Telecommunication Engineering

GRADUATION REQUIREMENTS

In the Telecommunication Engineering Department, Students must complete a minimum of 178 credits satisfactorily. These 178 credits are: The 14-credit required by the university and the common 34-credit required by the faculty of engineering, the Department of Telecommunication Engineering requires the following 130-credit.

INTRODUCTION

Telecommunication Engineering have become very essential for human life during the last decades, consequently, the telecommunication department's responsibility and approach to prepare a new generation of highly qualified engineers working in these fields must focus on clearly defined mission, vision, and education objectives.

VISION

The vision of telecommunication department is to become a nationally and internationally leading institution of higher learning and center for research and education generation the knowledge and technologies in order to shape the future in the fields of telecommunication engineering

MISSION

The mission of telecommunication department is to provide education for the students who are able to:

- Produce creative solutions to national needs.
- Generate and spread out knowledge and technologies essential to local and global needs in the field of telecommunication engineering.
- Compete internationally.
- Conscious to universal moral values.
- Adherent to the professional ethical code.

EDUCATIONAL OBJECTIVES

The educational objectives of the programs of telecommunication department are to graduate engineers who:

1. Have strong background in basic science and basic mathematics and able to use these tools in their own engineering field.
2. Are able to pinpoint and define engineering problems in the fields of telecommunication engineering.
3. Are able to employ necessary techniques, hardware, and communication tools for modern engineering applications.
4. Are able to solve problems through analytical thinking in their own or related fields.
5. Are able to follow and contribute to developments in their own fields.
6. Are able to communicate effectively.
7. Are able to work in a multi-disciplinary environment and with cross-functional teams, having strong ethical and professional responsibility and responding to national needs.

TELECOMMUNICATION ENGINEERING DEPARTMENT COURSE

1. COMPULSORY COURSES (121CREDITS):

Course Code	Course Title	Credit Hours	Prerequisite
BS101	Mathematics 3	3	BS001
BS102	Mathematics 4	3	BS101
BS103	Physics 3	3	-
BS104	Numerical Analysis (TE)	2	-
BS105	Computer Applications in Engineering	2	-
BS106	Physics 4	3	-
EE101	Electronic Engineering I	3	-
EE102	Electronic Engineering II	3	EE101
EE103	Basics Of Electrical Circuit I	3	BS004
EE104	Basics Of Electrical Circuit II	3	EE103
EE105	Electrical Engineering Materials	2	BS103
EE106	Signals and Systems	3	BS101
EE108	Logic Circuit	2	-
EE201	Electromagnetic Fields	3	BS103
EE202	Electromagnetic Waves	2	EE201
EE203	Electronic Engineering III	3	EE102
EE204	Power Electronics and Supplies for Telecommunication	2	EE102
EE205	Communication Theory	3	EE106
EE206	Transmission Media	3	EE106
EE207	Digital Signal Processing	2	EE106
EE208	Digital Communication Systems	3	EE205
EE209	Engineering Measurements	3	EE104
EE210	Information Theory and Coding	3	EE106
EE211	Automatic Control Systems	3	BS101
EE212	Motion Control and Servos	3	EE211
EE214	Digital Telecommunication	3	EE205
EE301	Satellite Communication	3	EE214
EE302	Data Communication Systems	2	EE106
EE303	Cryptography and Network Security	3	EE210
EE304	Radio and T.V Systems	3	EE214
EE305	Switching Systems	3	EE214
EE306	Antennas	3	EE202
EE307	Communication Networks	2	EE106
EE308	Mobile Communication	3	EE214
EE309	Teletraphic Engineering	3	EE106
EE311	Common Signalization System	3	EE214
EE401	Microprocessor Engineering for Switching Systems	3	EE305
EE402	Microwave Engineering	3	EE202
EE403	Optical Communication Systems	3	BS106/EE201
EE405	Information Technology for Telecommunication Networks	3	EE307
EE407	Power Transmission Systems	2	EE104
EE490	Senior Seminar	2	120 CR. HR
EE499	Graduation Project	6	130 CR. HR

Telecommunication Engineering

2. Elective Courses (9 Credits)

Prerequisite: senior standing

Studentsat the senior standing must complete 9 credits from the following electives:

Course Code	Course Title	Credit Hours
EE440	Acoustics	3
EE441	Radar Engineering	3
EE442	Communication Network Planning	3
EE443	Computer Architecture and Programming	3
EE444	Digital Image Processing	3
EE445	Advanced Communication systems and Network	3

TELECOMMUNICATION ENGINEERING PROGRAM
FRESHMAN

- **Semester 3**

Course Code	Course Title	Credit Hours	LT	TU	LB	Contact Hours
BS101	Mathematical 3	3	2	2	-	4
BS103	Physics 3	3	2	1	2	5
BS105	Computer Applications in Engineering	2	1	-	2	3
EE101	Electronic Engineering I	3	2	2	1	5
EE103	Basics of Electrical Circuits I	3	2	2	1	5
EE105	Electrical Engineering Materials	2	2	-	1	3
HM101	Technical Writing	2	2	-	-	2
Total		**18**	**13**	**7**	**7**	**27**

- **Semester 4**

Course Code	Course Title	Credit Hours	LT	TU	LB	Contact Hours
BS102	Mathematics 4 (TE)	3	2	2	-	4
BS106	Physics 4	3	2	1	2	5
EE102	Electronic Engineering II	3	2	2	1	5
EE104	Basics of Electrical Circuits II	3	2	2	1	5
EE106	Signals and Systems	3	2	2	-	4
EE108	Logic Circuit	2	2	1	1	4
HM102	Scientific Thinking	2	2	-	-	2
EN101	Technical Training I	-	-	-	-	-
Total		**19**	**14**	**10**	**5**	**29**

TELECOMMUNICATION ENGINEERING PROGRAM
SOPHOMORE

- **Semester 5**

Course Code	Course Title	Credit Hours	LT	TU	LB	Contact Hours
BS108	Probability and Statistics in Engineering	2	2	1	-	3
EE201	Electromagnetic Fields	3	2	2	1	5
EE203	Electronic Engineering III	3	2	2	1	5
EE205	Communication Theory	3	2	2	-	4
EE207	Digital Signal Processing	2	2	1	-	3
EE209	Engineering Measurements	3	2	2	1	5
EE211	Automatic Control Systems	3	2	2	1	5
Total		**19**	**14**	**12**	**4**	**30**

- **Semester 6**

Course Code	Course Title	Credit Hours	LT	TU	LB	Contact Hours
EE202	Electromagnetic Waves	2	2	1	-	3
EE204	Power Electronics and supplies for Telecommunication	2	2	1	-	3
EE206	Transmission Media	3	2	1	1	4
EE208	Digital Communication Systems	3	2	-	2	4
EE210	Information Theory and Coding	3	2	2	-	4
EE212	Motion Control and Servos	3	2	2	1	5
EE214	Digital Telecommunication	3	2	-	2	4
EN201	Technical Training II	-	-	-	-	-
Total		**19**	**14**	**7**	**6**	**27**

TELECOMMUNICATION ENGINEERING PROGRAM
JUNIOR

- **Semester 7**

Course Code	Course Title	Credit Hours	LT	TU	LB	Contact Hours
BS104	Numerical Analysis (TE)	2	2	1	-	3
EE301	Satellite Communications	3	2	2	-	4
EE303	Cryptography and Network Security	3	2	1	2	5
EE305	Switching Systems	3	2	2	-	4
EE307	Communication Networks	2	2	1	-	3
EE309	Teletraphic Engineering	3	2	2	-	4
EE311	Common Signalization System	3	2	2	-	4
HM202	Engineering Economics and Managements	2	2	1	-	3
Total		**21**	**16**	**12**	**2**	**30**

- **Semester 8**

Course Code	Course Title	Credit Hours	LT	TU	LB	Contact Hours
EE302	Data Communication Systems	2	2	1	-	3
EE304	Radio and T.V Systems	3	2	2	-	4
EE306	Antennas	3	2	2	1	5
EE308	Mobile Communication	3	2	2	-	4
EE	Elective	3	2	2	-	4
EE	Elective	3	2	2	-	4
EN301	Technical Training III	-	-	-	-	-
Total		**17**	**12**	**11**	**1**	**24**

TELECOMMUNICATION ENGINEERING PROGRAM
SENIOR

- **Semester 9**

Course Code	Course Title	Credit Hours	LT	TU	LB	Contact Hours
EE	Elective	3	2	2	-	4
EE401	Microprocessor Engineering for Switching Systems	3	2	2	-	4
EE403	Optical Communication Systems	3	2	2	1	5
EE405	Information Technology for Telecommunication Networks	3	2	2	-	4
EE407	Power Transmission Systems	2	2	1	-	3
EE499	Graduation Project	-	2	1	2	5
HM	Elective	2	2	-	-	2
Total		**16**	**14**	**10**	**3**	**27**

- **Semester 10**

Course Code	Course Title	Credit Hours	LT	TU	LB	Contact Hours
EE402	Microwave Engineering	3	2	2	1	5
EE490	Senior Seminar	2	1	2	-	3
EE499	Graduation Project	6	2	1	2	5
HM	Elective	2	2	-	-	2
Total		13	7	5	3	15

TELECOMMUNICATIONENGINEERING PROGRAM

Code	Course Title	CR	LT	TU	LB	CT	Code	Course Title	CR	LT	TU	LB	CT
Preparatory	**Semester 1**							**Semester 2**					
BS001	Mathematics 1	3	2	2	-	4	BS002	Mathematics 2	3	2	2	-	4
BS003	Physics 1	3	2	1	1	4	BS004	Physics 2	3	2	1	1	4
BS005	Chemistry	3	2	1	1	4	BS008	Engineering Mechanics 2	3	2	2	-	4
BS007	Engineering Mechanics 1	3	2	2	-	4	BS010	Engineering Drawing 2	2	1	2	-	3
BS009	Engineering Drawing 1	2	1	2	-	3	HM002	Russian Language 2	2	1	2	-	3
HM001	Russian Language 1	1	-	2	-	2	HM004	English Language 2	2	1	2	-	3
HM003	English Language 1	1	-	2	-	2	BS006	Computer Aided Drawing	1	-	-	2	2
HM005	Introduction to Engineering	2	2	-	-	2	ME002	Production Technology	2	1	1	1	3
Total		**18**	**11**	**12**	**2**	**25**	**Total**		**18**	**10**	**12**	**4**	**26**
Freshman	**Semester 3**							**Semester 4**					
BS101	Mathematical 3	3	2	2	-	4	BS102	Mathematics 4	3	2	2	-	4
BS103	Physics 3	3	2	1	2	5	BS106	Physics 4	3	2	1	2	5
BS105	Computer Applications in Engineering	2	1	-	2	3	EE102	Electronic Engineering II	3	2	2	1	5
EE101	Electronic Engineering I	3	2	2	1	5	EE104	Basics of Electrical Circuits II	3	2	2	1	5
EE103	Basics of Electrical Circuits I	3	2	2	1	5	EE106	Signals and Systems	3	2	2	-	4
EE105	Electrical Engineering Materials	2	2	-	1	3	EE108	Logic Circuit	2	2	1	1	4
HM101	Technical Writing	2	2	-	-	2	HM102	Scientific Thinking	2	2	-	-	2
							EN101	Technical Training I	-	-	-	-	-
Total		**18**	**13**	**7**	**7**	**27**	**Total**		**19**	**14**	**10**	**5**	**29**
Sophomore	**Semester 5**							**Semester 6**					
BS108	Probability and Statistics in Engineering	2	2	1	-	3	EE202	Electromagnetic Waves	2	2	1	-	3
EE201	Electromagnetic Fields	3	2	2	1	5	EE204	Power Electronics and supplies for Telecommunication	2	2	1	-	3
EE203	Electronic Engineering III	3	2	2	1	5	EE206	Transmission Media	3	2	1	1	4
EE205	Communication Theory	3	2	2	-	4	EE208	Digital Communication Systems	3	2	-	2	4
EE207	Digital Signal Processing	2	2	1	-	3	EE210	Information Theory and Coding	3	2	2	-	4
EE209	Engineering Measurements	3	2	2	1	5	EE212	Motion Control and Servos	3	2	2	1	5
EE211	Automatic Control Systems	3	2	2	1	5	EE214	Digital Telecommunication	3	2	-	2	4
							EN201	Technical Training II	-	-	-	-	-
Total		**19**	**14**	**12**	**4**	**30**	**Total**		**19**	**14**	**7**	**6**	**27**
Junior	**Semester 7**							**Semester 8**					
BS104	Numerical Analysis (TE)	2	2	1	-	3	EE302	Data Communication Systems	2	2	1	-	3
EE301	Satellite Communications	3	2	2	-	4	EE304	Radio and T.V Systems	3	2	2	-	4
EE303	Cryptography and Network Security	3	2	1	2	5	EE306	Antennas	3	2	2	1	5
EE305	Switching Systems	3	2	2	-	4	EE308	Mobile Communication	3	2	2	-	4
EE307	Communication Networks	2	2	1	-	3	EE	Elective	3	2	2	-	4
EE309	Teletraphic Engineering	3	2	2	-	4	EE	Elective	3	2	2	-	4
EE311	Common Signalization System	3	2	2	-	4	EN301	Technical Training III	-	-	-	-	-
HM202	Engineering Economics and Managements	2	2	1	-	3							
Total		**21**	**16**	**12**	**2**	**30**	**Total**		**17**	**12**	**11**	**1**	**24**
Senior	**Semester 9**							**Semester 10**					
EE	Elective	3	2	2	-	4	EE402	Microwave Engineering	3	2	2	1	5
EE401	Microprocessor Engineering for Switching Systems	3	2	2	-	4	EE490	Senior Seminar	2	1	2	-	3
EE403	Optical Communication Systems	3	2	2	1	5	EE499	Graduation Project	6	2	1	2	5
EE405	Information Technology for Telecommunication Networks	3	2	2	-	4	HM	Elective	2	2	-	-	2
EE407	Power Transmission Systems	2	2	1	-	3							
EE499	Graduation Project	-	2	1	2	5							
HM	Elective	2	2	-	-	2							
Total		**16**	**14**	**10**	**3**	**27**	**Total**		**13**	**7**	**5**	**3**	**15**

Telecommunication Engineering

TELECOMMUNICATIONENGINEERING
COURSE DESCRIPTION

1. MATHEMATICS 3

Code	Credit Hours	LT	TU	LB	Prerequisites
BS101	3	2	2	-	BS001

Basic definitions of differential equations - First order differential equations - Engineering applications - Second order differential equations - Higher order differential equations -Laplace transformation - Solving differential equations using Laplace transformation - Systems of differential equations - Fourier Series - Partial differentiation - Maxima & minima of functions of two variables - Applications of partial derivatives - Directional derivative - Taylor theorem for functions of two variables - Double integrals - Triple integrals - Line integrals - Surface integrals.

2. MATHEMATICS 4

Code	Credit Hours	LT	TU	LB	Prerequisites
BS102	3	2	2	-	BS101

Vector Fields, Divergence theorem, stokes theorem, Green's theorem, Independence of path. Functions of a complex variable, Cauchy-Riemann Equations, canton integrals, Cauchy theorem, Cauchy integral formulas, and Residue theorem.

3. PHYSICS 3

Code	Credit Hours	LT	TU	LB	Prerequisites
BS103	3	2	1	2	-

Electromagnetic waves, Production of EM waves, Energy in EM waves, Momentum transfer and radiation pressure, Wave nature of light, Interference, Young's double slit experiment, Interference by thin films, Michelson Interferometer, Diffraction, polarization, X-Rays, Diffraction of X- rays, Bragg's Law, The special theory of Relativity, Postulates, Time dilation, length contraction, Relativistic momentum and mass, Mass and energy.

4. NUMERICAL ANALYSIS (TE)

Code	Credit Hours	LT	TU	LB	Prerequisites
BS104	2	2	1	-	-

Numerical Solution of algebraic and transcendental equations, numerical solution of systems of linear equations, Numerical differentiation and integration, Numerical solution of differential equations, Using MatLAB for obtaining numerical solution.

5. COMPUTER APPLICATIONS IN ENGINEERING

Code	Credit Hours	LT	TU	LB	Prerequisites
BS105	2	1	-	2	-

Introduction to software programming: the concept of programming, difference between application programs and programming languages. Types of programming languages: Machine language, Assembly language, High level language.Principles of MATLAB programming

language:Starting with MATLAB.Creating arrays.Mathematical operations with arrays. Using script and managing Data.Two-Dimensional plots.

User-defined functions and function files.Programming in MATLAB.Polynomials, Curve fitting and interpolation.Application in numerical analysis.

6. PHYSICS 4

Code	Credit Hours	LT	TU	LB	Prerequisites
BS106	3	2	1	2	

Quantum theory and models of the atom, Plank's quantum theory, Photoelectric effect, energy, Mass and momentum of a photon, Compton effect, Pair production, Wave – particle Duality, The Bohr model, De Broglie's hypothesis, Quantum mechanics of the hydrogen atom, quantum numbers, Lasers, Radioactivity, Alpha decay, Beta decay, Gamma decay, Half -life time and rate of decay, Radioactive dating, Measurement of radiation.

7. ELECTRONIC ENGINEERING I

Code	Credit Hours	LT	TU	LB	Prerequisites
EE101	3	2	2	1	-

Introduction - Structure of atom, Conductors, Insulators and Semi conductor. Conductivity and number of charge carries. Band energy level and energy gap.Intrinsic semi conductors and doping. P and N type PN junction. Diode characteristics.Application of diode (different types of rectifiers, diode clipper, diode clamp, diode in logic circuits, voltage doubler). Two terminal devices (zener, tunnel, varicap, photo, light emitting diodes, varistors, thermistors , liquid crystal display, photo cells). Bipolar transistor (commonbase ,common emitter and common collector). Biasing and stabilization.
-Experiments on diode and transistor.

8. ELECTRONICS ENGINEERING II

Code	Credit Hours	LT	TU	LB	Prerequisites
EE102	3	2	2	1	EE101

Transistors: circuit modeling, frequency response of transistors, transistor in multi-stage amplifiers. Field Effect Transistor (FET). Transistors in feedback amplifiers: modeling, analysis and characteristics, the amplifier response and stability. Operational amplifiers: analysis and characteristics, applications (active filters, logarithmic and exponential, converters, etc.). Technological basics of integrated circuits.Introduction to analog microcircuits.Introduction to digital microcircuits.Optic-electronic devices.
-Experiments on FET and Op-Amp.

9. Basics of Electrical Circuits I

Code	Credit Hours	LT	TU	LB	Prerequisites
EE103	3	2	2	1	BS004

Element of electric circuit, sources in electric circuits (voltage sources, current sources, dependant& independent sources).

- D.C circuits, circuit theories (Kirchhoff's laws), Thevenin's theorem, Norton, Mesh and loop analysis. Max power transfer theorem) compensation theorem, super position theorem.
- A.C circuits, inductance, capacitance vector diagram power in A.C circuits.Single phase and three phase supply.

-Experiments for verify circuit theories.

10. Basics of Electrical Circuits II

Code	Credit Hours	LT	TU	LB	Prerequisites
EE104	3	2	2	1	EE103

Quadruple theory and circuits with distributed parameters theory. Inductances, and capacitors, first order circuits, second order circuits, Sinusoids and phasors, Three Phase circuits, magnetically coupled.

-Experiments on AC circuits

11. Electrical Engineering Materials

Code	Credit Hours	LT	TU	LB	Prerequisites
EE105	2	2	-	1	BS103

Structure of materials.Defects of crystal grid.Basics of physic-chemical analysis.Methods of getting, cleaning and controlling of cleanness of materials.Monocrystals.Conductors in microelectronics.

Methods of making of thin slicks.Formation of picture on the metal slicks.Processes of lithography in the technology of integrated circuits.

Etching of metal slicks.Semiconductor materials.Simple and complicate semiconductors.Non-crystal semiconductors.Liquid semiconductors.Basics of methods of doping of semiconductors.Chemical and electrochemical etching of semiconductors.Dielectrics.Methods of formation and etching of dielectrically slicks on the surface of semiconductors.Magnetic materials.Materials of quantum optics and optic electronics.Ecology problems of technologies of electronics.

12. Signals and Systems

Code	Credit Hours	LT	TU	LB	Prerequisites
EE106	3	2	2	-	BS101

Classification of signals and signal processing systems, Linearity and time invariance, Signal symmetry and orthogonality, Signal sampling, Convolution and its properties, modeling simple systems, Impulse response of systems, System description and block diagram representation, Fourier series and representation of signals, Periodic signals representation, the Fourier transform and its properties, response and applications of linear filters, The Laplace transform and it's properties, the inverse Laplace transform, Problem solving by Laplace transform.

13. Logic Circuit

Code	Credit Hours	LT	TU	LB	Prerequisites
EE108	2	2	1	1	-

Number systems: binary, octal, and hexadecimal. Binary mathematics: Gray code, BCD. Logic gates (OR, AND, NOT, NOR, XOR, NAND, and Truth table). Sequential Circuits, Flip Flop, Counters, Registers, Combinational Circuits, Address, Subtractions, Multipliers**,** Dividers, Multiplexers, Decoders, Encoders, Programming Language (VHDL).

14. Electromagnetic Fields

Code	Credit Hours	LT	TU	LB	Prerequisites
EE201	3	2	2	1	BS103

-Vector analysis, Coulomb's law of forces, Electric field intensity, Principle of superposition, Charge density (volumetric, surface and line charge densities), Electric field intensity due to charge distribution, Electric potential, Electric potential of charge distribution, Relation of field to potential in differential form, Equipotential surfaces, Electric flux density, Displacement vector Gauss's low of integral form, Gauss's law of differential form, Divergent theorem, Laplace's and Poisson's equations.
-Fields and potentials of simple charge configuration (finite line charge, ring charge, two equal and opposite point charges: dipole moment), Image method, Potential coefficients of transmission lines.
-Conductor dielectric and capacitors, Induced charge, Polarization and bound charges, Relation between D,E and P, Refraction, Boundary condition problems.
-Steady currents, Ohm's law in point form, Non conservation fields, Continuity Equation, Joules law.
-Experiments on Free hand mapping of electrostatic fields. Curvilinear squares. Capacitance of a field cell.

15. Electromagnetic Waves

Code	Credit Hours	LT	TU	LB	Prerequisites
EE202	2	2	1	-	EE201

-Magneto static : The static magnetic field of steady electric current- Biots- Savart law, Ampere's law of H, Current density vector J and Ampere's law, curl of H, Stokes Theorem. Magnetic vector potential, Magnetic dipole, Forces on a current element, Torque on a loop, Magnetic moment, Magnetic flux.

-Magnetic induction, The induce emf, Inductance: self and mutual, Newmann's formulas, Inductance of transmission lines, Energy stored in magnetic fields, Magnetic materials, Magnetic flux density and magnetization, Microphysical magnetization of materials, Diamagnetizing, Paramagnetizing, Boundary conditions problems.
-Loranze equation of force, Maxwell's equation of integral forms and differential forms, Electromagnetic field equations, Propagation of uniform plane waves in free space, Uniform plane waves traveling , Relation between E and H in a uniform plane wave, Sinusoidal Electromagnetic waves, Wave equation for conducting media, Poynting Vector, Four dimension waves.

16. ELECTRONICS ENGINEERING III

Code	Credit Hours	LT	TU	LB	Prerequisites
EE203	3	2	2	1	EE102

-Negative feedback in amplifiers. Series and shunt feedback, current and voltage feedback. Effect of feedback on Z_i, Z_o, and voltage amplification.
-Frequency response of RC amplifiers. Cascade amplifiers, low and high frequency response and bandwidth.Miller effect.Plotting of frequency.
-Power amplifiers. Class A, class B, class AB. Efficiency of different types. Transformer coupled amplifier. Push –Pull circuits, complementary- symmetry circuit. Heat loss and cooling of power amplifiers.Distorsion in power amplifier.
-Oscillators theory of feedback. RL oscillator, RC oscillators, Wien Bridge oscillator.Double T oscillator, Cristal oscillators.

17. POWER ELECTRONICS AND SUPPLIES FOR TELECOMMUNICATION

Code	Credit Hours	LT	TU	LB	Prerequisites
EE204	2	2	1	-	EE102

Solid state power components in telecommunication, diodes, SCR, IGBT, power transistors. Applications. Types of rectifications, filters, voltage control of power supplies. Dc Choppers, Inverters and cycloconverters. Harmonics and interface in power supplies

18. COMMUNICATION THEORY

Code	Credit Hours	LT	TU	LB	Prerequisites
EE205	3	2	2	-	BS106

Why Modulation? What is Modulation? Basic principle of modulation, Double sideband amplitude modulation, double sideband suppressed carrier amplitude modulation, Single Sideband amplitude modulation, quadrature AM, Vestigial sideband AM, Amplitude modulators, Detection of amplitude modulated signals, Factors effecting the choice of AM system, Angle modulation, Phase modulation, Frequency modulation, Frequency and phase modulators, Frequency and phase demodulators, Frequency division multiplexing, Noise in analog communication systems, Noise properties of networks, Algebraic representation of band-limited noise signal to noise ratio characteristics of detected signals, Pre-emphasis and de-emphasis.

19. TRANSMISSION MEDIA

Code	Credit Hours	LT	TU	LB	Prerequisites
EE206	3	2	1	1	BS106

Introduction of Modern telecommunications.Characteristics of transmission media.Theory of transmission media.Theory of cross-influence on the transmission lines and their protection.Wire transmission lines, Optical fibers (Physical Structure), Wireless media (Propagation, Microwave, Losses).

20. Digital Signal Processing

Code	Credit Hours	LT	TU	LB	Prerequisites
EE207	2	2	1	-	EE106

Elements of difference equations, Solution of difference equation, Z-transform of set of sequences, Some Properties of Z-transform, Inverse Z-transform, Solution of difference equations using Z-transform, Two sided Z-transform, Fourier Series expansion of periodic sampled signals, Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), Inverse Fourier Transform (IFFT), Spectral Estimation, Discrete time convolution, Discrete time system transfer functions, Infinite Impulse Response discrete time filters, Finite Impulse Response discrete time filter, FIR filter design, IIR filter design.

21. Digital Communication Systems

Code	Credit Hours	LT	TU	LB	Prerequisites
EE208	3	2	-	2	EE205

Advantages of digital communication, Analog to Digital conversion, Sampling Theorem, Sampling of continuous signals, Reconstruction of the continuous signal, Line coding, M-ary communication, Digital Modulation, Digital modulation techniques (Amplitude shift keying (ASK), Frequency shift keying (FSK), Phase shift keying (PSK), Differential phase shift keying (DPSK), MSK, GMSK), Effect of noise on digital modulation, Multiple Access Techniques: FDMA and OFDMA.

22. Engineering Measurements

Code	Credit Hours	LT	TU	LB	Prerequisites
EE209	3	2	2	1	EE104

What is measurement, Units and dimensions, Measuring system components, DC Bridge as signal conditioning circuit.
- Transducers, advantages of using transducers, characteristics of transducers (Sensitivity, Accuracy, Precession, Resolution, Response time, Linearity, Declivity…).
Measurement of temperature (Thermocouples, RTD, Thermistors, Diode Temperature Detector…), strain gauges (one, two, four element bridge), sound transducers (Different types of microphones), lux meter. Flow transducers, liquid level transducers, humidity, transducers, speed transducers, Pressure Transducers.
-Operational amplifier as signal conditioning circuit. Application on displacement transducers.
-Oscilloscope parts, modes of operation, probes, applications, digital oscilloscope.
-Digital counters parts (oscillator frequency, divider, gates, DCU).Applications (time, measurements, frequency, two frequency comparison, and clock mode).
-Experimental Part: Measuring electrical and mechanical values, calibrating some measuring devices. Measuring using Oscilloscope and digital counters.

23. Information Theory and Coding

Code	Credit Hours	LT	TU	LB	Prerequisites
EE210	3	2	2	-	EE106

-Definition of information, Information sources (Zero-memory, Markov adjoint and extensions), Entropy and its properties.
-Properties of codes, Construction of codes, The Kraft-Inequality, McMillan's-Inequality, Coding information sources, Shannon's first theorem, Coding without extensions, Huffman codes, r-ary compact codes, Code efficiency and redundancy, Channels and mutual information. Probability relations in a channel, Channel capacity, Conditional mutual information, Error probability and decision rules, Coding to correct errors, Random coding, Shannon's second theorem.
-First linear block codes are defined and described in terms of generator and parity check matrices systematic format. Concept of syndrome is introduced for detection, and decoding schemes are introduced. Cyclic codes are introduced, encoding and decoding techniques are explained. Implementation of these codes arediscured BCH codes are introduced also, and its family reed. Soliman codes, where they are used for multiple error correction. Finally convolution codes are explained.

24. Automatic Control System

Code	Credit Hours	LT	TU	LB	Prerequisites
EE211	3	2	2	1	BS101

Introduction to feedback system, Review of systems mathematical background, modeling of physical systems, mechanical systems, electrical systems, hydraulic systems, pneumatic systems, thermal systems, block diagram reduction technique and Signal Flow Graphs. Transient response and steady state error, Routh's Stability Criterion.The Root Locus Method. Frequency Response methods (Nyquist and bode diagram), different type of controllers, methods of Compensation Techniques, Introduction to Sample Control System.

- Experimental Part: Open and closed loop system, Servo-mechanicsnism principles. The effect of proportional gain, Integral Control, Derivative control and Velocity feedback on System, Performance, Frequency Response Measurement.

25. Motion Control And Servos

Code	Credit Hours	LT	TU	LB	Prerequisites
EE212	3	2	2	1	EE211

Motion control systems, speed control systems, DC servo system (field control), DC servo system (Armature Control), and AC control servo system. Application on servo systems (In robots control- in aircraft control- in cutting machines- flow control- thermal system control).
-Experimental Part: Two motion control system trainer, stepper motor trainer, DC/AC servo system trainer.

26. DIGITAL TELECOMMUNICATION

Code	Credit Hours	LT	TU	LB	Prerequisites
EE214	3	2	-	2	EE205

Pulse Code Modulation (PCM), Uniform quantization, Non-uniform quantization, Synchronization of PCM links, Delta modulation, Time Division Multiplexing (TDM), Hierchical Systems and frame format, Data communications, Spectral properties of data signal, Advance modulation techniques. Equalizer.SDH and PDH, Multiple access techniques TDMA and CDMA.

27. SATELLITE COMMUNICATION

Code	Credit Hours	LT	TU	LB	Prerequisites
EE301	3	2	2	-	EE214

Principles of Satellite Communication, Satellite Orbit Inclination, Communication Satellite Link Design, Satellite Analog Communication, Digital Carrier Systems and Satellite Links, Multiple Access Techniques and Packet Satellite Communication, Satellite Earth Stations, Communication Satellite Subsystems, Error Control Coding for Digital Satellite Links, Satellite Applications, Global, Regional, and national Communication Satellite Systems, Digital Satellite (Direct-to-Home) TV Systems, Satellite and Cable Transmission Systems, VSAT Satellite System, Global Positioning Satellite System, Internet and Satellite Links, Satellites, Digital telephony, E-Mail, FAX, Video Conferencing, mobile Telephony, and wireless Internet, Laser Satellite Communication, Special Purpose Satellites.

28. DATA COMMUNICATION SYSTEMS

Code	Credit Hours	LT	TU	LB	Prerequisites
EE302	2	2	1	-	EE106

Data communication systems design principles. Telecommunication services. Interconnection data communication services with subscribers. Quality of service concept. Numeration plans. Broadband networks. Frame relay, ATM, IP Networks and principles. Satellite data communication networks.Types of telecommunication services.TMN conception.

29. CRYPTOGRAPHY AND NETWORK SECURITY

Code	Credit Hours	LT	TU	LB	Prerequisites
EE303	3	2	1	2	EE210

Classic cryptography- Symmetric cryptography- Asymmetric cryptography- Hash function- Digital signature- Key distribution- PKI, Kerberos- TCP/IP networks- Web Security- Network security- Intrusion detection- Fire-walls.

30. Radio and T.V System

Code	Credit Hours	LT	TU	LB	Prerequisites
EE304	3	2	2	-	EE214

-Radio: The AM transmitter, AM receiver, The FM transmitter, FM receiver, Studio Consoles.
-Television: Vision, photometry, Illumination and optics. The picture tube, scanning generators, frequency spectrum of the television signals, synchronization of scanning generators. Camera tubes.Television broadcasting.Television recording.Television relay systems. Color television.Television test and alignment procedures.Large screen television systems. LCD screens, plasma screen.

31. Switching Systems

Code	Credit Hours	LT	TU	LB	Prerequisites
EE305	3	2	2	-	EE214

Telecommunication networks.Terminal equipment. Switching systems design principles. Analog and digital switching systems. Switching networks design. Control systems on the base of microcontroller's architecture.Signalization principles. Subscriber and network interfaces in digital switching systems. Basics of digital switching systems design. Maintenance of digital switching systems principle.Type of telecommunication services. Integration of telecommunication services on the base of digital systems
-Experiments on telephone equipment and switching systems.

32. Antennas

Code	Credit Hours	LT	TU	LB	Prerequisites
EE306	3	2	2	1	EE202

Fundamentals & definitions of transmitting and receiving antennas and antenna arrays. Dipoles array synthesis and antenna arrays, line sources. Resonant antennas wires and patches: Folded dipole antennas, YagiUda antennas, Helical antennas, Biconical antennas, sleeve antennas. Aperture antennas: Rectangular and circular apertures, Reflector antennas. Feeding networks for wire antennas, Arrays and reflectors. Microwave propagation: atmospheric effects, ground effects, plasma effects**.**

33. Communication Networks

Code	Credit Hours	LT	TU	LB	Prerequisites
EE307	2	2	1	-	EE106

Telephone networks design principles. Synchronization and Signalization plans. Data communication networks design principles. ISDN, B-ISDN.Network interconnection units.Internet networks.
Methods of analysis and synthesis of telecommunication networks. Telecommunication networks maintenance principles.
Message and package switching; construction principles of circuit and package switching systems.

34. Mobile Communications

Code	Credit Hours	LT	TU	LB	Prerequisites
EE308	3	2	2	-	EE214

Limitation of convolution mobile systems. First generation of mobile system is introduced (AMPS). GSM as a second generation is introduced including GSM system architecture, function of data bases, GSM security model handover techniques, and Location Management techniques. Multiples access schemes GSM Radio interface, GSM call sequence procedure, GSM Signal processing system model, GSM cell Geometry structure, channel management techniques, GSM coverage planning.

35. TELETRAPHIC ENGINEERING

Code	Credit Hours	LT	TU	LB	Prerequisites
EE309	3	2	2	-	EE106

Fundamentals of teletraphic theory;Models and methods of traffic engineering.Concept of traffic and grade of service.Time interval Distributions. Arrival processes. The Poisson processes. Erlang's loss system and B-formula.Loss systems with full accessibility. Overflow theory. Multi-dimensional loss systems.Dimensioning of telecommunication systems. Delay systems. Applied queuing theory.Networks of queues.Traffic measurements.

36. COMMON SIGNALIZATION SYSTEM

Code	Credit Hours	LT	TU	LB	Prerequisites
EE311	3	2	2	-	EE214

Systems of numeration, signaling and synchronization on communication networks; modem methods of digital signal treatment, microprocessor equipment of signal forming and treatment. Basics of CSS7. Open System Interconnection (OSI) model. Message transfer part (MPT). ISUP.SCCP.TCAP.MAP.MUP.HUP.INAP.OMAP.EL Information technologies for telecommunication networks Basics of computer networks design.Discrete message transfer. Local area networks LAN (on the physical and channel level). Network level. WAN. Methods analysis and control of networks. Economics for telecommunication industry

37. MICROPROCESSOR ENGINEERING FOR SWITCHING SYSTEMS

Code	Credit Hours	LT	TU	LB	Prerequisites
EE401	3	2	2	-	EE305

Control complexes for switching units: basic requirements, trends of development, architecture; input-output system organization: program control, channels of direct access to memory; interfaces, interfacing equipment; multiprocessor systems: architecture, interconnection, software: operation software of real time, software language of high level CHILL Power supply and security in the telecommunication networks.

38. MICROWAVE ENGINEERING

Code	Credit Hours	LT	TU	LB	Prerequisites

EE402	3	2	2	1	EE202

Transmission Line Theory, Transmission lines and waveguides, Microwave Network Analysis, Impedance Matching and Tuning, Microwave Resonators, Power Dividers and Directional Couplers, Microwave Filters, Active Microwave Circuits, Design of Microwave Amplifiers and Oscillators, Microwave Systems.

39. Optical Communication Systems

Code	Credit Hours	LT	TU	LB	Prerequisites
EE403	3	2	2	1	BS106/EE201

Theory of optical waveguides, step- and graded-index fiber, attenuation and dispersion, fiber preparation, measurement of fiber properties, sources (LED and lasers), detectors, transmitter and receiver design, modulation and multiplexing

40. Information Technology for Telecommunication Networks

Code	Credit Hours	LT	TU	LB	Prerequisites
EE405	3	2	2	-	EE307

Design and analysis of computer networks. Basic concepts: background and architecture of the Internet; five-layer and seven-layer reference models; distributed computing; networked multimedia systems; public-key cryptography and digital certificates; flow control; local networks; transport protocols; congestion control; scheduling; multicast routing. Lab fee.Spring.

41. Power Transmission Systems

Code	Credit Hours	LT	TU	LB	Prerequisites
EE407	2	2	1	-	EE104

The electrical power system, the basic power circuit, percent and per unit quantities, circuit constants, assemblies and power system components, power limits and stability, faults on power systems, circuit-interrupting devices, system instrumentation, relays and relay systems, electrical insulation, grounding, power distribution.

42. Acoustics

Code	Credit Hours	LT	TU	LB	Prerequisites
EE440	3	2	2	-	-

Sound propagation in space, sound diffraction.Sound localization. Electroacoustic transducers, Middle ear, Sound in tubes, Inner ear, Perception of sound and learning loss, Speech sound production, Audit systems.

43. Radar Engineering

Code	Credit Hours	LT	TU	LB	Prerequisites
EE441	3	2	2	-	-

Principles of radar- Detection of objects- Panometric indicator- System duplexer- Limitation of radar performance- Gain directive of radar. Fluctuation of echo for an object- Probability of object detection- Noise in echo- Techniques for increasing the probability of detection- Effect of reflection- Radar protection against jamming- Methods anti-jamming. Three dimensions radar- Radar antennas oscillators and amplifiers of radar- Magnetrons.

44. Communication Network Planning

Code	Credit Hours	LT	TU	LB	Prerequisites
EE442	3	2	2	-	-

SDH fundamentals, ATM fundamentals, ISDN concept and protocol layers 1, 2 and 3, XDSL subscriber access, signaling system number 7, intelligent network concept. Recent developments in broadband systems.

45. Computer Architecture and Programming

Code	Credit Hours	LT	TU	LB	Prerequisites
EE443	3	2	2	-	-

-Processors: The variety of processors and computational engines. Processor types and instruction sets. Operand addressing and instruction representation. CPUs: Microcode, Protection, and processor modes. Assembly languages and programming paradigm.

-Memories: Memory and storage. Physical memory and physical addressing.Virtual memory technologies and virtual addressing. Caches

-I/O: Input/output concepts and terminology. Buses and bus architectures. Programmed and interrupt driven I/O. a programmer's view of devices.

46. Digital Image Processing

Code	Credit Hours	LT	TU	LB	Prerequisites
EE444	3	2	2	-	-

Meaning of digital image processing- Digital image fundamentals- Image enhancement in the special domain- Grey level- Histogram processing- Image enhancement in the frequency domain- Domain filters (Smoothing, Sharpening and homomorphic) – Image restoration- Color Image Processing – color segmentation and slicing.Noise in color image – Image compression- Image Segmentation.

47. Advanced Communication Systems

Code	Credit Hours	LT	TU	LB	Prerequisites
EE445	3	2	2	-	-

CDMA2000, UMTS12, UMTS 16, WI-FI, WI-MAX, 3.5 G, 3.75 G, 4 G

48. Senior Seminar

Code	Credit Hours	LT	TU	LB	Prerequisites
EE490	2	1	2	-	120CR.HR

Selected topics of interest to the faculty will be used to introduce students to engineering science.

49. GRADUATION PROJECT

Code	Credit Hours	LT	TU	LB	Prerequisites
EE499	6	4	2	4	130CR.HR

The student introduces a complete study and constructs a project determined through his department applying the basics of sciences that he studied – The student presents a report containing the rules and calculations that he made in his project.