

Program: B. Tech /MBA Tech (Computer Engineering, EXTC)				Semester: V/ VI	
Course: Artificial Intelligence				Module Code: 702CO0C032	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (marks -50)	Term End Examinations (TEE) (Marks -100)
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50
Prerequisite: Data Structure and Algorithms, Programming for Problem Solving.					
Course Objective To impart knowledge of the fundamental theories, methods and techniques in the field of Artificial Intelligence and to design and develop AI systems.					
Course Outcomes After completion of the course, students will be able to - <ol style="list-style-type: none"> 1. Explain agents and environment in AI 2. Apply various heuristic and searching strategies to solve problems in the AI domain 3. Design knowledge base using expert systems and game playing 4. Implement supervised and unsupervised learning approaches to solve problems in the AI domain 					
Detailed Syllabus					
Unit	Description				Duration
1	Introduction to Artificial Intelligence Definitions of AI, Applications of Artificial Intelligence, Concept of Modeling, Inference and Learning. Introduction to Machine learning and Deep learning as a subset of AI. Intelligent agents, concept of rationality, structure of agents, Environment, Properties of task environment. Real world Examples of agents and environments.				04
2	Solving problems by Searching Problem solving agents, searching for solutions. Uninformed Search: Breadth first search, Depth first search, Uniform cost search Informed Search: Informed search strategies, Greedy Best First Search, A* search, Hill climbing, problems with hill climbing such as Local Maxima, Plateau, Ridge, Genetic Algorithm. Adversarial				07



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	Search: Introduction to the Domain of a game, optimal decisions in games, minimax algorithm, Alpha-beta pruning.	
3	Knowledge Representation Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution.	06
4	Constraint satisfaction Problem (CSP) Constraint satisfaction problems, Backtracking search for CSPs, variables and value ordering, propagating information through constraints, Intelligent backtracking, Local search for CSP. Case study on CSP.	05
5	Learning Inductive learning, Types of learning, supervised - decision trees classification, unsupervised learning - K-means clustering.	05
6	Expert system Definition, model, characteristics, architecture, development process, limitations, examples of expert systems.	03
	Total	30
Text Books		
1. Stuart Russel and Peter Norvig, <i>Artificial Intelligence: A Modern Approach</i> , 4 th edition, 2021, Pearson.		
2. Dan W. Patterson, <i>Introduction to Artificial Intelligence and Expert System</i> , Pearson, 2015.		
Reference Books		
1. Elaine Rich, Kevin Knight, <i>Artificial Intelligence</i> , 3 rd edition, Tata Mc-Graw Hill, 2015.		
2. Patrick H. Winston, <i>Artificial Intelligence</i> , 3 rd edition, Pearson, 2002.		
Laboratory Work		
8 to 10 experiments (and a practicum where applicable) based on the syllabus.		



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SVKM's Narsee Monjee Institute of Management Studies
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Program: B Tech/MBA Tech Information Technology, B Tech/MBA Tech (Computer Engineering), B Tech Artificial Intelligence, B Tech EXTC, MBA Tech EXTC, B Tech Computer Science, B Tech AI and ML, B Tech AI and DS				Semester: VI, VII, VIII	
Course : Cloud Computing				Code: 702IT0C026	
Teaching Scheme			Evaluation Scheme		
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Examinations (TEE) (Marks- 100)
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50
Pre-requisite: Computer Networks					
Course Objective The course is designed to enable students to understand state-of-the-art cloud computing technologies and applications. This course covers basic models, architecture, virtualisation. It also delves into concepts, processes and best practices needed to secure cloud information. It emphasises on business models, risk management and service management aspects of cloud.					
Course Outcomes After completion of the course, student would be able to- <ol style="list-style-type: none"> 1. Classify the layers of cloud reference model based on their significance 2. Address security concerns and orchestration in cloud environment 					
Detailed Syllabus					
Unit	Description				Duration
1	Introduction to Cloud Essential Characteristics of Cloud, Cloud Service Models, Cloud Deployment Models, Cloud Service Brokerage, Cloud Reference Model, Considerations for building Cloud Infrastructure				5
2	Physical Layer Compute System, Storage System Architecture, Network Connectivity				5
3	Virtual Layer Virtual Layer Functions, Virtualization Software, Resource Pool and Virtual Resources				5
4	Control Layer Control Layer Functions, Control Software, Resource Optimization Techniques				5
5	Cloud Security Threats, Security Mechanisms, IAM solutions, Security Algorithms				5
6	Orchestration Container Approach, Docker Container, Items in a Dockerfile, Kubernetes Pods, Kubernetes Terminology, Kubernetes Cluster Model, Kubernetes Features				5
	Total				30
Text Books <ol style="list-style-type: none"> 1. Douglas E. Comer, <i>The Cloud Computing Book: The Future of Computing Explained</i>, 1st Edition, Taylor and Francis, 2021 2. Tim Mather, <i>Security and Privacy Trends in Cloud Computing and Big Data</i>, 1st Edition, Taylor and Francis, 2022. 					



Reference Books

1. Umang Singh, San Murugesan and Ashish Seth, *Emerging Computing Paradigms Principles, Advances and Applications*, Wiley India, 2022.
2. Sanjiva Shankar Dubey, *Cloud Computing and Beyond: A Managerial Perspective*, 2nd Edition, Wiley, 2021.
3. John R. Vacca, *Cloud Computing Security Foundations and Challenges*, 2nd Edition, CRC Press, 2021.
4. Brij Gupta, Gregorio M, Dharma P Agarwal and Deepak Gupta, *Handbook of Computer Networks and Cyber Security*, 1st Edition, Springer, 2020.

Laboratory Work

8 to 10 Programming exercises based on the syllabus.



Signature
(Head of the Department)



Program: B Tech / MBA Tech (Computer Engineering, Information Technology, Artificial Intelligence) B Tech Computer Science				Semester: VI /VII /V	
Course: Distributed Computing				Code: 702CO0C034	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Examinations (TEE) (Marks - 100)
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50
Prerequisite: Operating Systems					
Course Objective To introduce the concepts and design of distributed computing and algorithms that support distributed computing.					
Course Outcomes After completion of the course, student will be able to - <ol style="list-style-type: none"> 1. Explain the basic concepts of distributed computing 2. Apply the concepts of distributed computing to implement various mechanisms of communication 3. Analyze various approaches of synchronization, mutual exclusion, election algorithms and fault tolerant services 4. Recognize different kinds of naming and their implementation 					
Detailed Syllabus					
Unit	Description				Duration
1	Introduction to Distributed System Definition, Goals, Examples of Distributed System-Internet. System architectures-centralized architecture, decentralized architecture, hybrid architecture, Client-Server Model, Servers-general design issues, server clusters, managing server clusters.				05
2	Communication Basic RPC operation, RPC implementation, RPC semantics in presence of failures, RMI- Basics, Implementation, Case study-Java RMI, Message oriented communication-: transient and				06



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	<p>persistent communication. Stream oriented communication- support for continuous media, streams and QoS, stream synchronization.</p>	
3	<p>Synchronization Introduction, Physical Clock synchronization algorithms, Logical clocks, event ordering, implementation of Logical clocks, Lamport's logical clock algorithm, Vector clocks, Mutual exclusion: Centralized, distributed and token ring mutual exclusion algorithms, comparison of these algorithms. Traditional election algorithm- Bully and Ring election algorithm.</p>	06
4	<p>Fault Tolerance Introduction, Process resilience, Reliable group communication.</p>	08
5	<p>Naming Names, identifiers, and addresses, Flat naming , Structured naming: name spaces and resolution, implementation of name space, Case study- Domain Name System, Attributed based naming- Directory services.</p>	05
	Total	30

Text Books

1. Andrew S. Tanenbaum, *Distributed System: Principles and Paradigms*, 3rd Edition, Pearson Prentice Hall, 2017.

Reference Books

1. George Couloris, *Distributed System: Concept and Design*, 5th edition, Pearson Education, 2009.
2. Pradeep K. Sinha, *Distributed Operating System*, IEEE Press, Prentice Hall of India Ltd, 1998.
3. Mei-Ling L. Liu, *Distributed Computing: Principles and Applications*, Addison - Wesley, 2004.

Laboratory / Tutorial work:

8 to 10 experiments (and a practicum where applicable) based on the syllabus.



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Program: B Tech Computer Science				Semester: VI	
Course: E-Commerce				Code: 702IT0E027	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Examinations (TEE) (Marks- 100)
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50
Pre-requisite: Computer Networks					
Course Objective To provide principles of Electronic Commerce from a technical and business perspective					
Course Outcomes After completion of the course, the student will be able to -					
<ol style="list-style-type: none"> 1. Classify and Compare different Electronic Commerce Software and Online Payments methods 2. Explain various E-Commerce Legal, ethical, social issues and Security issues 3. Use modern engineering tool for developing effective model of E-Commerce web applications 					
Detailed Syllabus					
Unit	Description				Duration
1	Introduction Evolution Of Commerce , Business Models, Revenue Models, and Business Processes, Role of Merchandising ,Product/Process Suitability to Electronic Commerce ,Advantages and Disadvantages of Electronic Commerce Economic Forces and Electronic Commerce ,Transaction Costs Markets and Hierarchies ,Using Electronic Commerce to Reduce Transaction Costs ,Identifying Electronic Commerce Opportunities, Strategic Business Unit Value Chains ,Industry Value Chains , SWOT Analysis: Evaluating Business Unit Opportunities, International Nature of Electronic Commerce, Infrastructure and tools for e-commerce, current trends in e-commerce applications development.				6
2	Electronic Data Interchange and Electronic Commerce Software Early Business Information Interchange Efforts Emergence of Broader EDI Standards How EDI Works Value-Added Networks EDI Payments EDI on the Internet Supply Chain Management Using Internet Technologies Value Creation in the Supply Chain Increasing Supply Chain Efficiencies Electronic Commerce Software for Midsize to Large Businesses. Electronic Commerce Software for Small and Midsize Companies. Electronic Commerce Software for Large Businesses Enterprise-Class Electronic Commerce Software Customer Relationship Management Software Supply Chain Management Software				8



	Content Management Software Knowledge Management Software	
3	Electronic and Online Payments Overview, Payment Gateway, Certificates, Digital Token, Smart Cards, Credit Cards, Magnetic Strip Cards, E Checks, Credit/ Debit Card EPS, Online Payments: Mobile Payments, Online Banking, Emerging Financial Instruments - Application in Business, E- Commerce Laws, Forms of Agreement, Government Policies and Agenda.	6
4	Legal, ethical and social issues The Legal Environment of Electronic Commerce Borders and Jurisdiction Jurisdiction on the Internet Conflict of Laws Contracting and Contract Enforcement in Electronic Commerce Use and Protection of Intellectual Property in Online Business Copyright Issues Patent Issues Trademark Issues Domain Names and Intellectual Property Issues Protecting Intellectual Property Online Defamation Online Crime, Terrorism, and Warfare Online Crime Online Warfare and Terrorism	4
5	Electronic Commerce Security <u>Security for Client Computers</u> Cookies ,Web Bugs ,Active Content ,Java Applets ,JavaScript ActiveX Controls ,Graphics and Plug-Ins ,Viruses, Worms, and Antivirus Software ,Digital Certificates ,Steganography <u>Communication Channel Security</u> Secrecy Threats Integrity Threats Necessity Threats Threats to the Physical Security of Internet Communications Channels Threats to Wireless Networks ,Firewalls <u>Security for Server Computers</u> Web Server Threats Database Threats	6
	Total	30
Text Books		
1. Gary P. Schneider, <i>Electronic Commerce</i> , 12 th Edition, Cengage Learning, 2016.		



Reference Books

1. Henry Chan, Raymond Lee, Tharam Dillon and Elizabeth Chang, *E Commerce-Fundamentals and application*, 1st Edition, John Wiley & Sons, 2015.
2. M. L. Brodie and Dieter Fensel, *Ontologies: A Silver Bullet for Knowledge Management and Ecommerce*, 2nd Edition, Springer, 2004.

Laboratory Work

8 to 10 Programming exercises based on the syllabus.



Signature

(Head of the Department)



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Program: B Tech/MBA Tech Computer Engineering B Tech Computer Science B Tech/MBA Tech Information Technology				Semester: VI/ V	
Course: Human Computer Interaction				Code : 702CO0E007	
Teaching Scheme			Evaluation Scheme		
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks- 50)	Term End Examinations (TEE) (Marks- 100)
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50
Prerequisite: Software Engineering					
Course Objectives This course gives an introduction to Human Computer Interface and provides an understanding of user centered design process. It will help students to design and evaluate interactive systems keeping users in mind.					
Course Outcomes After completion of the course, students will be able to - 1. Discuss the importance of good interface design for human computer interaction 2. Apply design principles, models and evaluation techniques to user interface design 3. Identify various aspects of user experience and design thinking in HCI 4. Design user interface application using HCI concept					
Detailed Syllabus					
Unit	Description				Duration
1	Introduction Introduction to HCI, Importance of good interface design, Notions- Human, Computer & Interaction. Multi-disciplinary Applications of HCI.				04
2	Design Process & Interaction Introduction of design, Types of design: User-centered design, Participatory design, Scenario based design, Interaction design basics, users & persona, scenario				05
3	Design Rules Cognitive psychology - Visual perception, Ergonomics, Memory Models, Shneiderman's design rules, Norman's 7 principles for designing				06
4	HCI Models GOMS model, Hierarchical Task Analysis				03



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5	Evaluation Techniques in HCI Need of evaluation in interface designing, introduction to quantitative and qualitative research methods in designing, Types of evaluation techniques- Heuristics evaluation model, Experimental evaluation model.	06
6	User Experience Basic understanding of UX in HCI, Role of UI and UX in HCI designing, Elements of UX	04
7	Designing for Emerging Technologies Voice based UI, designing for wearables.	02
	Total	30

Text Books

1. Helen Sharp, Jennifer Preece, Yvonne Rogers *Interaction Design: Beyond Human-Computer Interaction*, 5th Edition, Wiley Publication, 2019.
2. Alan Dix, Janet Finlay, Gregory Abowd, Russel Beale, *Human-Computer Interaction*, 4th Edition, Pearson Education, 2009.

Reference Books

1. Ben Shneiderman, *Designing the User Interface: Strategies for Effective Human- Computer Interaction*, 3rd Edition, Pearson Education, 2014.
2. Follett Jonathan (Ed), *Designing for Emerging Technologies*, 1st Edition, O'Reilly, 2014.
3. Levy Jaime, *UX Strategy: How to Devise Innovative Digital Products that People Want*, 1st Edition, O'Reilly, 2015.

Laboratory Work:

8 to 10 experiments (and a practicum where applicable) based on the syllabus.



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Program: B Tech All Program [except CSBS and CSE(DS) 311 (VT)] MBA Tech All Program, B Tech Integrated Civil				Semester: VI / X	
Course: Interpersonal Skills				Code: 702BS0C063	
Teaching Scheme			Evaluation Scheme		
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Examinations (TEE)
0	2	0	1	Marks Scaled to 50	-
Pre-requisite: Nil					
Course Objective The course aims to build and enhance skills critical to future employability through a medley of activities and simulation practices. Also vital skills like persuasion, team participation, self-branding and workplace communications are developed through this course					
Course Outcomes After completion of the course, students will be able to -					
<ol style="list-style-type: none"> 1. Demonstrate awareness of business networks and communicate appropriately in various contexts 2. Illustrate the knowledge of team dynamics to work productively in teams and participate effectively in contexts such as group discussions 3. Apply persuasive communication strategies to articulate themselves in situations such as personal interviews 4. Create social media plans and employment related documents to showcase their personal brand 					
Detailed Syllabus					
Unit	Description				Duration
1.	Corporate Communication Workplace hierarchy and importance of Formal and Informal Networks, Cross cultural communication, Business etiquette and netiquette, Corporate presentations-sales and elevator pitch, advanced features in Power-Point (zoom, morph), data and non data driven graphics in presentations				06
2.	Group and Team Dynamics Group Discussions(GD) - speaking in GDs, discussing problems and solutions, creating a cordial and cooperative atmosphere, using persuasive strategies, being polite and firm, turn-taking strategies, effective intervention, reaching a decision,				08

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	Organizational GD, GD as part of selection process: characteristics, evaluation and analysis Dynamics of group formation, the dysfunctions of groups and teams: norm violation and role ambiguity, groupthink and group-polarization, team building exercises	
3.	Employment Communication Self-branding through social media, resume-traditional and non-traditional formats-scannable, video portfolios, visual, etc.; cover letters-solicited and unsolicited	08
4.	Personal Interviews Virtual hiring practices; stages of interview: face-to-face interviews: causes of failure in an interview, types of interview questions, mock interviews	08
	Total	30
Text Books		
<ol style="list-style-type: none"> 1. Meenakshi Raman and Sangeeta Sharma, <i>Technical Communication: Principles and Practices</i>, 3rd ed., Oxford University Press, 2015 2. Fred Luthans, <i>Organisation Behaviour: An Evidence Based Approach</i>, 12th ed. McGraw Hill, 2013 		
Reference Books		
<ol style="list-style-type: none"> 1. Frances Trought, <i>Brilliant Employability Skills</i>, 2nd ed. Pearson, 2017. 2. S P Robbins, Timothy A Judge and Neharika Vohra, <i>Organizational Behavior</i>, 15th ed., Pearson, 2013 3. Scot Ober and Newman Amy, <i>Contemporary Business Communication</i>, 8th ed., Biztantra Publications, 2017 4. Cliff Atkinson, <i>Beyond Bullet Points</i>, 4th ed., Pearson Education, 2018 		
Laboratory Work		
8 to 10 Practical activities based on the syllabus		





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SVKM's NMIMS University
Mukesh Patel School of Technology Management and Engineering

Program: B Tech / MBA Tech Computer Engineering B Tech (CSBS, AIDS, Computer Science)	Semester: VII VII /VI
Course: IoT and Applications	Code: 702CO0E017

Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Examinations (TEE) (Marks- 100)
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50

Prerequisite

C/ C++ Programming, Microprocessor and microcontroller, Computer Networks, Cyber Security.

Course Objective

The course educates students on the basic concepts of the internet of things. This course also covers technologies, components, processes and mechanisms of the internet of things to develop the complete application.

Course Outcomes

After completion of the course, students will be able to:

1. Describe the fundamentals of IoT and M2M,
2. Identify various IoT access technologies,
3. Analyze security and privacy issues in IoT,
4. Develop and implement IoT applications.

Detailed Syllabus:

Unit	Description	Duration
1.	Fundamentals of IoT Definition, characteristics and reliability issues & solutions of IoT, Evolution of Internet of Things, IoT architectures, Resource management, IoT data management and analytics, communication protocols, IoT applications, security and privacy, Identity management and authentication, standardization and regulatory limitations.	07
2.	IoT and M2M Introduction, M2M - Machine to Machine, difference between IoT and M2M, software defined networking and network function virtualization.	02
3.	IoT protocols Networking Protocols: 6LowPan, RPL, Thread, IoT Devices Application-Level Protocols: MQTT, CoAP, REST.	06



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4.	Security and Privacy in the IoT IoT reference model, security threats and requirements, IoT security overview, Security frameworks for IoT, Privacy in IoT networks, obfuscation and diversification for securing IoT.	06
5.	Designing of IoT systems Design principles for connected devices, IoT design methodology, prototyping, business models.	04
6.	IoT Applications Home automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle.	05
	Total	30

Text Books

1. Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014 (classic).
2. Rajkumar Buyya and Amir Vahid Dastjerdi, "Internet of Things Principles and Paradigms", Morgan Kaufmann publications, 2016.

Reference Books

1. Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", Wiley publications, 2014.

Laboratory Work

8 to 10 experiments (and a practicum where applicable) based on the syllabus.



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SVKM's NMIMS University
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Program: B. Tech/MBA Tech (Computer Engineering) B Tech (Computer Science, AIDS)				Semester: VI	
Course: Microservices and Architecture				Code: 702CO0E010	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Examinations (TEE) (Marks-100)
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50
Pre-requisite: Object-Oriented Programming, Java Programming, Web Technologies					
Course Objective This course helps students to gain in-depth knowledge of Microservice-Based System Architecture. Students will gain knowledge to develop a Microservice for real-life scenario					
Course Outcomes After completion of the course, student will be able to 1. Explain the concepts of Microservices and its architecture 2. Design, develop and test Microservices using Spring Boot 3. Understand the concepts of Microservices governance, security and migration					
Detailed Syllabus					
Unit	Description				Duration
1	Microservice Evolution Introduction to Microservices, Monolithic Architecture, Limitation of Monolithic, Service Oriented Architecture, Web Services, Need for Microservices Architecture, comparing the Microservice Architecture with SOA, features of MSA, Applications of MSA.				02



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2	Microservice Architecture Overview of Microservice architectural styles, Design Principles of Microservices, Communication models for Microservices, Synchronous and Asynchronous communication, Microservice Transaction Management.	02
3	Introduction to Spring Boot Introduction to Spring Boot Framework, Overview of Spring Cloud Prerequisite of Spring Boot, Spring boot features, Spring Boot Architecture, Installation and configuration, Creating Spring boot project, Project Components.	02
4	Design and Development of Microservices Microservices and Domain-Driven Design, Microservice Boundaries, Microservices Design Patterns- Decomposition patterns, Integration patterns, Database patterns, Observability Patterns, Cross-cutting concern Patterns.	04
5	Building Microservices with Spring Boot Setting up a development environment, Introduction to HTTP, REST and REST principles, Using Spring Boot to build RESTful Microservices, Getting started with Spring Boot, Developing the Spring Boot Java Microservices using STS, The Spring Boot configuration, Spring Repository.	04
6	Database Management in MSA The Spring Data JPA using Spring boot ,Monolithic application and shared database, Database per Microservice, Sharing data between Microservices, CQRS, Transaction with Microservices- Avoiding Distributed transactions with Two-Phase Commit, Database log mining, Event sourcing, Saga.	05
7	Integrating Microservices Microservices Integration Patterns, requirements of	03



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	integration services, Introduction to Service orchestration using Kubernetes , Service integration using Spring Boot.	
8	Microservices Testing & Registry Need of testing, types of testing, testing of overall system, Testing individual Microservices, Service Registry and Discovery, Service registry and discovery using spring boot, API Gateway and Config Server.	03
9	Deploying and Running Microservices Introduction to Docker and CI/CD pipeline , Deploying Microservices with Docker, container orchestration, Microservices deployment patterns.	03
10	Microservices Security and migration Basic security requirements, JWT and OAuth Implementation using Spring Boot Security. MSA Migration-Advantages, issues, process, disadvantages.	02
	Total	30

Text Books

1. Kasun Indrasiri, Prabath Siriwardena, *Microservices for the Enterprise Designing, Developing, and Deploying*, 1st Edition, Apress, 2018.
2. Sourabh Sharma, *Mastering Microservices with Java Build Enterprise Microservices with Spring Boot 2.0, Spring Cloud, and Angular*, 3rd Edition, Packt Publishing, 2019.

Reference Books

1. Chellammal Surianarayanan, Gopinath Ganapathy, Raj Pethuru, *Essentials of Microservices Architecture: Paradigms, Applications, and Techniques*, 1st Edition, CRC Press, 2019.
2. Magnus Larsson, *Hands-On Microservices with Spring Boot and Spring Cloud*, 1st Edition, Packt Publishing, 2019.
3. Chris Richardson, *Microservices Patterns With examples in Java*, 1st Edition, Manning, 2018.
4. Eberhard Wolff, *Microservices - A practical guide Principles, Concepts, and Recipes*, 2nd edition, Impressum, 2018.
5. Irakli Nadareishvili, Ronnie Mitra, Matt McLarty, Mike Amundsen, *Microservices Architecture: Aligning Principles, Practice and Culture*, 1st Edition, O'reilly, 2016.



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6. Eberhard Wolff, *Microservices Flexible Software Architecture*, 1st Edition, Pearson Education, 2016.
7. Sam Newman, *Building Microservices Designing fine-grained systems*, 1st Edition, O'reilly, 2015.

Laboratory / Tutorial work

8 to 10 experiments (and a practicum where applicable) based on the syllabus.



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Program: B Tech / MBA Tech IT and Computer Engineering / B Tech Computer Science				Semester : VI	
Course : Software Quality Assurance				Code: 702IT0E022	
Teaching Scheme			Evaluation Scheme		
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Examinations (TEE) (Marks-100)
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50
Prerequisite: Software Engineering, Object Oriented Analysis & Design					
Course Objective To understand software quality management process and quality management models. To learn software quality metrics, assurance and various software standards					
Course Outcomes After completion of this course, student will be able to- <ol style="list-style-type: none"> 1. Classify the various software quality factors 2. Describe and comprehend SQA architecture and its components 3. Identify the different software defects and techniques used for defects removal 4. Evaluate on the basis of Software quality metrics and the standards 					
Detailed Syllabus					
Unit	Description				Duration
1	Introduction Software quality challenge, software errors, faults and failures, causes of software errors, software quality and software quality assurance definition.				3
2	Software quality factors Need for software quality requirements, classification of software requirements into software quality factors, product operation, revision and transition software quality factors, alternative models of software quality factors, software compliance with quality factor.				4
3	Components of SQA SQA system architecture, pre project software quality components, software project lifecycle components, infrastructure components for error prevention and improvement, Management SQA components, SQA standards, system certification and assessment components, human component.				4
4	Defect removal effectiveness Software development methodologies, factors affecting QA activities in development process, Verification, validation and qualification, model for SQA defect removal effectiveness and cost, reviews.				4
5	Software testing Definition and objectives, testing process, strategies, software test classification, black box and white box, test case design, automated testing, Alpha and Beta site testing programs, Security Testing				4



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6	Maintenance and external participants Pre maintenance software quality components, Maintenance software quality assurance tools, types of external participants, risks and benefits, assuring quality of external participants, SQA tools for assuring quality of external participants Contribution.	5
7	Standards Scope of quality management standards, ISO 9001, ISO 9000- 3, CMM and CMMI, Boot strap methodology, ISO/IEC 15504 model, ISO/IEC 27001 IEEE STD 12207, IEEE STD 1012, IEEE STD 1028.	3
8	Software quality metrics Objective and classification of software quality metrics, process metrics and product metrics, implementation and limitation of software quality metrics.	3
	Total	30
Text Books 1. Daniel Galin, <i>Software Quality Assurance: From Theory to Implementation</i> , 2 nd Edition, Pearson Education, 2012.		
Reference Books 1. Milind Limaye, <i>Software quality assurance</i> , Tata McGraw-Hill Education, 2011. 2. Gordon Schulmeyer, <i>Handbook of Software Quality Assurance</i> . 4th Edition, Artech House, 2008.		
Laboratory Work 8 to 10 experiments Programming exercises based on the syllabus.		



Signature
(Head of the Department)



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Program: B Tech (Computer Engineering, Computer Science, AI and ML) MBA Tech (Computer Engineering)				Semester: V/VI	
Course: Cyber Security				Code: 702AI0E004	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 50)	Term End Examinations (TEE) (Marks - 100)
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50
Prerequisite: Computer Programming					
Course Objective This course is an introduction to the field of Cyber Security. This course presents a balance of the managerial and technical aspects of the discipline. It will prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.					
Course Outcomes After completion of the course, students will be able to - <ol style="list-style-type: none"> 1. Explain the basics of cyber security. 2. Implement mechanisms of cryptography, authentication and access controls. 3. Differentiate security mechanisms in programs and networks. 4. Describe risk management related to computer security. 					
Detailed Syllabus					
Unit	Description				Duration
1	Introduction Basic components of computer security (CIA), characteristics of information, vulnerabilities, threats, attacks and controls, classifications of hackers.				03
2	Cryptography Cryptographic basics, transposition cipher, substitution cipher, block and stream cipher steganography, public v/s private key encryption, Private key encryption: DES, Public key encryption: RSA, Key management, Key exchange - Diffie-Hellman, Digital Signature, One-way hash functions.				07
3	Authentication Authentication basics, Password, Challenge response, Biometrics.				03
4	Access Control Access control principles, ACL, DAC, MAC, and Role based Access Control, Access control models, Kerberos.				03
5	Program Security				04



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SVKM's NMIMS
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	Secure programs, non-malicious Program Errors, Viruses and other malicious code, types of viruses, attack mechanism of viruses, Targeted Malicious Code, Controls Against Program Threats.	
6	Network Security Eavesdropping, spoofing, denial of service attacks, Security controls: encryption, virtual private networks, SSL, Firewall: Kinds of Firewalls, Filtering Services, DMZ, IDS and its types of IDS.	06
7	Risk Management Risk analysis, various terminologies associated with risk management, Risk assessment techniques, managing risk, steps for risk management, Business impact analysis, various terminologies associated with BIA, Different types of continuity planning, testing and revising the plan	04
	Total	30
Text Books <ol style="list-style-type: none">1. M. Bishop, S.S. Venkatramanayya, <i>Introduction to Computer Security</i>, 1st edition, Pearson Education, 2014.2. M. Whitman, H. Mattford, <i>Principles of Information Security</i>, 6th edition, Cengage Learning, 2017.3. C. Pfleeger, S. Pfleeger, <i>Security in Computing</i>, 5th edition, Pearson Education, 2015.		
Reference Books <ol style="list-style-type: none">1. A. Kahate, <i>Cryptography & Network Security</i>, 3rd edition, Tata McGrawHill, 20172. W. Stallings, <i>Cryptography and Network Security Principles and Practice</i>, 7th edition, Pearson Education, 20173. Mark Rhodes-Ousley, <i>Information Security: The Complete Reference</i>, 2nd edition, McGraw Hill Education, 2013.		
Laboratory/ Tutorial Work 8 to 10 experiments (and a practicum where applicable) based on the syllabus.		



Signature
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