2010.
2. Papadimitriou, C. and Lewis, C. L., –Elements of the Theory of Computation‖, PHI, 1997.
3. Michael Sipser,―Introduction to Theory of Computation‖, Cengage Learning, 3rd edition, 2013.

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COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTIT603	UG	Cyber and Network Security	3	0	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based on 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:
1. To gain a fundamental knowledge of Cyber crime and Network Security.
2. To gain a fundamental understanding of a Cyber-attack and Challenges in identify and prevent them from occurring.
3. To gain a fundamental knowledge of Tools and Methods used in Cyber crime for prevention.
4. To understand the need of Cyber law and the fundamental concepts of Cyber Forensic.
5. To provide the fundamental skills and understanding needed to identify Cyber Security threats.

Course Outcomes:
Upon completion of the subject, students will be able to:
1. Identify physical points of vulnerability in simple networks and security needs of an organization.
2. Evaluate the Legal Perspective of Cybercrime and Cyber Security.
3. Formulate, update and communicate short- and long-term organizational cyber-security strategies and policies.
4. Troubleshoot, maintain and update an enterprise-level information security system.
5. Investigate the Cybercrime with the help of Cyber Forensic.

SYLLABUS

UNIT–I
Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security mechanism, Fundamental Security Design Principles, Attack Surface and Attack trees, A Model for Network Security. Introduction to Cybercrime, Cybercrime and Information Security, Classification of Cybercrimes: The Legal Perspective, Cybercrime: An Indian Perspective.

UNIT–II
Introduction to Cyber offence, How Criminal plan the attack, Social Engineering, Cyber stalking, Cyber café and cybercrime, Botnets: The fuel of cybercrime, Attack vector, cloud computing. Cybercrime: Mobile and Wireless devices, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges

Posed by Mobile Devices, Registry Setting for Mobile Devices, Authentication Service Security, Attack on Mobile Phones.

UNIT–III

Tools and Methods Used in Cybercrime, Proxy Server and Anonymizers, Phishing and Identity Theft, Password Cracking, Keylogger and Spyware, Virus and Worms, Trojan Horse and Backdoors, Steganography DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attack on Wireless Networks.

UNIT–IV

Cybercrime and the Legal Landscape around the World, Why Do We Need Cyber laws, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Information Technology Act, Digital Signature and the IT Act, cybercrime and punishment.
Introduction to Cyber Forensics, Historical Background of Cyber Forensics, Cyber Forensics and Digital Evidence, Forensic Analysis of E-Mail, Digital Forensic Life Cycle, Approaching Computer Forensic Investigation, Relevance of OSI Model to Computer Forensic, Challenges in Computer Forensic.

UNIT–V

Network Access Control and Cloud Security, Transport- Level Security, Wireless Network Security, Electronic Mail Security, IP Security.

TEXT BOOKS:

1. William Stallings, ―Cryptography and Network Security: Principles and Practice‖,7th EditionPearson,2017
2. Sunit Belapure, Nina Godbole―Cyber Security‖,1st edition, Wiley Publication, 2011

REFERENCES:

1. Carl Endorf, Eugene Schultz, Jim Mellander―Intrusion Detection&Prevention‖,1stEdition,TMH,2007
2. Neal, Krawetz, Introduction to Network Security,1st Edition ,Cengage Learning,2006
3. Atul Kahate,‖Cryptography and Network Security‖,McGraw Hill,,2009
4. Charlie Kaufman, Radia Perlman, Mike Speciner, Michael Speciner, ― Network Security -Private communication in a public world‖ ,2nd Edition,TMH,2002
5. Fourozon, ‒Cryptography & Network Security‖ 4thEdition ,TMH,2005
6. Mayank Bhushan ‒Fundamentals of Cyber Security‖,1st Edition ,BPB Publication,2017
7. GauravGupta,Sarika Gupta ‒Information Security and Cyber Laws‖,1st Edition,Khanna Book Publishing,2011.

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							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCS612	UG	Simulation and Modeling	2	1	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based on 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. Introduce students to the simulation and modeling techniques.
2. Provide a way for students with opportunities to develop basic simulation and modeling
3. Introduce concepts of modeling layers of society's&industrialreal world problems.
4. Build tools to view and control simulations and their results.

Course Outcomes:
On completion of the subject, students will be able to:
1. Characterize a given engineering system in terms of its essential elements, that is, purpose, parameters, constraints, performance requirements, subsystems, interconnections and environmental context.
2. Develop a modeling strategy for a real world engineering system, which considers prediction and evaluation against design criteria, and integrates any required sub-system models.
3. Assess and select a model for an engineering system taking into consideration its suitability to facilitate engineering decision making and predicted advantages over alternative models.
4. Interpret the simulation results of an engineering system model, within the context of its capabilities and limitations, to address critical issues in an engineering project
5. Fundamentals and techniques for designing and using simulation, modeling, and optimization algorithms with applications in system performance modeling, business infrastructure modeling, and distributed and parallel computing. An introduction to advanced complex systems models.

SYLLABUS

UNIT–I
INTRODUCTION
Introduction to simulation & modeling, advantages anddisadvantages of simulation, application areas in communication, computer and softwaredesign, systems and systems environment, components of a system, discrete and continuoussystems, model of a system, types of models, discrete-event simulation, steps in a simulationstudy. Simulation Examples- Simulation of

queueing systems, on-demand and inventorysystems, simulation for reliability analysis, Introduction to GPSS.

UNIT–II
COMPUTER BASED SYSTEM SIMULATION:

Types of System Simulation, Monte Carlo Method, comparison of analytical and Simulation methods, Markov Model, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cobweb Model. Continuous System models, Analog and Hybrid computers, Digital-Analog Simulators, Continuous system simulation languages, Hybrid simulation, Real Time simulations.

UNIT III
INTRODUCTION TO QUEUING THEORY

Characteristics of queuing system, Poisson's formula, birth-death system, equilibriumof queuing system, analysis of M/M/1 queues. Introduction to multiple server Queue models M/M/c Application of queuing theory in manufacturing and computer system, FSM, Petri-net Model.

UNIT–IV
VERIFICATION AND VALIDATION

Verification of Simulation Models, Calibration and Validation of Models, Validation of Model Assumptions , Validating Input & Output Transformations, Design of simulation experiments,

UNIT–V
SIMULATION TOOLS

Simulation Tools – Model Input – High level computer system simulation – CPU – Memory, Simulation – Comparison of systems via simulation – Simulation Programming techniques, Development of Simulation models, General Purpose Simulation Package-MATLAB, ARENA, EXTEND, Study of SIMULA, DYNAMO

TEXT BOOKS:

1 Gordon G., System simulation, PHI Learning

2.Singh V.P System Simulation and Modeling NEW AGE INTERNATIONAL, PUBLISHERS

3.Taha H, Operations Research; PHI.

4.Payer, T., Introduction to system simulation, McGraw Hill.
5.Spriet JA; Computer Aided Modeling and Simulation, Academic Press INC; USA

REFERENCES:

1. J K Sharma, Operations Research Theory and Application, Pearson Education Pvt Ltd, 2 Edition
    Banks J; Hand book of Simulation; John Wiley.
2.Law AM and Kelton WD; Simulation Modeling and Analysis; TMH

LIST OF EXPERIMENTS:
1. Simulate CPU scheduling algorithm using queueing system.
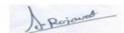2. Simulate multiplexer using queueing system.

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3. Simulate Network congestion control algorithms using Petri-net Model.
4. Simulate disk scheduling algorithms Petri-net Model.
5. Verification and validation of Petri-net Model.
6. Simulate a Manufacturing shop and write a program in GPSS.
7. Simulate Telephone system model and write a program in SIMSCRIPT.
8. Graphical Simulation and Modeling using MATLAB.
9. Study of SIMULA.
10. Study of DYNAMO.

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SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCS613	UG	Software Testing and Quality Assurance	2	1	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based on 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
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
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

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

UNIT–IV

SYSTEM TESTING - Functional testing-non-Functional testing-acceptancetesting-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

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.

TEXT BOOKS:
1. KshirasagarNaik&PriyadarshiTripathy, ‖Software Testing & Quality Assurance‖, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman ,‖Software Engineering: A Practitioner's Approach‖, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar,‖Software Enginerring‖, TMH
4. Sommerville,‖Software Enginerring‖,Pearson Education.
5. 5.―IBM CE-Enablement Program- Essentials of Software Engineering (OOAD & SW Lifecycle)‖, IBM Careeer Education

REFERENCES:
1. KshirasagarNaik&PriyadarshiTripathy, ‖Software Testing & Quality Assurance‖, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman ,‖Software Engineering: A Practitioner's Approach‖, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar,‖Software Enginerring‖, TMH
4. Sommerville,‖Software Enginerring‖,Pearson Education.
5. http://www.softwaretestinghelp.com/online-software-testing-course-syllabus/
6. https://amizone.net/AdminAmizone/WebForms/Academics/NewSyllabus/1217201473127

725.pdf
7. http://www.tutorialspoint.com/uml/

LIST OF EXPERIMENTS:
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.
8. Manual Testing for PAN card verification.
9. Generate test case for ATM machine.
10. Overview of Testing process using Rational Robot.
11. Write a script to record verification point using Rational Robot (For GUI testing of single click on window OS).
12. Write a script to record verification point for Clip Board and alphanumeric values using Rational Robot.

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							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCS617	UG	Robotics	2	1	2	4	60	20	20	30	20

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

Course Objectives:
The objective of this course is to impart knowledge about industrial robots for their control and design.

Course Outcomes:
Upon completion of the subject, students will be able to:
1. Perform kinematic and dynamic analyses with simulation.
2. Design control laws for a robot.
3. Integrate mechanical and electrical hardware for a real prototype of robotic device.
4. Select a robotic system for given application.

SYLLABUS

UNIT–I
Introduction to Robotics: Types and components of a robot, Classification of robots, closed-loop and open-loop control systems.Kinematics systems; Definition of mechanisms and manipulators, Social issues and safety.

UNIT–II
Robot Kinematics and Dynamics: Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics Dynamic Modelling: Equations of motion: Euler-Lagrange formulation

UNIT–III
Sensors and Vision System: Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity /Affine/Projective transformations. Vision applications in robotics.

UNIT–IV
Robot Control: Basics of control: Transfer functions, Control laws: P, PD, PID. Non-linear and advanced controls.

UNIT–V
Robot Actuation Systems: Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

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SEMESTER VI

Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications.

TEXT BOOKS:
1. Saha, S.K., ‒Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ghosal, A., ‒Robotics‖, Oxford, New Delhi, 2006.
3. Niku Saeed B., ‒Introduction to Robotics: Analysis, Systems, Applications‖, PHI, New Delhi.
4. Mittal R.K. and Nagrath I.J., ‒Robotics and Control‖, Tata McGraw Hill.
5. Mukherjee S., ‒Robotics and Automation‖, Khanna Publishing House, Delhi.
6. Craig, J.J., ‒Introduction to Robotics: Mechanics and Control‖, Pearson, New Delhi, 2009
7. Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, ‒Robot Modelling and Control‖, John Wiley and Sons Inc, 2005
8. Steve Heath, ―Embedded System Design‖, 2nd Edition, Newnes, Burlington, 2003.
9. Merzouki R., Samantaray A.K., Phathak P.M. and Bouamama B. Ould, ‒Intelligent Mechatronic System: Modeling, Control and Diagnosis‖, Springer.

LIST OF PRACTICALS:
1. Study components of a real robot and its DH parameters.
2. Forward kinematics and validate using a software (Robo Analyser or any other free software tool).
3. Inverse kinematics of the real robot and validation using any software.
4. Use of open source computer vision programming tool openCV.
5. Image Processing using openCV.
6. Image Processing for color/shape detection.
7. Positioning and orientation of robot arm.
8. Control experiment using available hardware or software.
9. Integration of assorted sensors (IR, Potentiometer, strain gages etc.), micro controllers and ROS (Robot Operating System) in a robotic system.
10. Project work

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COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	THEORY END SEM University Exam	THEORY Two Term Exam	THEORY Teachers Assessment*	PRACTICAL END SEM University Exam	PRACTICAL Teachers Assessment*
BTCS618	UG	Block Chain	2	1	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based on 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. Provide conceptual understanding of how block chain technology can be used to innovate and improve business processes.
2. Covers the technological underpinning of block Chain operations in both theoretical and practical implementation of solutions using block Chain technology.

Course Outcomes:
Upon completion of the subject, students will be able to:
1. Understand block chain technology.
2. Develop block chain based solutions and write smart contract using Hyperledger Fabric and Ethereum frameworks.
3. Build and deploy block chain application for on premise and cloud based architecture.
4. Integrate ideas from various domains and implement them using block chain technology in different perspectives.

SYLLABUS

UNIT–I
Introduction: Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain. Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

UNIT–II
Understanding Block chain with Crypto currency: Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

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UNIT–III
Understanding Block chain for Enterprises: Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

UNIT–IV
Enterprise application of Block chain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Block chain.

UNIT–V
Block chain application development: Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda.

TEXT BOOKS:
1. Melanie Swan, ‑Block Chain: Blueprint for a New Economy‖, O'Reilly, 2015
2. Josh Thompsons, ‑Block Chain: The Block Chain for Beginners- Guide to Block chain Technology and Leveraging Block Chain Programming‖.
3. Daniel Drescher, ‑Block Chain Basics‖, Apress; 1st edition, 2017.
4. Anshul Kaushik, ‑Block Chain and Crypto Currencies‖, Khanna Publishing House, Delhi.
5. Imran Bashir, ‑Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained‖, Packt Publishing.
6. Ritesh Modi, ‑Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain‖, Packt Publishing.
7. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman. Ramakrishna, ‑Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer‖, Import, 2018

LIST OF PRACTICALS:
1. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on Cloud to run.
   https://github.com/hyperledger/https://docs.docker.com/getstarted/https://console.ng.bluemix.net/docs/services/block chain/index.html
   https://console.bluemix.net/docs/containers/container_index.html#container_index
2. Create and deploy a block chain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chaincode, and perform invoke and query on your block chain network
   https://developer.ibm.com/patterns/create-and-deploy-block chain-network-using-fabric-sdk-java/
3. Interact with a block chain network. Execute transactions and requests against a block chain

network by creating an app to test the network and its rules.

https://developer.ibm.com/patterns/interacting-with-a-block chain-network/

4. Deploy an asset-transfer app using block chain. Learn app development within a Hyperledger Fabric network.

https://developer.ibm.com/patterns/deploy-an-asset-transfer-app-using-block chain/

5. Use block chain to track fitness club rewards Build a web app that uses Hyperledger Fabric to track and trace member rewards.

https://developer.ibm.com/patterns/fitness-club-rewards-points-iot-and-retail-integration/

6. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Block chain Starter Plan. Use Hyperledger Fabric to invoke chaincode while storing results and data in the starter plan.

https://developer.ibm.com/patterns/car-auction-network-hyperledger-fabric-node-sdk-starter-plan/

7. Develop an IoT asset tracking app using Block chain. Use an IoT asset tracking device to improve a supply chain by using Block chain, IoT devices, and Node-RED.

https://developer.ibm.com/patterns/develop-an-iot-asset-tracking-app-using-block chain/

8. Secure art using block chain digital certificates. Node.js-based auction application can help democratize the art market

https://developer.ibm.com/patterns/securing-art-using-block chain-digital-certificates/

9. Mini projects such as :

(i) Block chain for telecom roaming, fraud, and overage management. See how communication service providers use block chain to enhance their value chains.

https://developer.ibm.com/patterns/blockchain-for-telecom-roaming-fraud-and-overagemanagement/

(ii) Use IoT dashboards to analyze data sent from a Block chain network. Build an IoT app and IoT dashboards with Watson IoT Platform and Node-RED to analyze IoT data sent from a Block chain network.

https://developer.ibm.com/patterns/iot-dashboards-analyze-data-block chain-network/

(iii) Create an Android app with Block chain integration. Build a Block chain enabled health and fitness app with Android and Kubernetes.

https://developer.ibm.com/patterns/create-an-android-app-with-block chain-integration/

(iv) Create a global finance block chain application with IBM Block chain Platform Extension for VS Code. Develop a Node.js smart contract and web app for a Global Finance with block chain use case

https://developer.ibm.com/patterns/global-financing-use-case-for-block chain/

(v) Develop a voting application using Hyperledger and Ethereum. Build a decentralized app that combines Ethereum's Web3 and Solidity smart contracts with Hyperledger's hosting Fabric and Chaincode EVM

https://developer.ibm.com/patterns/voting-app-hyperledger-ethereum/

(vi) Create a block chain app for loyalty points with Hyperledger Fabric Ethereum Virtual Machine. Deploy Fabric locally with EVM and create a proxy for interacting with a smart contract through a Node.js web app

https://developer.ibm.com/patterns/loyalty-points-fabric-evm/

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SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTIBM601	UG	Micro services Architecture and Implementation	3	0	2	4	60	20	20	30	20

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

Course Objectives:
Students will acquire knowledge on:
1. Understand the importance of Microservices and describe its need as an Architecture Implementation.
2. Understand strengthen the understanding of basic concepts of Docker and Kubernetess.
3. Understand the Html and its Tags
4. Understand CSS and how we implement in html
5. Be able to Deploy application on docker and Access the Kubernetess

Course Outcomes:
At the end of the mobility period, students will be able to:
1. Make an application using nodejs
2. Run docker commands
3. Deploy container and pods on kubernets.

Syllabus:
UNIT–I
css and JavaScript:
Understand JavaScript and DOM and BOM , Understand Server side Application, Understand NoSQL (MongoDb), Deployment of Nodejs application

UNIT–II
Server side nodejs:-Key features of NodeJS, Installation and Configuration, NodeJS Command Line, Sample Project using Node Express command prompt, Nodeclipse plugin, Sample Project using Nodeclipse, Performing CRUD Operations,Key features of MongoDB, Connection Pooling using NodeJS Mongo driver,Dockerarchitecture,Virtual machines versus containers, about containers.

UNIT–III
Docker: A shipping container for code, Benefits of using containers, Docker basic concepts, Docker shared and layered file systems technology. Deployment of container, Learn the concept of kubernetes, Learn how to run Docker command, Understand pods and cluster Container ecosystem,

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UNIT–IV

Kubernetess, Container, orchestration, Kubernetess architecture, Master Node Components,
Worker Node Components, Kubernetess Building Blocks, Images, Immutability, Pod, Config Maps & Secrets, Deploying Applications on Kubernetess, Pod Health Checking, Kubectl Commands

UNIT–V
Cloud Application Component Architecture, Benefits of using Kubernetess with IBM Containers, About Microservices ,monolithic application, microservice security, api management and gateways, the future of microservices, microservices governance

TEXT BOOKS:
1. Sam Newman ,‖Building Microservices‖, O'Reilly Media
2. Ajay Sharma,―Microservices Architecture‖, Kindle Edition
3. IBM Career education Microservices Architecture and Implementation

REFERENCES:
1. Eberhard Wolff ,―Microservices — A Practical Guide‖, Korean translation
2. Martin Kleppmann ,‒Designing Data-Intensive Applications‖, O'Reilly Media

Video Lectures
1. https://www.youtube.com/watch?v=dD2EISBDjWM&list=PLr6-GrHUlVf_ZNmuQSXdS197Oyr1L9sPB
2. https://www.youtube.com/watch?v=0afZj1G0BIE&t=38s
3. https://www.youtube.com/watch?v=Ukg_U3CnJWI&t=15s
4. https://www.youtube.com/watch?v=TlB_eWDSMt4
5. https://www.youtube.com/watch?v=voDummz1gO0
6. https://www.youtube.com/watch?v=lktzQrHQcYU
7. https://www.youtube.com/watch?v=I4zWlW93-V4

LIST OF EXPERIMENTS:
1. Design a static web application using html and CSS.
2. Wap program to define variable ,control structure in JavaScript
3. Define Function in JavaScript and understand message and link.
4. Wap for window in JavaScript and its objects. Create a gauge report and a pie chart repor
5. Design application using nodejs and configure node-eclipse.
6. Connectivity with mongo DB nodejs app
7. Docker Commands
   a. Listing Running Containers
   b. Restarting Stopped Containers

    c. Retrieving Log Outputs

    d. Container Isolation

    e. Creating Docker Images

    f. Building a Dockerfile

    g. Copying Build Files

8. Kubernetesss Cluster Demo
9. VM Creation in Google Cloud Platform – Demo
10. Minikube on local machine

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COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	THEORY END SEM University Exam	THEORY Two Term Exam	THEORY Teachers Assessment*	PRACTICAL END SEM University Exam	PRACTICAL Teachers Assessment*
BTIBMC601	UG	Artificial Intelligence	3	0	2	4	60	20	20	30	20

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based on 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 evolution and relevance of AI in the world today.
2. Explore opportunities brought by the intersection between human expertise and machine learning.
3. Understand AI technology building blocks, including: natural language processing, machine and deep learning, neural networks, virtual agents, autonomics and computer vision.
4. Develop a deeper understanding of machine learning techniques and the algorithms that power those systems.
5. Engage in role-playing challenge-based scenarios to propose real-world solutions to different industries using AI and design thinking.

Course Outcomes:

1. Describe the field of AI and its subfields machine learning, NLP and computer vision
2. Describe how Watson technology is being applied to solve real world problems
3. List the Watson services available on the IBM Cloud
4. Describe the purpose of training the various Watson services to adapt them to a closed-domain
5. Describe how to build a chatbot by using the IBM Watson Conversation service

Syllabus:

UNIT–I: AI LANDSCAPE
AI impact in the world today, History and Evolution of AI, AI Explained, AI Technologies, Applications of A.I. Summary & Resources

UNIT–II: AI INDUSTRY ADOPTION APPROACHES
AI Industry Impact, Autonomous Vehicles, SmartRobotics, Future Workforce and AI, Applications of AI. Main focus of AI, Summary & Resources.

UNIT–III: FUTURE TRENDS FOR AI
Artificial Intelligence Trends, Limits of machine and human, AI predictions in the next 5 years

Summary and Resources.

UNIT–IV: MACHINE LEARNING AND DEEP LEARNING

Machine Learning Explained, Various Algorithms of Machine Learning, Deep Learning Explained, Deep learning ecosystem, Experiments, Explain what neural networks are and why they are important in today's AI's field Explain what domain adaptation is and its applications Summary& Resources.

UNIT–V: NATURAL LANGUAGE UNDERSTANDING AND COMPUTER VISION

NLP Overview, NLP Explained, Virtual Agents Overview, Virtual Agents for the Enterprise, Summary and Resources, Computer Vision Overview, AI Vision through Deep Learning, Computer Vision for the Enterprise, Experiments. Summary and Resources

COMPUTER VISION

Define computer vision, History of computer vision Tools and Service of completed vision, Use cases of computer vision. Describe cognitive system, Summary and Resources.

TEXT BOOKS:

1. IBM TEXT BOOK

REFERENCES:

1. A Modern Approach‖ by Norvig and Russell

LIST OF EXPERIMENTS:

1. SETTING UP YOUR CLOUD ACCOUNT
- Obtain an IBM cloud account
- Apply promotion code
- Uses the various services of IBM Cloud

2. CREATING A MODEL USING MACHINE LEARNING
- Apply Algorithmes
- Train the model
- Test The Model

3. CREATING AN AI VIRTUAL ASSISTANT
- Create a dialog skill
- Create a virtual assistant
- Load virtual assistant with various dialog skills
- Integrate your assistant

4. CREATE A CHATBOT USING PYTHON
- Use python Library
- Train the ChatBot
- Test The ChatBot

5. CREATE AN APPLICATIN USING OPEN CV

- Understand the Open CV Library
- Train The images and test

6.EDGE DETECTION CONCEPT
- Canny Algorithme
- How to detect the edges

7.BASIC UNDERSTANDING OF Tkinter,CREATE A GUI USING PYTHON
- Create an interface for the project
- Use the buttons and drop down

8. BASIC UNDERSTANDING OF NLTK
- Concept of Tokenization
- Concept of Lematization

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COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTIT608	UG	IT Workshop-SciLab/MATLAB	0	0	4	2	0	0	0	60	40

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based on 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. Familiarization of the syntax, semantics, data-types and library functions of numerical computing languages such as MATLAB and/or SCILAB.
2. Learn application of MATLAB and/or SCILAB for implementation/simulation and visualization of basic mathematical functions relevant to electronics applications.

Course Outcomes:

Upon completion of the subject, students will be able to:
1. Understand the need for simulation/implementation for the verification of mathematical functions.
2. Understand the main features of the MATLAB/SCILAB program development environment to enable their usage in the higher learning.
3. Implement simple mathematical functions/equations in numerical computing environment such as MATLAB/SCILAB.
4. Interpret and visualize simple mathematical functions and operations thereon using plots/display.
5. Analyze the program for correctness and determine/estimate/predict the output and verify it under simulation environment using MATLAB/SCILAB tools.

SYLLABUS

UNIT–I
INTRODUCTION TO SIMULATION SOFTWARE: About SCILAB/MATLAB, SCILAB/MATLAB System, Starting and Quitting SCILAB/MATLAB.
EXPRESSIONS: Variables Numbers, Operators Functions, Expressions.

UNIT–II
FLOW CONTROL: If, else, and else if, switch and case, for, while, continue, break try - catch, return.
COMMAND WINDOW: The format Function, Suppressing Output, Entering Long Statements, Command Line Editing.

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UNIT–III
MATRICES AND ARRAYS: Entering Matrices sum and transpose, subscripts, colon Operator, magic Function.
WORKING WITH MATRICES: Generating Matrices, The load Function, M-Files, Concatenation, Deleting Rows and Columns, Linear Algebra, Arrays Multivariate Data, Scalar Expansion, Logical Subscripting, find Function.

UNIT–IV
SCRIPTS & FUNCTIONS: Scripts, Functions, Global Variables, Passing String Arguments to Functions, eval Function, Function Handles, Vectorization , Pre allocation.
OTHER DATA STRUCTURE: Multidimensional Arrays, Cell Arrays, Characters and Text, Structures

UNIT–V
GRAPHICS: Plotting Process, Editing Process, Preparing Graphs, Basic Plotting Functions, Mesh & Surface Plot, and Image Reading & Writing, Printing graphics. SIMULINK

TEXT BOOKS & REFERENCES:
1. MATLAB and its Applications in Engineering, Rajkumar Bansal, Pearson Publishers, ISBN-10: 8131716813, 2009.
2. A Guide to MATLAB: For Beginners & Experienced Users By: Kevin R. Coombes, John E. Osborn, Garrett J. Stuck
3. SCILAB(a Free Software to Matlab),Er. HemaRamachandran and Dr. Achutsankar Nair, S. Chand Publishers, ISBN-10: 8121939704,2011
4. Introduction to SCILAB by Rachna Verma and Arvind Verma
5. SCILAB—A Beginner's Approach by Anil Kumar Verma
6. http://in.mathworks.com/
7. https://www.scilab.org/resources/documentation/tutorials

LIST OF PRACTICALS:
1. Addition, subtraction and multiplication of two matrices.
2. Verify whether the given matrix is singular or non-singular and compute its inverse if applicable.
3. Sorting of 1-D array and searching of an array/matrix. Also, list the set of numbers that obey a common condition in an array/matrix using *find( )*.
4. Solve simultaneous equations (maximum of three) using Cramer's rule. [Simultaneous equations may be obtained by applying KCL or KVL for a circuit and they can be solved for voltages or currents, respectively]
5. a) Show that $\log_{10}(A*B)=\log_{10} A+ \log_{10} B$ and $\log_{10}(A/B)=\log_{10} A-\log_{10} B$
1. b) Plot the voltage across capacitor during charging $V_c=V_0[1-e^{-(t/RC)}]$
6. a) Plot a straight line for the given slope and intercept using different plot attributes.
1. b) Differentiate and integrate y=mx+c, separately, and display the results on the same plot.

7. Plot $y_1 = A*sin(2\pi f_1 t)$, $y_2 = B*cos(2\pi f_2 t)$ and $y_3 = A*sin(2\pi f_1 t) + B*cos(2\pi f_2 t)$, in time and frequency (after computing DFT or FFT) domains as subplots and infer the results.

8. Integrate and differentiate sin(x) and display the results on the same plot in different colors. Also display sin(x) on the same plot.

9. Compute mean, median, standard deviation and variance of a set of data using formulae and verify using built-in functions.

10. Find all the even and prime numbers between two numbers (range).

11. Demonstrate (a) reading and display image, (b) converting color image to gray and black-and-white and plotting their histograms, and (c) conversion of image file formats.

12. Compare the results of the built-in and user-defined function to compute $cos(x)$ [the series $cos(x) = 1 - (x^2/2!) + (x^4/4!) - (x^6/6!) + \dots$ can be used]

13. Write a program to compute roots of a quadratic equation $ax^2 + bx + c = 0$ given a, band c.

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SEMESTER VI

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCS606	**UG**	**Minor Project**	0	0	4	2	0	0	0	60	40

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

Course Objectives:
This course is the masters by coursework Minor Project.
A Minor Project is a substantial work of supervised research or development, requiring the equivalent of about four to six months full-time work from start to finish. A Project involves identifying a task or problem, searching and reviewing relevant literature, a proposed, implemented, and critically analyzed solution to the task or problem, and a written report describing the problem, the relevant literature, the solution, and its relation to other work in the area.

Note: This course includes a work integrated learning experience in which your knowledge and skillswill be applied and assessed in a real or simulated workplace context and where feedback from industry and/ or community is integral to your experience.

Objectives/Learning Outcomes/Capability Development

Program Learning Outcomes

This course contributes to the following program learning outcomes:

- **Enabling Knowledge:**

You will gain skills as you apply knowledge with creativity and initiative to new situations. In doing so, you will:
6. Demonstrate mastery of a body of knowledge that includes recent developments in Information Technology
7. Recognize and use research principles and methods applicable to Information Technology.

- **Critical Analysis:**

You will learn to accurately and objectively examine, and critically investigate Information Technology (IT) concepts, evidence, theories or situations, in particular to:

➢ analyze and model complex requirements and constraints for the purpose of designing and implementing software artifacts and IT systems

➢ Evaluate and compare designs of software artifacts and IT systems on the basis of organizational and user requirements.

- **Problem Solving:**

Your capability to analyze complex problems and provide suitable solutions will be extended as you learn to: design and implement software solutions that accommodate specified requirements and constraints, based on analysis or modeling or requirements specification.

- **Communication:**

You will learn to communicate effectively with a variety of audiences through a range of modes and media, in particular to: interpret abstract theoretical propositions, choose methodologies, justify conclusions and defend professional decisions to both IT and non-IT personnel via technical reports of professional standard and technical presentations.

- **Responsibility:**

You will be required to accept responsibility for your own learning and make informed decisions about judging and adopting appropriate behaviour in professional and social situations. This includes accepting the responsibility for independent life-long learning and a high level of accountability. Specifically, you will learn to: effectively apply relevant standards, ethical considerations, and an understanding of legal and privacy issues to designing software applications and IT systems.

- **Research and Scholarship:**

You will have technical and communication skills to design, evaluate, implement, analyze and theorize about developments that contribute to professional practice or scholarship; specifically you will have cognitive skills:

To demonstrate mastery of theoretical knowledge and to reflect critically on theory and professional practice or scholarship

To plan and execute a substantial research-based project, capstone experience and/or piece of scholarship.

Course Learning Outcomes

Upon successful completion of this course you should be able to:

6. Identify a task or problem relevant to /or IT
7. Search and review of the relevant literature
8. Propose a solution to the task or problem
9. Develop a software and/or algorithmic solution to the task or problem
10. Implement solutions to meet high quality requirements developed by the supervisor
11. Carry out research under supervision

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12. Present the research in a written form like that used for published papers
13. Present the research in an oral seminar.

Overview of Learning Activities

A Minor project is a substantial work of supervised research or software development. You will choose an academic staff member as your supervisor to work on a research project. To successfully complete the course, you must demonstrate research skills: ability to undertake research under supervision, ability to analyze, develop, and present the research in a written form like that used for published papers, and ability to present the research in an oral seminar.

In this course, you are expected to carry out research activities including implementing a complete solution to the problems identified by the supervisor, critical analysis of results, and completing a written Project. The major deadline for this course is the delivery of the Minor Project by the end of the semester.

Overview of Assessment

You must satisfactorily complete each of the following assessment tasks for this course:

1. Research project comprising an implemented and critically analyzed solution to the task or problem

2. Written report (final Project) describing the problem, the relevant literature, the solution, and its relation to other work in the area

3. Seminar on your research (of 20 minutes) soon after your Project is submitted.

The Minor Project is assessed on its merits as a research publication. Each Project is examined by two academics, usually from within the Institute.

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