Program: B Tech (Computer Engineering, Computer Science, AI and ML) MBA Tech (Computer Engineering) B Tech Integrated (Computer Engineering)	Semester: V-VII/ VI/ X
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 -
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

Signature

(Head of the Department)

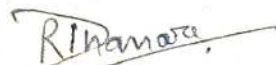|		
5.	**Program Security** Secure programs, non-malicious Program Errors, Viruses and other malicious code, types of viruses, attack mechanism of viruses, Targeted Malicious Code, Controls Against Program Threats.	04
6.	**Network Security** Eavesdropping, spoofing, denial of service attacks, Security 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

1. M. Bishop, S. S. Venkatramanayya, *Introduction to Computer Security*, 1st Edition, Pearson Education, 2014.
2. M. Whitman, H. Mattford, *Principles of Information Security*, 6th Edition, Cengage Learning, 2017.
3. C. Pfleeger, S. Pfleeger, *Security in Computing*, 5th Edition, Pearson Education, 2015.

Reference Books

1. A. Kahate, *Cryptography & Network Security*, 3rd Edition, Tata McGrawHill, 2017.
2. W. Stallings, *Cryptography and Network Security Principles and Practice*, 7th Edition, Pearson Education, 2017.
3. Mark Rhodes-Ousley, *Information Security: The Complete Reference*, 2nd Edition, McGraw Hill Education, 2013.

Laboratory Work

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

Signature

(Head of the Department)

AY 2024-25

Program: B Tech /MBA Tech (Computer Engineering) B Tech (CSBS, Computer Science, EXTC, AI & DS)/ BTI Computer					Semester: IV/V/ VI /VII/X	
Course: Machine Learning					Code: 702CO1E001	
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 - Probability and Statistics, Python Programming

Course Objective

This course provides a concise introduction to the fundamental concepts in machine learning from a practical perspective. Also, it covers the different learning algorithms and paradigms used in Machine Learning.

Course Outcomes

After successful completion of this course, students will be able to -
1. Identify machine learning techniques suitable for a given problem,
2. Solve the problems using various machine learning techniques,
3. Develop an application using machine learning techniques,
4. Evaluate and interpret the results of the algorithms.

Detailed Syllabus

Unit	Description	Duration
1.	**Machine Learning Fundamentals** Terminology, Supervised and Unsupervised Learning with examples, Underfitting / Overfitting, Bias-Variance Trade-off, Model Selection, Applications	02
2.	**Exploratory data Analysis** Missing Value Treatment, Handling Categorical data: Mapping ordinal features, Encoding class labels, Performing one-hot encoding on nominal features, Outlier Detection and Treatment. Feature Engineering: Variable Transformation and Variable Creation, Selecting meaningful features.	02
3.	**Regression** Linear regression using Least Squares (analytical approach), Linear regression using Gradient Descent (iterative approach), Multiple linear regression, Polynomial regression	06
4.	**Classification** Performance Evaluation, Confusion Matrix, Accuracy, Precision, Recall, F1-score, ROC Curves, AUC, k-fold Cross-Validation. Logistic Regression, Naive Bayes Classifier, Support Vector Machines, Neural Networks: Perceptron, Multi-layer Perceptron, Training using Back-propagation,	08

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	Applications	
5.	**Tree-Based Methods** Basics of Decision Trees, Regression Trees, Classification Trees, Trees v/s Linear Models, Advantages and Disadvantages of Trees, Ensemble techniques- Bagging, Boosting, Random forest	06
6.	**Unsupervised Learning** Challenges of Unsupervised Learning, Partitioning Methods: K-Means clustering, Dimension Reduction Methods, Principal Component Analysis (PCA), Hierarchical Clustering, Introduction to Recommender systems (Non-personalized and Content-based)	06
	Total	**30**

Text Books:
1. Judith Hurwitz, Daniel Kirsch, "Machine Learning for dummies", IBM Limited Edition, John Wiley & Sons, Inc., 2018.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning: Data Mining, Inference, and Prediction", 2nd Edition, Springer, 2017.

Reference books
1. Aurelien Geron, "Hands-on Machine Learning with Scikit Learn, Keras and Tensorflow", 2nd Edition, Oreilly Publication, 2019.
2. James, Witten, Hastie, Tibshirani," Introduction to Statistical Learning", 7th Edition, Springer, 2017.

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

Signature

(Prepared by Concerned Faculty/HOD)   AY 2024-25

Program: B Tech (Computer Engineering, Information Technology, Artificial Intelligence, Computer Science, AIML) MBA Tech (Computer Engineering, Information Technology, Artificial Intelligence) BTI Computer Engineering	Semester: VI /VII /V / VIII/X
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 -

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	06

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	presence of failures, RMI- Basics, Implementation, Case study- Java RMI, Message oriented communication-: transient and persistent communication. Stream oriented communication- support for continuous media, streams and QoS, stream synchronization.	
3	**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.	06
4	**Fault Tolerance** Introduction, Process resilience, Reliable group communication.	08
5	**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.	05
	Total	30

Text Books

1. Andrew S. Tanenbaum, *Distributed System: Principles and Paradigms*, 3rd Edition, Pearson Prentice Hall, 2017. ISBN 9789332549807

Reference Books

1. George Couloris, *Distributed System: Concept and Design*, 5th edition, Pearson Education, 2017. ISBN 9789332575226
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, Publisher : Pearson Education, 2004 ISBN-13 : 978-8131713327.

Laboratory / Tutorial work:

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

Signature

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Program: B Tech and MBA Tech all branches (except B Tech CSBS and B Tech CSE (DS)) / B Tech Integrated Computer and 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, the student will be able to -

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, 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	08
3.	**Employment Communication**	08

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	Self-branding through social media, resume-traditional and non-traditional formats- scannable, video portfolios, visual, etc.; cover letters-solicited and unsolicited	
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

1. Meenakshi Raman and Sangeeta Sharma, *Technical Communication: Principles and Practices*, 3rd ed., Oxford University Press, 2015
2. Fred Luthans, *Organisation Behaviour: An Evidence Based Approach,* 12th ed. McGraw Hill, 2013

Reference Books

1. Frances Trought, *Brilliant Employability Skills,* 2nd ed. Pearson, 2017.
2. S P Robbins, Timothy A Judge and Neharika Vohra, *Organizational Behavior*, 15th ed., Pearson, 2013
3. Scot Ober and Newman Amy, *Contemporary Business Communication*, 8th ed., Biztantra Publications, 2017
4. Cliff Atkinson, *Beyond Bullet Points*,4th ed., Pearson Education, 2018

Laboratory Work

- 8 to 10 Practical activities based on the syllabus

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AY 2024 - 25

Program: B Tech (Artificial Intelligence, AL and ML, AI and DS, Computer Engineering, Electronics & Telecommunication Engineering, CSE (DS) 311 (VT)) MBA Tech (Artificial Intelligence, Computer Engineering) B Tech Integrated (Computer Engineering)	Semester: VI/VII/V-VII/X/XII
Course: Computer Vision	**Code:** 702AI0C017

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: Programming concepts and Image Processing fundamentals

Course Objective

The objective of this course is to provide an introduction of Computer Vision concepts and its application

Course Outcomes

After completion of the course, students will be able to -
1. Describe the fundamental image processing techniques required for computer vision
2. Apply features extraction and image segmentation techniques
3. Understand the concept of image classification and image classification
4. Analyse applications using computer vision techniques

Detailed Syllabus

Unit	Description	Duration
1.	**Introduction** The Process of Recognition, Tackling the Recognition Problem, Introduction to Computer Vision Low-level, Mid-level, High-level, Overview of Diverse Computer Vision Applications	03
2.	**Feature Extraction** Global and regional features, DOG, HOG, , Corner and Interest Point Detection, Local invariant feature detectors and descriptors, SIFT, SURF, local texture representation using filters	08
3.	**Image Segmentation** Image Segmentation by Clustering Pixels: The watershed Algorithm, Mean-Shift , Motion Segmentation: Optical Flow, Background subtraction	05
4.	**3D Vision and Motion** 3D vision, Projection schemes for three-dimensional vision, shape from shading, Tackling the Perspective n-point Problem, Invariants and Perspective, Image Transformations and Camera Calibration, Motion	08
5.	**Real-Time Pattern Recognition Systems** Automated Visual Inspection, Inspection of Cereal Grains, Surveillance, In-Vehicle Vision Systems	06
	Total	30

Signature

Text Books

1. E. R. Davies, Matthew Turk, *Advanced Methods and Deep Learning in Computer vision,* Academic Press Inc, 2021
2. D. Forsyth, J. Ponce, *Computer Vision: A Modern Approach,* 2nd Edition, Pearson Education India, 2015.

Reference Books

1. Richard Szeliski, *Computer Vision: Algorithms and Applications*, Springer, 2010.
2. Simon J. D. Prince, *Computer Vision: Models, Learning, and Inference*, 1st Edition, Cambridge University Press, June 18, 2012.

Laboratory Work

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

Signature

(Head of the Department)

Program: B Tech/MBA Tech (Computer Engineering, Information Technology, Artificial Intelligence) B Tech (AI and ML, Computer Science) BTI Computer Engineering	Semester: VI/ V/ VII/X
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 Objective

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

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4	**HCI Models** GOMS model, Hierarchical Task Analysis	03
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. ISBN-13: 9780134380384
 2. Follett Jonathan (Ed), Designing for Emerging Technologies, 1st Edition, O'Reilly, 2014. ISBN:9789351109020
 3. Levy Jaime, UX Strategy: How to Devise Innovative Digital Products that People Want, 1st Edition, O'Reilly, 2017.

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

Signature

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Program: B. Tech /MBA Tech(Computer Engineering) BTI Computer Engineering		Semester: VI /X	
Course: Business Information Visualization and Analysis		Code:	

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 Extraction and Processing

Course Objective

To provide insights about visual Data analytics concepts, tools, and finding patterns in the data in the form of dashboards.

Course Outcomes

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

1. Clean and Prepare data for visualization using programming.

2. Analyze data using charts and graphs

3. Design and implement dynamic dashboard (Report)

4. Analyse data using basic statistics and for predictive analytics

Detailed Syllabus

Unit	Description	Duration
1	**Getting started with Data visual analytics** Introduction to Data Visual Analytics, Role of Data Visual Analytics for Business, Data Visual Analytics Architecture, Data Visual Analytics Methodology, Job Roles in Data Visual Analytics, Business Scenario	**02**
2	**Preparing data for visualization** Accessing Data, Formatting Data Values, Preparing Data with SET and INFILE, Conditional Processing of Data, Controlling of Input and Output Operations on Data, Creating Accumulated Data, Concatenation and Merging of Data.	**07**
3	**Analyzing raw data for visualization** Reading Standard and Delimited Data, Informats, Handling-Missing Data, Enhancing and Analyzing Data, Applying Filters, Basic data analysis using graphs, Advance filters using Parameters.	**05**
4	**Visual Analytics:** Different types of data Items in analytics, Data Exploration with data with charts and graphs: Bubble plot, bar chart, pie chart, line chart, scatter	**03**

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	plot, creating data item and applying filters, basic data analysis using graphs, creating advance filter using parameters. Selection of Charts using data Items	
5.	**Designing Dynamic Dashboard** Designing Dashboards, creating a simple report, working with graphs, working with filters and report sections, establishing, Interactions, working with gauges, working with tables, Working on Links and actions in the dashboard.	06
6.	**Predictive Analytics using Statistics** Data Prediction basics, ANNOVA, Naive Bayesian Classifier, Decision tree, Data Forecasting, Network Analysis, Path Analysis, Text Analytics.	05
7.	**Case Study** Creating a dashboard for a sample business scenario.	02
	Total	30

Text Books

1. Kieran Healy, *Data Visualization: A Practical Introduction*, Princeton University Press,
   1st Edition, 2018.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, *The Elements of Statistical Learning: Data Mining, Inference, and Prediction,* Springer, 2nd Edition, 2017.

Reference Books

1. Robert Allison, *Visualizing Data with SAS*, SAS Institute, 2017.
2. Business Analytics: Data Analysis & Decision Making 5/E (Pb) Paperback, (English) 5th Edition, Albright S.C. (2013).
3. *Visual Analytics 7.5,* User's Guide by SAS Institute (Free online SAS documents). *Link:*
4. The Tableau Workshop, Sumit Gupta, 1st Edition. (April 2022).(ISBN: 9781800207653)
5. *SAS Programming Guide,* SAS Institute
6. Visual Analytics with SAS Viya, Special Collection, 2019
7. Powell, Brett. Mastering Microsoft Power BI: expert techniques for effective data analytics and business intelligence. Packt Publishing Ltd, 2018.

Laboratory / Tutorial work

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

Signature

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Program: B Tech and MBA Tech (Computer Engineering, Artificial Intelligence, EXTC) B Tech (AI and DS, AI and ML, Computer Science, CSE (DS)) BTI Computer Engineering	Semester: VI/ VII/ V /X
Course: Biometrics	**Code:** 702CO0E009

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: Image Processing

Course Objective
This course is designed to cover Biometric Identification Science and Technology.

Course Outcomes
After completion of the course, student will be able to-
1. Understand the importance of biometric based system
2. Apply Image Processing techniques in designing the Biometric based solution
3. Design and develop various biometric recognition systems considering their ethical responsibility
4. Understand the multimodal Biometric based recognition system.

Detailed Syllabus		
Unit	Description	Duration
1	**Introduction to Biometrics** Biometric attributes, Biometric data, System overview, Privacy and its challenges, Biometric matching basics, authentication, identification.	04
2	**Types of Biometrics** Biometric systems based on fingerprint recognition, Iris recognition, Face identification and localization in images, Retina recognition methods, Human identification based on gait,	06

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	Speech as biometric data.	
3	**Multimodal Systems** Advantages of multimodal system, Types of multimodal system, Combination techniques: Feature level fusion, score level fusion, decision level fusion. Performance Testing and reporting, Errors in the test set, matching issues.	05
4	**Biometric Performance hierarchy** The statistical basis of biometric system, hypothesis testing, The False Match, False Non-Match and Equal Error Rates, ROC curves, DET curves, Identification - CMC curve, verification, Dealing with uncertainty, Systematic Errors, Sampling Errors, Confidence Interval Interpretation, Computing Confidence Intervals, Parametric Techniques, Non-parametric Bootstrapping, Statistical measures of Biometrics, Comparison of privacy factor in different biometrics technologies.	08
5	**Biometrics for Network Security Applications** Iris Recognition, Fingerprint Recognition, Surveillance Systems.	07
	Total	30

Text Books

1. Ted Dunstone and Neil Yager, *Biometric System and Data Analysis: Design, Evaluation, and data Mining*, Springer,2009. ISBN978-1-4419-4595-2
2. R. M. Bolle, J. H. Connell, S. Pankanti, N. K. Ratha, and A. W. Senoir, *Guide to Biometrics*, Springer,2006. ISBN978-1-4419-2305-9

Reference Books

1. A. K. Jain, R. Bolle and S. Pankanti, *Personal Identification in Networked society*, Kluwer Academic Publishers,2005 ISBN 978-1-4757-8295-0
2. John Vacca, *Biometrics Technologies and verification Systems*, Elsevier Inc Inc., 2007. ISBN: 9780750679671

Laboratory Work

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

Signature

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Program: B. Tech/MBA Tech (Computer Engineering) B Tech (CSBS, Computer Science, AI & DS) BTI Computer Engineering		Semester: VI/V/ X	
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,	02

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		features of MSA, Applications of MSA.	
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**

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7	**Integrating Microservices** Microservices Integration Patterns, requirements of integration services, Introduction to Service orchestration using Kubernetes , Service integration using Spring Boot.	03
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.

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5. Irakli Nadareishvili, Ronnie Mitra, Matt McLarty, Mike Amundsen, *Microservices Architecture: Aligning Principles, Practice and Culture*, 1st Edition, O'reilly, 2016.

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.

Signature

(Prepared by Concerned Faculty/HOD)   AY 2024-25

Program: B Tech/MBA Tech(IT, ComputerEngineering), BTI (Computer Engineeering), B Tech (AI and ML, Computer Science)		Semester : V,VI,VII,X	
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-
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, *Software Quality Assurance: From Theory to Implementation*, 2nd Edition, Pearson Education, 2012.

Reference Books

1. Milind Limaye, *Software quality assurance*, Tata McGraw-Hill Education, 2011.
2. Gordon Schulmeyer, *Handbook of Software Quality Assurance.* 4th Edition, Artech House, 2008.

Laboratory Work

8 to 10 experiments Programming exercises based on the syllabus.

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(Head of the Department)