NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF INDUSTRIAL AND SYSTEMS ENGINEERING
SYSTEMS ENGINEERING PROGRAM

SYLLABUS - ST334 DATA COMMUNICATION SYSTEMS

I. GENERAL INFORMATION

CODE	:	ST334
SEMESTER	:	8
CREDITS	:	3
HOURS PER WEEK	:	4 (Theory – Practice)
PREREQUISITES	:	ST314 Computer Architecture, ST324 Operating Systems
CONDITION	:	Compulsory
INSTRUCTOR	:	Ruben Borja, Emerson Carranza,

II. COURSE DESCRIPTION

This is a theoretical-practical course of tools, devices and technologies to achieve an effective data communication, allowing students to have a total knowledge of local area network as well as the wide area network. For this purpose, models and architectures evolution will be studied using DoD (TCP-IP), ISO (OSI) proposed as base.

III. COURSE OUTCOMES

1. Understand how theoretical fundamentals, physical devices and communication protocols integrate to make up a data communication system.
2. Provide students with knowledge about local network topology, Communication techniques: distribution, compartment, conflict, selection and token passing.
3. Study and identify the physical structure of data transmission circuits.
4. Study data transmission service models implemented on the Internet.
5. Study the main network application implemented on the Internet.
6. Provide students with fundamentals for network applications development.

IV. LEARNING UNITS

1. DATA COMMUNICATION STANDARDS / 8 HOURS

Concepts of network, data, local area network (LAN), wide area network (WAN), Quality of Service (QoS), Security problems, Network collaboration services.

Computer networks, the Internet. Types of services on the Internet. Internet components. Hierarchy on the Internet. Reference model (OSI), layers structuring, definition of each layer and their application. Definition of protocol. Network protocol. How to model and use networks. OSI TCP/IP models, encapsulation process.

Introduction to LAN, WAN and MAN networks, types of protocols and network topology. Application layer. Protocols interaction, services and applications, approach to HTTP, DNS, DHCP, SMTP/POP, TELNET and FTP.

Network systems with structured wiring. Most important standards developed by ANSI/TIA/EIA 568A, 568B, 606, 569, 607, etc.

2. CONNECTIVITY TECHNOLOGIES - LAN VS BROADBAND NETWORKS / 6 HOURS

Network devises for designing LAN, WAN and MAN networks. Data transmission means. Transport layer. TCP and UDP protocols common applications.
LAN and ARP addresses. Connectivity technologies: Ethernet, Fast Ethernet, Giga Ethernet, IEEE committee. 802 IEEE standards. OSI network layer. Addressing and routing, route determination, data package and Internet Protocol (IP).
Definition of communication methods: Network interface cards (NICs), bridges, getaways, hubs, switches. Switch-based networks design. Network addressing, address mask, prefix length. Determination of sub networks and hosts.

3. SECURITY AND WIRELESS DATA COMMUNICATION STANDARDS / 4 HOURS
Wireless technologies, WLAN components and structures. Wireless LAN security problems and mitigation strategies. WLAN planning, WAP (Wireless Access Point) and wireless client configuration.
Basic security, Network threat. Attack methods, security applications and procedure, Firewall functions and how to use them to be protected against attacks.

4. TRENDS IN COMMUNICATION EQUIPMENTS (ROUTERS, SWITCHES, ETC), TECHNOLOGICAL TRENDS IN COMMUNICATIONS (PLC, WI FI, WI MAX, SATELLITE, MEDIUM-HEIGHT SATELLITE, ETC) / 4 HOURS
Trends in communication equipments. Network planning and wiring. Selection of an adequate LAN device. Devices selection factors. Interconnection of devices, Addressing scheme development, Sub network calculation, Interconnections of devices.

5. COMPUTING SOLUTIONS INTEGRATION / 6 HOURS
Necessary steps to gather, design and create a prototype as technical solution for a small business. Propose a technical solution for a problem. Design a technical solution for a small office environment. Create a technical solution prototype proposed with packet tracer.

V. LABORATORIES AND PRACTICAL EXPERIENCES:

Lab 1: Personal Computer hardware.
Lab 2: Operating Systems.
Lab 3: Network connections.
Lab 4: Internet connections.
Lab 5: Network addressing.
Lab 6: Network services.
Lab 7: Wireless networks.
Lab 8: Security.
Lab 9: Trends in communication equipments
Lab 10: Verification of communication through the Internetwork.

VI. METHODOLOGY

The course is carried out in theory, practical and lab sessions. In theory sessions, the instructor introduces concepts, technologies and design criteria and applications. In practical sessions, research group projects of communication technologies application are carried out. At the end of each subject, students must hand in and expose an application project or paper. In all sessions, students' active participation is encouraged.

VII. EVALUATION FORMULA

The average grade PF is calculated as follows:

PF = 0.20*PI+0.20*((CL1+CL2+CL3+CL4+CL5)/5)+0.20*((L1+L2+L3+L4)/4)+0.4*((EP+ EF)/2)

EP: Mid-Term Exam EF: Final Exam L#: Labs
PI: Research project CL#: Reading control

VIII. BIBLIOGRAPHY

1. **ANDREW S. TANENBAUM**
   Computer Networks (Spanish)
   Pearson Editorial, 4th Edition

2. **WILLIAM STALLINGS**
   Communications and Computer Networks (Spanish)
   Prentice Hall Editorial 7th Edition, 2003

3. **JAMES F. KUROSE, KEITH W. ROSS**
   Computer Networking
   Prentice Hall Editorial, 2nd Edition

4. **W. STALLINGS**
   Network Security Fundamentals. Applications and Standards.
   Prentice Hall, 7th Edition