

## 414 CNE Course Syllabus

<b>Course Code</b>	414CNE
<b>Course Name</b>	Fault Tolerance
<b>Credit Hours</b>	3 (2 for theory and 1 for lab)
<b>Contact Hours</b>	4 (2 for theory and 2 for lab)
<b>Instructor Name</b>	Eng. Mohammad A. Aty

### **Text Book** (title, author, and year)

- Reliability of Computer Systems and Networks: Fault Tolerance, Analysis, and Design, Shootman, John Wiley & Sons, 2003.
- Fault-Tolerant Systems, Korenand C. M. Krishna, 2007

### **Specific Course Information**

<b>Catalog Description</b>	This course focuses on the Standard LAN design topology, hierarchy and redundancy, STP concept and implementation, Gateway redundancy and load balancing HSRP, VRRP, GLBP, WAN routers congestion control and active queue management RED, WRED, WFQ, Traffic shaping and leaky bucket algorithm, TCP flow and congestion control, slow start, congestion avoidance, fast retransmit and fast recovery, and TCP flavors
<b>Prerequisites</b>	CNE310 –COMPUTER NETWORKS
<b>Co-requisites</b>	NIL
<b>Required/Elective</b>	required

### **Course Learning Outcomes**

1	To describe how to make networks fault tolerant through different layers.
2	To explain multilayers redundancy management protocols, STP, HSRP, VRRP, GLBP and TCP congestion and flow control protocols.
3	To analyze network problems connected with redundancy, routing and congestion RED, WRED, AQM.
4	To conduct experiments for designing and configuring reliable and highly available networks using real network devices.
5	To operate simulation tools such as Wireshark, GNS3 in order to perform required measurements analysis and design of the networks fault tolerance.
6	To demonstrate the students team-work outcome through small group projects.
7	To show professional and ethical behavior when dealing with network fault tolerance problems.
8	To show the ability for good written communication through lab reports and mini-projects.

### Mapping course LOs to the SLO.

Course LOs #	Student Learning Outcomes											
	a1	a2	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2
1			√									
2			√									
3			√									
4						√						
5							√					
6								√				
7									√			
8											√	

### List of Theory Topics

- Concept of high availability networks, Standard LAN design topology, hierarchy and redundancy
- Users Communities, VLANs, Subnetworks, intra and inter VLAN communication, Redundancy management, STP concept and implementation.
- Gateway redundancy and load balancing HSRP, VRRP, HSRP
- WAN routers congestion control and active queue management RED, WRED, WFQ, Traffic shaping and leaky bucket algorithm
- TCP flow and congestion control, slow start, congestion avoidance, fast retransmit and fast recovery, TCP flavors,
- Network error coding, block code, Trellis coding, Viterbi algorithm,

### List of Lab Experiments

- Introduction to Fault Tolerance System & Networks
- Configuration of Switches and Creating VLAN's
- Configuration of Inter VLAN Routing
- Configuration Virtual Trunk Port (VTP)
- Configuration of Spanning-Tree protocol(STP)
- Configuration of Hot Standby Routing Protocol (HSRP)
- Configuration of Hot Standby Routing Protocol (VRRP)
- Configuration of Gateway Load Balancing Protocol(GLBP)on Hardware
- Configuration of Hot Standby Routing Protocol(HSRP) on Hardware Design-1 without VLAN's
- Configuration of Hot Standby Routing Protocol (HSRP) on Hardware Design-2 with VLAN's