Course Outline

1. Document Information

Degree Program	Computer Science
Course Number	CS 503
Course Title	Fault-Tolerant Computing Systems
Semester Hours	3
Course Coordinator	Bidyut Gupta
Revision Term	Spring 2021
Latest Revision	Spring 2021

2. Catalog Description

An introduction to different aspects of fault-tolerance in computing systems. Redundancy techniques with an emphasis on information redundancy, software fault-tolerance, coding techniques, algorithm-based fault-tolerance, fault-tolerant interconnection network architecture, DFT techniques, and quantitative evaluation methods.

3. Textbooks

4. References

5. Course Learning Outcomes

- To give the students an introduction to the different aspects of fault detection, diagnosis and tolerance in computer systems in general.
- To prepare the background such that students will be able to carry out further work in a more specialized fashion in any of these areas

6. Assessment of the Contribution to Student Outcomes

Outcome	1	2	3	4	5	6	7
Assessed	X	X	X	X	X		X

7. Prerequisites by Topic

CS 401

8. Major Topics Covered in the Course

1. Introduction: Fault Characterization, reliability modeling, physical faults and fault models. {4 classes}
2. Test generation in digital systems: concepts, structural level and functional level test generation, random testing. {6 classes}
3. Design for testability: testability measures, scan techniques, testable networks, syndrome testability. {6 classes}
4. Fault Simulation: simulation models, algorithms for simulation and evaluation, parallel and deductive fault simulation. {6 classes}
5. Coding Techniques: parity check, unidirectional, arithmetic and communication codes and properties, self-checking circuits, fault-tolerant combinational and sequential machines. {6 classes}
6. System Diagnosis: Digraph models, diagnosability analysis and algorithms, distributed diagnosis. {6 classes}
7. Fault-tolerant VLSI based architectures: Interconnection networks, binary cube, graph networks, dynamic reconfiguration. {6 classes}