King Fahd University of Petroleum & Minerals
College of Computer Sciences & Engineering

Department of Computer Engineering

CSE 641: Reliability & Fault Tolerance of Computer Systems (3-0-3)

Syllabus

Catalog Description

Fundamental concepts in the theory of reliable computer systems design. Reliability models and evaluation techniques. Availability and survivability of computer systems. Reliability and fault tolerance of computer networks (single loop, double loops, hypercube, multi-stage, etc.). Fault tolerant routing techniques. Fault tolerance and reliability of software. Projects using available network reliability evaluation tools.

Prerequisite: (COE 523 or equivalent) OR Conset of Instructor.

Text Book:

Dhiraj Pradhan, ``Fault-Tolerant Computer System Design'', Prentice-Hall, 1996.

Course Objectives:

(1) To introduce students to the theory of reliable and fault-tolerant computer systems.
(2) To provide in-depth design and analysis issues in the design of general reliable computer systems.
(3) To provide in-depth design and analysis issues in the design of reliable and fault-tolerant multicomputer networks.
(4) To introduce students to the basic design aspects of reliable and fault-tolerance ATM/high speed networks.
(5) To Provide in-depth design and analysis issues in the design of topological design and optimization of reliable and fault-tolerant Telecommunication networks.

Course Learning Outcomes:

After taking this course, students should be able to
(1) Grasp firmly the foundation of the theory of reliable and fault-tolerant computer systems.
(2) Master the issues involved in the design and analysis of reliable computer systems including multicomputer networks, ATM/high speed networks, and telecommunication networks.

Topics:

1.
   Module 1: Introduction to Design & Analysis of FT Systems
   (Chapter 1)

   Fundamental concepts. Redundancy techniques. Dependability evaluation
   techniques. Design Methodology.

2.
   Module 2: Reliability Estimation
   (Chapter 6)

   Elementary reliability. System reliability. System availability.
   Reliability models. Coverage models.

3.

Module 3: Principles of FT Multiprocessors & Distribute Systems
(Chapters 3 and 4)

Fundamental concepts. Fault tolerance through static redundancy. Fault
tolerance through dynamic redundancy. Fault detection in multiprocessor
systems. Rollback recovery. Reconfiguration of multiprocessor systems.
Case studies in FT multiprocessors & Distribute systems.

4.

Module 4: FT and Reliability Design of ATM Switch Architectures

(Supplement)

Design of reliable and fault-tolerant space-division ATM networks.

5.

Module 5: Reliability and FT Computer Networks Optimization

(Supplement)

Topological optimization of computer communication networks subject to
reliability and fault tolerance constraints.

6.

Module 6: Fault Tolerance Software
(Chapter 7)

Fundamental concepts. Design of FT software. Reliability models for FT
software. Exception handling. Case study.

Computer Usage:

Use of available network reliability evaluation tools.

Laboratory Experiments:

None.

Grading Policy (Tentative):

       10% Quizzes
       20% Major Exam (Tentatively offered at the end of week 8)
       40% Course Projects (Two projects equally weighted)
       30% Final Exam (Scheduled by the Registrar)

ABET Category content:

Engineering Science: **60 %**

Engineering Design: **40%**

Prepared by: Prof. Mostafa Abd-El-Barr. **Date:** November 2002.