Data structure and Algorithms (2	Algorithm and complexity, Linear list (stack, queue and linked list), Tree structure, sorting and search algorithms
C/C++ programing (2)	C/C++ program structure, functions and operators, array, pointer, class and object; object-oriented programming, data structure (Stack, Queue, Linked List, Tree), Search and sorting algorithm
Software Engineering (2)	Introduction to basic knowledge of software engineering, fundamental software development methodologies, and fundamental phases in development of a software product. Overview of project management. To explore each phase in software development such as requirement discovery, analysis and design.
Electronic Devices (3)	Introduction to fundamentals of construction, principles, characteristics and parameters of electronic devices which consists of semiconductor diodes, bipolar junction transistor, field effect transistor, analog integrated circuits, digital integrated circuit, photo-electronic devices and it's applications
Circuit Theory (3)	Kirchhoff's laws, resistive circuits, equivalent circuits using Thevenin-Norton theories, nodal method, loop method, sinusoidal analysis, phasors, Circuit analysis via Laplace transform, transient analysis, poles and zeros of network functions, two-port networks.
Analog Electronics (3)	Diode application, BJT/FET small signal amplifier, Coupling, Frequency response, Feedback, Power Amplifier, Operational Amplifier and its application, Tutorial of Design and Implementation of electronic ciruits.
Digital Electronics (3)	- General concept: counting and representation systems, Boolean algebra, basic logic gates, manufacturing technology (TTL, CMOS, ...) - Design of combinational logic circuit: Cover Karnaugh, Quine McClusky, hazard, basic circuits (encoder, decoder, ALU, MUX, DEMUX, Adder ...) - Sequential logic circuit design: flip-flop types, FSM (finite state machine Moore, Mealy), implement FSM by FF, basic circuits (translation register, counter, queue ...) - Design using CAD: programmable microchips (PAL, PLA, CPLD, FPGA), VHDL hardware simulation language (or Verilog)
Analog Electronics 2 (2)	- Nonlinear function circuits using Operational Amplifier (OPAM) - DC supply circuits - Harmonic oscillation circuits - Amplitude (AM), Frequency (FM) and Phase (PM) modulation circuits - Amplitude, frequency and phase demodulation circuits - Frequency conversion and Phase Lock Loop (PLL) circuits - Analog/Digital (A/D) and Digital/Analog (D/A) conversion circuits

Digital System Design and Synthetic (2)	Process of designing digital ICs using HDL Verilog hardware description language. - Test digital IC function - Describe combinational logic circuit, sequencial logic circuit by Verilog. Digital circuit design by using FSMD and ASMD methods. Synthesize digital circuits from HDL language into logic gates. Analyzing speed and time of digital circuits. Optimizing digital circuits. Exercise of digital circuit design
VLSI Design (3)	- Introduction to IC design:review of fabrication technology. - Design method: use computer help, basic element fabrication, library creation ... - Basic circuits: NOT, NAND, NOR, ADDER, .v.v., Mirror circuit, differential circuit, amplifier circuit, comparator circuit. - Design software: introduce Cadence, Verilog, HSPICE. - Digital IC design: introduction. - Analog IC design: introduction - A project of a digital or analog IC design.
Analog IC design (2)	Aiming to provide knowledge about analysis, simulation and design of analog CMOS ICs: - Describe MOS and BJT active component models - Describe some attention in the layout -The basic circuit: line mirror, differential amplifier, current source and simple voltage source -Analysis and design of simple current and voltage source circuits -Bandgap circuit -Compare line -Circuit sampling and keeping -Analysis of differential amplifier circuit design -The basic IC models: source IC, ADC, DAC, .. -Project: analyzing an analog IC design
Embedded System Design (3)	Concept of embedded system, microprocessor used in embedded system, memory used in embedded system, peripheral device and peripheral device connection, real-time operating system
Power Electronics (2)	Power electronic components; DC-DC, DC-AC, AC-DC power conversion circuit. Circuit model using DC-DC transformer, charge balance on the capacitor, on the coil; Calculation of approximations for small voltages and currents. Continuous / intermittent operation mode. Circuit model, circuit performance with non-ideal components
Computer Architecture (2)	This course introduces to students the history of computer technologies and basic modules in a computer systems, such as memory ((ROM, PROM, EPROM, Flash, EEPROM, FeRAM, SRAM, SBSRAM, DRAM, FPDRAM, EDO DRAM, SDRAM, DDR-SDRAM, RDRAM) and memory organization (cache, virtual memory); microprocessor: pipelining, superscalar, VLIW, vector computer, multithread; peripheral devices: intefaces (RS232, UART, USB, IEEE 1394), buses (ISA, PCI ...), Hard disk (RAID, SCSI), CD, CD-WR, DVD, monitors, printers
Advanced Programing (2)	Advanced Java Programming: -Introduction to Java and Programming Environment - Objects, Classes and fundamental programming - Multithreading and networking - Database Connectivity - Securities .- Android mobile device pprogramming
Object-oriented Analysis & Design (3)	Introduction to design methods, system analysis (waterfall, parallel, rapid application development ...), object-oriented analysis and design, UML, case studies (ATM, digital audio recorder)

Artificial Intelligence and Applications (3) *	AI overview including history, classification and application. Basic machine learning techniques, deep learning based on Python language through practical applications related to machine vision, speech recognition, and natural language processing based on industrial design/research tools such as TensorFlow, Caffe, Torch/ PyTorch runs on CPU / GPU. The AI trend on the circuit is introduced and comparison of the development potential with the traditional method of using the cloud. Circuit technologies from Arduino, Raspberry, Nividia, Intel, Google and Xilinx firms are introduced and examples of designing neural networks, convolutional neural networks, regression neural networks or Internet of Things on embedded devices is the focus of the subject.
Real-time Systems (2)	Basic concepts and requirements for real-time systems, different real-time levels (hard/firm/soft real-time). Algorithms for scheduling real-time tasks, control reception and rejection. The module also mentions architecture and design of commercial real-time operating systems (RTOS) (QNX, VxWorks, .vv) and open code (RTAI/RTLinux) as well as real-time middleware (real-time middleware for embedded systems. Students are introduced to real-time database with synchronization, query and transaction functions. Finally, the module will introduce typical applications of real-time information systems including multimedia, real-time monitoring and control using sensors and actors / actuators, and control systems. in production as well as vehicle engineering.
Distributed Systems (2)	This module presents distributed system architectures, requirements for system design, multi-processor structures, multi-computers, computer networks and layered, object-oriented distributed architectures (objecte- based), data-centered, and event-based. Students are introduced to the information mechanism in the distributed system, calling the remote procedure call, activating the dispersal procedure (remote method invocation), inter-process communication and multipath. The module also mentions logical synchronization in distributed systems, election algorithms and mutual exclusion aside from distributed transactions. Concerning the reliability of the system, students get used to the process error resistance, reliable group communication and error recovery mechanism. Finally, peer-to-peer presentation (p2p) as a distributed application effectively supports data sharing and multimedia streaming with a large number of users.
Advanced Digital Signal Processing (2)	Signal detection and system parameter estimation (signal detection and system parameter estimation [1,2]) and application - Theory of Adaptive Filter Theory [3] and application + Filter least square + Wiener adaptive filter + Kalman filter + Least mean square LMS (Least mean square) algorithm - Method of designing application number filters in real time
Hardware Verification (2)	Techniques and methods for testing digital hardware design. Test hardware based simulation. Check form design. Programming to support design testing. Architecture and operation of the simulator. Testbench. Check, confirm, and test situations Decision graph. Equivalent testing and symbol simulation. Check the model and calculate the symbol.
Computer Vision (2)	The overall design of a computer vision system comes from image acquisition, image analysis, object detection in images and recognizing object meaning through machine learning techniques. This module requires learners to be able to program C ++ or C # and use Matlab software. Teaching methods will be based on problem-based learning (Problem Based Learning), access to the basic content to design computer poetic systems, specifically: 1. Read the image from the 2D color image or the depth image. 2. Convert and upgrade photos to facilitate image separation 3. Separate photos and separate objects of interest 4. Extract selected features 5. Create templates 6. Design pattern recognition system based on machine learning techniques
Wireless Communication System Analysis and Design (2)	Radio communication system; radio standards; SISO and MIMO radio channel models; architecture of radio systems; analyzing calculations and designing linear high-frequency super-elements; analyzing and calculating the design of nonlinear ultra-high frequency elements; linearization techniques; antennas transmitting waves in radio communication systems; analyzing, calculating, designing transmitters, receivers and radio communication routes.
Future Internet (2)*	Architecture and mechanism for quality of service (QoS) guarantees in the Internet: resource reservation, admission control, traffic shaping/policing, scheduling algorithms; IntServ and DiffServ models. - Quality of Experience (QoE); the relationship between network resources and QoE; QoE - QoS mapping and QoE-based resource reservation - Software-Defined Networking (SDN) and its applications in cloud paradigm

Microprocessor (3)	Introduction to microprocessors: function, structure and working principle; instruction set, addressing modes, memory and IO maps. Assembly programming for 80x86 microprocessors. Interfacing with memory and IO devices. Interrupt and interrupt controller; DMA, real-life microprocessors Intel, Motorola GPP, DSP, microcontrollers (AVR, 8051, PIC...)
Electronic Measurement (2)	Introduction of electronic measurement, general principles for electronic measurement of electrical and non-electrical quantities, electrical parameters of measurement, and processing of the measurement results. Different types of measurement errors, processing methods for minimizing errors, the working range and resolution of the measuring equipment, the quality of the measurement devices; Measurement and observation the parameters or characteristics of the electrical signal as well as observation of different figures of signals, the parameters of voltage, current etc.
Signal and System (3)	- Definitions, classifications and operations of signals, systems. - Representation and analysis of LTI systems in time and frequency domains. Fourier series and Fourier transforms of continuous and discrete-time signals and systems. - Laplace transform and Z-transform, and their applications to analyze LTI systems. - Amplitude modulation / demodulation. Signal space and the principles of digital communications.
Information Theory (2)	Basic concepts of information theory, entropy, channel capacity, source coding, channel coding.
Electromagnetic Fields (3)	- The static electric field: Introduction on electrostatic field. Basic properties of the static electric field. - The static magnetic field: Basic laws of conduction current, Ampere's law, basic properties of the static magnetic field. - Time-varying electromagnetic fields: Maxwell equations. Energy of electromagnetic fields. Poynting theorem. Poynting vector. - Plane electromagnetic wave: Properties and propagation of harmonious plane wave, plane wave in perfect dielectric environment, harmonious plane wave in semiconductor and conductor environments, reflection and refraction, skin effect. - High frequency propagation line - directional line. Waveguide, delay line, parallel line, coaxial cable, optical fiber propagation line.
Anten and Propagation (2)	Antenna: review of electromagnetic radiation, the characteristics of a radiation source (antenna) .Introduction to radiation system. The basic techniques to control the characteristics of the radiation system. Present some common antennas (principles, composition, electrical contact, applications) and antenna design methods in order to achieve the requirements. Propagation: Presentation of electromagnetic wave propagation method in space. Calculate the electromagnetic wave energy at the collection point. Study the influence of the ground, the troposphere and the ionosphere on wave propagation. Introducing the computational model of wave propagation

Communication Networks (2)	- Overview: communication network components - Switching methods: circuit switching, packet switching, ATM switching - Communication networks: ISDN, NGN - Signaling: SS7, IN - Design of telecom networks
Microwave Engineering (2)	Introduction: microwave engineering and applications. Microwave transmission line: concept, model, parameters, lossless microwave transmission lined terminated with a load and connected to a source. Impedance matching techniques: narrow-band and wideband impedance matching techniques. Microwave network analysis: ABCD matrix, Z, Y matrix, S matrix, signal flow graph. Microwave circuits, component, modules: active and passive component, filter, cavity, amplifier, LNA...
Mobile Communications (2)	- Overview of mobile cellular systems: 1G, 2G, 2.5G, 3G and 4G; concepts of radio channels (FDD, TDD, channel allocation); radio propagation models (fading, shadowing etc.), HATA and COST 231 model, channel attenuation - GSM system: network architecture and components, frequency reuse, PLMN, VLR/HLR, MSC, LAI. Um radio interface, frame structure. Capacity planning in GSM - 3G systems: UMTS architecture and specifications; concept of spread spectrum in UMTS; Uu radio interface; basic UTRAN-FDD mechanisms: Cell Breathing, noise rise; coverage and capacity planning, power control, TPC and "Near-far" problem, fast closed PC (TPC), handover, mobile originated voice call flow; HSPA/HSDPA - 4G systems: Key features of LTE (OFDM, SC-FDMA, OFDMA, MIMO); LTE architecture; radio network architecture E-UTRAN; EPC core network architecture; LTE network procedures and protocols; structure of 4G physical channels
Satellite Communications (2)	Introduction: system structure, parameters, movement and orbit equations, satellite orbit: LEO, MEO, HEO, GEO budget link, G, EIRP, G/T, etc; satellite station, earth station, modulations, multiple access; satellite systems: geostationary, local or global, mobile, network, VSAT, marine satellite systems, mobile system, positioning system, VINASAT-1 and VINASAT 2
Optical Communications (2)	- Optical devices: Laser, receiver, Diod PIN, APD, DFB, optical fiber amplifier EDFA, optical cable, physical property, signal degradation: attenuation and dispersion, dispersion compensation. - Optical network: Long-haul, Metro, Access (EPON, APON). Components in optical network: OLT, ONU, ADM, OXC, DCS .v.v. PDH, SONET and SDH. Optical switch, MEMS. WDM, IPoWDM, SDL Technology. Optical nano structures: filter, dispersion compensator,..Design of a optical communication system.
Telecommunication Network Planning and Management (2)	- Overview - Topology design and planning in telecommunication networks: problems and constraints in topology design; access network design: criteria and methods; algorithms of designing access networks in tree configuation (Krukal, Esau-William etc.); back-bone network design: minimum spanning tree and Prim algorithm; shortest path tree and Dijkstra; - Teletraffic and its impact in network design and planning: voice traffic and Erlang formulas for voice traffic; traffic model, traffic matrix and their role in network design and planning - Telecommunication network management: problem specification; network monitor and control; network management platforms: TMN, SNMP, CORBA - Management of Internet and NGN: SNMP; ASN.1 & BER; SNMP SMI; SNMP MIB Objects; CASE & MIB-II diagram; MG-Soft MIB Compiler & Browser; RMON & RMON2; SNMPv2; Net-SNMP; SNMPv3

Time-Space Signal Processing (2)	Singnal processing in time and frequency domains: channel properties in time and frequency domain, model of MIMO antennas at transmitter and receiver; MIMO channel model, basic space and time coding schema (Alamouti's STBC encoding and decoding scheme). The combination of MIMO technology with smart antenna techniques and OFDM. Deployment of space - time signal processing in advanced communication systems.
Cloud and Edge Computing (2)	Service model and business model of cloud computing services (SaaS, IaaS, PaaS) - Infrastructure of cloud computing: data center architecture - Virtualization concept in edge and cloud computing; concepts of host virtualization : hypervisor and virtual machine; container; common virtual machine and container management platforms; - Concept of network function virtualization; SDN deployment for network virtualization in cloud computing and edge computing; - The cloud computing platforms: OpenStack. Etc.
System Modelling and Numerical Simulation Methods (2) *	Part I introduces transmission channel modeling methods (filter usage method, Rice method and Monte carlo method), network traffic and load model, signal transceiver system. Part II introduces the simulation and analysis of digital systems through computers: signal discrete, signal design and optimization methods, modulation and coding using computers, methods simulating probability processes. Methods for evaluating the quality of simulation systems through bit error functions, mean square error function, signal delay, etc. Methods for assessing and minimizing digital system complexity before testing design in practice.
Network Security (2)	Identify threats in network environments: viruses, malware, DDoS, man-in-the-middle, worms, etc. - Assess the risks and security vulnerabilities: network services, source codes, ports etc. - Fundamentals of cryptography: encryption/decryption schemes and algorithms - Authorization, authentication and accoungting (AAA): mechanisms and architecture - Security protocols: IPSec, TLS, SSL. - Network security components and systems: Firewall, IPS, IDS
Advanced Information Theory and Channel Coding (2)	Determination of Bayer theorem conditions (Conditional probability with Bayes' Theorem) - Symmetric binary channel model (Binary symmetric channel) [1] - Removable discrete channel model (discrete memoryless channel) [2] - Calculation of channel capacity with noise [3] - Theory of information loss (rate distortion theory) [4] Advanced channel encoding: - Viterbi encoder and soft-coding algorithm (Viterbi algorithm soft output (SOVA)) - Turbo encoding and decoding - Galois field (Galois field) - LDPC (low-density parity-check codes) codes and applications - Code BCH and application - Reed-Solomon code and application
Microwave Circuit Design (2)	Principle of ultra-high frequency: transmission models, parameters of network analysis, impedance coordination techniques, basic technical parameters and evaluation methods - Introduction and application of ADS (Advanced Design System) super high frequency simulation software - Design of passive ultra-high frequency elements: low-pass filter - high throughput - band gap - strip barrier, power divider, micro strip antenna, ... - Positive super high frequency elements design: LNA low noise amplification, power amplifier, frequency multiplication, frequency mixing, modulation / demodulation, ... - Manufacturing test and testing designs

Digital Communications (3)	- Introduction to digital communications: basic blocks of didital transceivers and receivers - A/D and D/A conversion: sampling, quatization, PCM and their factors on signal quality. - Base-band digital signal transmission: channel system modeling, baseband signal modeling - Impact of noise/distortion/attenuation on the signal, Nyquist criteria, pulse shaping and Nyquist channel filtering , raised-cosine filter, matched filter - Channel coding, line coding - Digital modulation: ASK, FSK, QPSK, QAM, I/Q modulation, multilevel modulation. - Multiplexing and multiple access: FDM, TDM, CDM vs. FDMA, TDMA,
Digital Signal Processing (3)	Introduction of signal and discrete system, Fourier transform and Discrete Fourier transform, FFT algorithms and implementiations on hardware, FIR and IIR filter and systhesis method, applications of digital signal processing in image/sound signal processing
Operating Systems (3)	Overview of an operating system: components of operating systems, single-task operating systems, multi-task OSs, real-time OSs. - The concept of process - management, coordination, process synchronization. - Concept of deadlock, conditions of congestion occurrence - resource management and anti-congestion. - Memory management: organization, memory hierarchy. paging, segment. Virtual memory management. - file management, in / out management, external memory management. - Operating system security. - Several typical operating systems: WINDOWS, DOS, LINUX.
Computer Networks (3)	- Overview: OSI model vs. TCP/IP model. Classification of networks: LAN, MAN, WAN – bus, star, ring, meshed - Local area networks: performance evaluation of MAC schemes: roll call/hub polling, token ring, token bus, ALOHA, CSMA/CD/CA; layer-2 protocols: LLC, HDLC, SDLC, SLIP/PPP. - Layer-2 internetworking: layer-2 addressing (MAC), learning bridge, spanning tree, source routing bridge; IEEE 802.1d - Layer-3 internetworking: IP, layer-3 addressing, sub-netting and supernetting, ARP, NAT, DNS, DHCP. Control protocol: ICMP. Autonomous system. Routing protocols: distance vector routing, link-state routing, path routing. RIP, OSPF, BGP; forwarding table and routing table, table lookup algorithms. VPN and its applications. - UDP and TCP: TCP/UDP packet headers, TCP state machine, TCP flow and congestion control, retransmission/fast retransmission. Random Early Discard (RED). Problems when transmitting TCP over wireless networks.
Cryptography (3)	The module presents symmetric key encryption method, public key encryption method, cryptographic, cryptosystem and pseudo-random sequence generation problem, Elgamal digital signature scheme and standard ECDSA digital signature, complexity processing and data complexity of a specific attack on the cryptosystem; security features of encryption methods, linear cryptanalysis, differential cryptanalysis and security code building problems for applications.
Fundamentals of Data Communications (3)	- Queuing theory and teletraffic: M/M/1, M/M/N, M/G/1, M/D/1. Queue networks. Reservation systems; Priority queues; - Introduction to graph theory. Routing: flooding, random walk, hot potatoes; source routing and minimal spanning tree; shorstest-path routing with Dijktra and Bellman algorithms. - Flow and congestion control: concept of fairness, window-based flow control, rate-based flow control - Simulation techniques: discrete-event simulation, generating random numbers, analysis of statistic outcomes; simulation tools.
Telecommunication Systems (3)	Introduction: analog and digital sources, overview of telecommunication systems. LOS microwave communication systems: concept, system architecture, propagation, link budget design. Satellite communication systems: concept, fundamental knowledge, system architecture, link budget, application of satellites. Mobile communication systems: cell concept, frequency reuse, standards, GSM architecture and applications, WCDMA and LTE, LTE-A. Optical fiber communication systems: concept, physical phenomenon of light in optical fiber, light emitting devices, photodiode, system, new technologies, link budget design. High frequency communication systems: concept, wave propagation, system architecture.

Avionics Communication Networks (2)	Introduction to the ACN: system architecture, standards, applications. This course provides students with basic knowledge on ATM, ATC and services in Vietnam
Global Navigation Sattellite Systems (3)	The basic principles of satellite navigation. Properties of GPS satellite signals, data acquisition, correction and demodulation. Interference, multi-path and flashing phenomena. Differential GPS, built-in GPS with network and other supporting devices. Galileo and other satellite navigation systems.
Remote Sensing and GIS (3)	Introduction of basic concepts of remote sensing, remote sensing systems and geographic information systems (GIS). Using electromagnetic radiation in remote sensing, structure of remote sensing systems, remote sensing satellites, overview of remote sensing data. Remote sensing image interpretation and analysis with a focus on visual expression and image processing techniques. Image surveying, a technique used to determine the geometric characteristics of objects through aerial photographs or satellite images and its application in building map. Geographic information system (GIS) including system structure, format and data structure, processing and combining geographic information data.
Navigation and Airline Management (2)	Introduction to navigation: navigation methods, navigation systems used in aeronautics. Concepts of air traffic management, air traffic control, traffic congestion management, departure / arrival management, flight information, flight information region, control of take-off, landing and en-route regions, airspace access and management.
Digital Image Processing (3)	This course provides students with fundamentals of DIP and frequently used DIP algorithms such as: image transform, image enhancement, edge detection, segmentation ... Students are guided to use MATLAB and programming languages (C/C++/C#) to implement the studied DIP algorithms and develop related applications.
Sound Signal Processing (3)	Introduce of sound processing techniques, advanced voice compression and audio compression standards. Basic properties of sound. Voice coding methods (waveform encoding, parameter encoding, hybrid coding). Voice coding standards and applications (G.711, G.721, G.726, G.728 ...). Sound coding methods in frequency domain. Advanced audio compression standards (MPEG1 Audio, MPEG2 Audio, MPEG2 AAC, Dolby AC-3, MPEG4 Audio).
Multimedia Systems (2)	- Multimedia protocols: RTP / RTCP, RTSP, and HTTP streaming; - Multimedia session control protocol: SIP, H323, SDP; - Methods of distributing multimedia contents: Client-server, CDN, P2P, Edge / Cloud-based; - Multimedia cloud computing; - Large data multimedia systems and multimedia data analysis; - Multimedia application systems: internet TV, video-on-demand, livestreaming, video conference, multimedia social networks

Radio Communications (3)	This course focuses on physical layer and MAC layer for radio communications: - Radio system, structure of radio system: the structure of receiver and transceiver - Theory of radio channels: multi-path diversity transmission model, Doppler Effect, channel model depending on frequency and time, pathloss model, mathematic model of radio channel, radio channel simulation methods. basic knowledge on radio communications including: - Theory of radio channel propagation - Types of interference in radio communications, channel equalization methods, noise reduction - Radio channel capacity - Receiver structure - Common modulation methods for radio communications - IEEE and ETSI standards for radio communications
Data & Telegram Transmission (3)	This course provides students knowledge about basic of data communications and their applications in aeronautical area. Features and requirements of data communications, network architecture, data communication technologies, aeronautical data communication and message switching and data link application G/G and A/G.
Localization & Electronic Navigation (3)	Introduction to the radar system: system architecture, operation and applications in Air Traffic Management; Sonar and applications; GNSS and Location based services.
Multimedia (2)	Introduction to fundamentals of compression: Entropy, RLC, VLC, Huffman. Video and audio compression standards: MPEG-1, MPEG-2, MPEG-4, MPEG-7 Video, H.263, H.264; MPEG-1, MPEG-2 Audio, JPEG), Model-based Video Coding (MBVC). Digital Media: CDR, CDRW, DVD, Digital Camera, Video Camera, WebCam. Media Content Creation and Publishing. Multimedia networks: VoIP, SIP, RTP, RTCP, RTSP, H.323.
Television (2)	Theory of light and color, RGB, YUV, .v.v.Principle of analysis and synthesis of television images. Image signal form, sync signal, vertical/horizontal scan, sound, color signal, dazzling signal, etc. Principle of color television: PAL, NTSC, SECAM color television systems. Principles and diagrams of color TV blocks. Types of color recording tubes. Video transmitter. TV studio, television techniques. CATV TV, TH satellite. Digital television systems: DVB-T, DVB-C, DVB-S, MMDS. Introduction to digital modulation in television: QAM, COFDM. Digital Set-Top-Box

Computer Graphics (2)	Basics of color, luminance, scanning, image, pattern, texture (texture), graphic effect (effect); - Foundations of graphic mathematics and graphic geometry transformation; - Modeling and 3D graphics: conversion, presentation and interaction; - Graphic animations; - Graphic libraries: OpenGL, WebGL, HTML5, DirectX, WPF; - Graphics hardware: GPU, graphics card; - Application of graphics: games, animation, design, 3D planning.
Virtual Reality and Enforcement Reality (2)	Basics: real-time simulations, 3I principles (Interaction, Immersion, Imagination), Tracking, Mapping; - VR / AR / MR system structure: input (mouse, keyboard, sensor, HMD, etc.), output (vibrator, audio, haptic / force feedback devices, texture, etc.), UI; - Interaction in VR / AR / MR (Selection, Manipulation, Isomorphic / non-isomorphic, Exocentric / egocentric interactions) and methods of execution (distant / direct interaction, Physical / virtual controls, Gesture interactions, Function to emotions) - Navigation technique (Navigation): Physical locomotion, Target based techniques, Steering; - Interface MR: Menu directions, Haptic control panel; - Tool to develop VR / AR / MR application system: Apple ARKit, Google ARCore, MS HoloLens.
Multimedia Production (2)	Process of multimedia content production; - Methods and tools for creating and compiling hypermedia authoring content; - Environmental programming development (Adobe, HyperPublish Pro, MatchWare Mediator) multimedia content; - Media mark-up language; - Multimedia database, multimedia content storage and search; - Digital rights management (DRM) control; - Techniques and systems videography and cinematography.