



NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ELECTRICAL AND ELECTRONICS ENGINEERING

TELECOMMUNICATIONS ENGINEERING PROGRAM

IT535 – TELEPHONE SWITCHING

I. GENERAL INFORMATION

CODE	: IT535 – Telephone Switching
SEMESTER	: 9
CREDITS	: 03
HOURS PER WEEK	: 04 (Theory – Practice)
PREREQUISITES	: IT515 – Telecommunications III
CONDITION	: Mandatory

II. COURSE DESCRIPTION

The purpose of this course is to provide the student with the knowledge about the evolution and development of the telephony for the analog and digital switching systems, including the hardware and software of different telephone systems, integration of technologies such as ATM and IP including Voice over IP (VoIP) and photonic switching technologies.

III. COURSE OUTCOMES

At the end of the course the student will:

- Know the criteria for the design of analog and digital telephone switching systems.
- Know the operation and use of software and hardware used in different telephone systems.
- Know how to integrate technologies such as ATM and IP over classic telephone systems.

IV. LEARNING UNITS

1. INTRODUCTION

Communication channels. Switching channels. Networks of POTS (Plain Old Telephone Service). The Telecommunications Industry. Evolution of technology, Evolution of architecture. Evolution of telephone systems.

2. LINES AND TRUNKS

Lines. The telephone. Subscriber signaling. Telephone exchange. Subscriber extension Functions per line. Trunks: Network hierarchy between telephone switching centers. Trunks Trunk circuits. Signaling between telephone switching centers.

3. TRAFFIC ENGINEERING

Traffic measurements. Network management. Quality of telephone service. Telephone demand projections. Routing plan. Interconnection of telephone switching centers.

4. PUBLIC AND PRIVATE ANALOG SWITCHING

Analog switching Architecture. Line Finders. Selectors. Crossbar. Block of lines Trunk blocks. Call progression, call routing.

5. PUBLIC AND PRIVATE DIGITAL SWITCHING SYSTEMS

Concepts of pulse code modulation (PCM). Higher order PCM systems. Special switching concepts. Time switching. Digital switching circuits. Synchronism. ISDN concepts. BORSCHT. OAM & P

6. PUBLIC AND PRIVATE TELEPHONE SERVICES

Multi line phones. Services with added value. Hunting groups. Basic access telephone systems. Primary access service. Telephone via Internet. 800 series intelligent telephone systems.

7. PROGRAM CONTROL IN TELEPHONE SYSTEMS

Introduction. Computerized control process. Hardware architecture. Software architecture. Progress of a call. Operation and maintenance.

8. MAN-MACHINE INTERACTION

The human component. Human audio I/O. Human visual I/O. Human data I/O. Interactive Voice Response (IVR). Telecommunications terminal equipments. Telecommunications services.

9. NETWORK SIGNALING

Line signaling. Registration signage. R-2 signaling. ISDN signaling. SS7 signaling. Signaling for LAN and WAN networks.

10. NETWORK AND SWITCHING PARADIGMS

Ring and star networks capacity. Network hierarchies with circuit and packet switching. Operational Domain for circuit and packet switching. Switching capacity. Smart Networks: Signaling. Switching software. The advanced intelligent network.

11. SWITCHING AND NETWORKS OF THE FUTURE

Spatial, temporal and wavelength photonic switching. Devices: switches and multiplexers. Integration. Residential star fiber optic infrastructure. National Photonic Network with switching capacity. Regulations.

V. METHODOLOGY

The course takes place in theory and practice sessions. In the theory sessions the professor presents the different components of a classic telephone network, and new switching networks for communications. In the practical sessions different problems are presented and solved. In all classes the active participation of the student is promoted both in the analysis and in the solution of problems.

VI. EVALUATION FORMULA

The learning will be evaluated through the "G" system.

- Midterm Exam (ME): weights as 1
- Final Exam (FE): weights as 1
- Average of Quizzes (Q): weights as 1

The final grade (FG) is obtained as follows:

$$FG = \frac{ME + FE + Q}{3}$$

VII. BIBLIOGRAPHY

- “Reference Manual 4th edition”, Herbert Schildt. 2001.
- “Telephone Switching Systems”, Richard A. Thompson. Artech House, 2007.
- “Telecommunication Switching Systems and Networks”, V. Thiagarajan, B. Manav, PHI Learning Pvt. Ltd. 2015.