COURSE CONTENT

FAULT TOLERANCE SYSTEMS

III Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
2235829	Foundation	3	0	0	3	40	60	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

Prerequisites: Basic knowledge of Computer Organization and Architecture

Course Overview:

Fault Tolerant Computing is about designing systems that continue to operate correctly even when faults occur. This course builds from basic concepts to advanced system-level and real-world implementations**.**

Course Objectives:

1. To understand the fundamental concepts, principles, and importance of fault tolerance in computer systems.
2. To study different fault models, redundancy techniques, and reliability analysis methods used in fault-tolerant system design.
3. To learn hardware and software fault tolerance techniques for improving system reliability and availability.
4. To analyze error detection, fault diagnosis, and recovery mechanisms in distributed and embedded systems.
5. To develop the ability to design and evaluate fault-tolerant systems for reliable computing applications.

Course Outcomes: After Completion of the Course, Students should be able to

1. Understand the fundamental concepts, principles, and architecture of fault tolerant systems used in reliable computing environments.
2. Analyze different types of faults, failures, and recovery mechanisms in distributed and real-time systems.
3. Design and implement fault-tolerance techniques such as redundancy, checkpointing, replication, and error recovery methods.
4. Evaluate the reliability, availability, and performance of computing systems using fault-tolerance models and testing techniques.
5. Apply fault-tolerant strategies in cloud computing, embedded systems, communication networks, and enterprise applications to ensure continuous system operation.

UNIT - I: Introduction to Fault Tolerant Computing: Basic concepts and overview of the course; Faults and their manifestations, Fault/error modeling, Reliability, availability and maintainability analysis, System evaluation, performance reliability tradeoffs.

UNIT - II: System level fault diagnosis: Hardware and software redundancy techniques. Fault tolerant system design methods, Mobile computing and Mobile communication environment, Fault injection methods.

UNIT-III: Software fault tolerance: Design and test of defect free integrated circuits, fault modeling, built in self- test, data compression, error correcting codes, simulation software/hardware, fault tolerant system design, CAD tools for design for testability.

UNIT - IV: **Information Redundancy and Error Correcting Codes:** Software Problem. Software Reliability Models and Robust Coding Techniques, Reliability in Computer Networks Time redundancy. Re execution in SMT, CMP Architectures, Fault Tolerant Distributed Systems, Data replication.

UNIT - V: Case Studies in FTC: ROC, HP Non-Stop Server. Case studies of fault tolerant systems and current research issues.

TEXT BOOKS:

1. Fault Tolerant Computer System Design by D. K. Pradhan, Prentice Hall.

REFERENCE BOOKS:

1. Fault Tolerant Systems by I. Koren, Morgan Kauffman.
2. Software Fault Tolerance Techniques and Implementation by L. L. Pullum, Artech House Computer Security Series.
3. Reliability of Computer Systems and Networks: Fault Tolerance Analysis and Design by M. L. Shooman, Wiley

ELECTRONIC RESOURCES:

1. https://ocw.mit.edu/
2. https://ocw.mit.edu/courses/6-033-computer-system-engineering-spring-2018/resources/mit6_033s18lec14/
3. https://ocw.mit.edu/courses/6-033-computer-system-engineering-spring-2018/resources/mit6_033s18lec15/

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)