ELECTRICAL SYSTEM
(2018 - 2019 academic year)

1st year of study – 1st semester (autumn)

Mathematical Analysis– Alexandru BICA

1. Differential calculus on the real axis: the first order derivative, mean value theorems, finding extrema and optimization problems
2. Taylor's formula and applications
3. The space Rn: structure, scalar product, norm, open sets, neighbourhood of a point. Vectors in R2 and R3 : operations, vectorial product
4. Continuous functions on Rn. First order partial derivatives, the differential of first order
5. Gradient vector of a scalar field, the directional derivative. Vectorial fields: divergence and rotor
6. The Jacobi matrix. Partial derivatives of composite functions
7. Second order and high order partial derivatives. The Hesse matrix and the differential of second order. Taylor's formula in Rn
8. Finding local (relative) extrema for functions of several variables. Extrema with restrictions
9. Improper integrals. Parameter dependent integrals
10. The length of a curve in R2 and R3. First kind line integrals (the line integral along piecewise smooth curve of a scalar field)
11. Second kind line integrals (line integrals of vector fields). Path independence
12. Double integrals: the double integral over a normal domain, change of variables (polar coordinates), the area of a set from R2, Green's theorem
13. Triple integrals: the triple integral over a normal domain, change of variables (spherical coordinates, cylindrical coordinates), volumes and gravity center, moments of inertia
14. The area of a surface. Surface integrals of scalar fields
15. Orientable surfaces. Surface integral of vector fields
16. The Gauss-Ostrogradski divergence theorem. The Stokes' theorem

Linear algebra, analytical and differential geometry - Dorina FECHETE

1. Preliminaries (sets, relations, functions, algebraic structures, matrices, determinants, systems of linear equations)
2. Vector spaces. Properties and examples
3. Basis and dimension of a vector space
4. Change of basis of a vector space
5. Subspaces
6. Linear transformations. Definitions and properties
7. Matrix of a linear transformation
8. Eigenvalues and eigenvectors; Matrix diagonalizations
9. Bilinear forms and quadratic forms
10. Inner-products, norms and metrics
11. Euclidean vectors
12. Analytic geometry
    • Equations and curves
    • Lines and planes
    • Conic sections
    • Quadric surfaces
13. Differential geometry of curves and surfaces

Introduction to computer engineering and programming - Ioan HATHAZI

1. Basic hardware, software and IT concepts. Differentiation between different types of computers: server, minicomputer, computer network, personal computer and laptop according to capacity, speed, cost, typical users. Understanding Terminal Notions.
2. Knowledge of the main parts of your personal computer: CPU, hard drive, input / output

devices, memory types, data carriers such as diskettes, zip, CD-ROMs, etc. Understanding the term peripheral mechanisms.

3.   Getting started with computer operation and using Windows.
4.   Acquiring spreadsheet skills using Microsoft Excel.
5.   Word processing by using Microsoft Word.
6.   Realization of presentations by using PowerPoint.
7.   The Internet concept, what is a search engine? understanding the differences between the Internet and the World Wide Web (www).
8.   Security, Copyright, and the Law.
9.   Computer Viruses. The understanding the term virus used in the computer domain. How the viruses get into the computer system. Knowledge of anti-virus measures.
10. Understanding the copyright notions and the main legal and security issues related to copying. Know the implications of transferring files over the network. Understanding the terms of shareware, freeware and user license.
11. Algorithms. C ++ programming environment. Structure of a source program in C language.

Physics - Florin BEIUŞEANU

1. Elements of mechanics.
   1.1 Kinematics of the material point.
   1.2. Fundamentals laws of motion of the material point.
   1.3. Mechanical work. The mechanical energy. Mechanical strength.
   1.4. Theorem of kinetic energy variation. Mechanical energy conservation law.
   1.5. Cases of the motion of the material point.
   1.6. The motion in a uniform force field.
   1.7. The motion in a uniform force field in the resistive medium.
   1.8. The motion in a conservative field of elastic forces. Simple harmonic motion.
   1.9. Amortized harmonic motion.
   1.10 Maintained harmonic motion.
   1.11 Composition of harmonic oscillations.
   1.12. The propagation of oscillations in the elastic medium.
   1.13. Elastic waves. Wave equation. Wave energy. The equation of wave propagation.
   1.14. Wave propagation in solid materials

2. Fundamentals of thermodynamics.
   2.1. General notions.
   2.2. The general law of thermodynamics.
   2.3. The first law of thermodynamics.
   2.4. Applications.
   2.5. The adiabatic transformation
   2.6. Second law of thermodynamics.
   2.7. Calculation of Carnot efficiency.
   2.8. Entropia.
   2.9. Third law of thermodynamics.

3. Fundamentals of electrostatics.
   3.1. The electrical field.
   3.2. The electrical charge.
   3.3. The electrical flow. Gauss's law.
   3.4. The electrical dipole.
   3.5. Fundamentals of electricity.
   3.6. Ohm's Law.
   3.7. The electrical Conductivity

4. Fundamentals of magnetostatics.
   4.1. The magnetic field.
   4.2. The magnetic force.
   4.3. Electrodynamic force.

4.4. Biot-Savart law.
4.5. Magnetic circuit law.
4.6. Magnetic flux.
4.7. Gauss's law.
4.8. Magnetic dipole.
4.9. Magnetic dipoles of the atoms
5. Fundamentals of electromagnetism.
5.1. The laws of electromagnetism.
5.2. Maxwell's equations
6. Magnetic properties of mater
6.1. The susceptibility and magnetic permittivity.
6.2. Diamagnetic substances.
6.3. Paramagnetic substances.
6.4. Ferromagnetic substances.
7. Fundamentals of optics
7.1. The fundamental laws of geometrical optics
7.2. The laws of reflection.
7.3. The laws of refraction
7.4. Total reflection.
7.5. Flat mirror.
7.6. Spherical mirrors.
7.7. Blade with parallel plane sides.
7.8. Optical prism, Lenses, Spherical diopter

Computer-Assisted Graphics I - Maria DURGĂU

1. Presentation of the AutoCAD operating mode. The AutoCAD User Interface. Launching orders. Data input. Selecting objects. Display Control. Establishing the drawing environment. End of work session.
2. Use basic commands for drawing, editing, and specifying entity-specific points. Draw commands for base entities. Commands used to modify and edit drawings. Using Object Snap Modes (Object SNAP). Selection sets.
3. 3.Using the UCS coordinate system in plane drawing (2D). Orders for making connections and bevels. Orders that allow copying, moving, scaling, and splitting entities.
4. General rules for the execution of the technical drawings Lines used in the technical drawing. Formats of technical drawings. Indicator. Numerical scales used in the technical drawing. Standardized writing. Representations used in industrial design: Representation in double and triple orthogonal point projection.
5. Orthogonal representation of the straight. Double Orthogonal Projection of the Straight. Triple Orthogonal Projection of Straight.
6. Rules for the representation and marking of views and sections. Layout of the projections in the plan. Classification of views. Section representation of parts. Classification of sections. Notation of section sectioning path.
7. Use of commands for quoting drawings. Rules and quotation rules. Elements of quote. Symbols used for enrolling quotas. Quoting specific elements. Classification of allowances. Quoting methods.
8. Quoting drawings with AutoCAD. Configuring Query Elements. Print text. Text style. Text input
9. Viewing a drawing. Hatching and representing breaks. Study some drawing display commands. Hatching. Hatch styles. Representation of ruptures.
10. Using Layers. Layer Definition. Create and modify layers. Determining the color and layer type of layers. Define blocks. Studying commands for creating and inserting blocks into AutoCAD.
11. Elements of 3D Modeling and Visualization. Introduction to 3D modeling. Types of three-dimensional models. Superficial models. Coordinate systems in 3D. Creating surfaces. Modeling solids. Generating Solids. Editing Solid Objects. Quoting in 3D
12. Presentation of the OrCAD Capture program. Present the steps required to create the electrical

schemes using the OrCAD Capture program.

Chemistry - Claudia MORGOVAN

1. Notions about the atom.
2. Electrical conductors.
3. Transport of electricity through interfaces and electrolyte solutions.
4. Balances at electrically charged interfaces. Potentials of the electrodes.
5. Galvanic elements.
6. Corrosion and protection against corrosion.
7. Applications of electrochemistry. Electrochemical energy sources.

Elements of mechanical engineering - Titus DELIMAN

1. Fundamental concepts of vectorial computation, basic elements.
2. Definition of triorthogonal reference systems and particular systems.
3. Elements of the kinematics of the material point.
4. Study of radar operating principle reported on position vector properties, assistant software requirements.
5. Analysis of the movement of the crank mechanism, setting the harmonics of the movement of the piston-slide.
6. The Phasors of the Movement.
7. Homogeneous transformation between reference systems. Applications.
8. Elements of relative movement.-Absolute and relative derivative of a mobile vector.
9. Study of relative movement in general case.
10. The technical effects of Coriolis acceleration and its implications for moving the material point.

Technological methods and procedures - Livia BANDICI

1.Getting started with technological methods and processes
    1.1. Production process;
    1.2.Technological flow;
    1.3.Quality technical control
2. Material properties
    2.1. Properties of materials and tests;
    2.2. Physical properties;
    2.3. Electrical properties;
    2.4. Magnetic properties;
    2.5. Mechanical properties and tests;
    2.6. Chemical properties;
    2.7. Electrical properties of insulating materials
3. Materials used in industry
    3.1. Materials used in machine building;
    3.2. Metals and alloys used in electrical engineering;
    3.3. Electrical insulating materials used in electrical engineering
4. Methods and processes of cold machining
    4.1. Methods and processes for splitting machining;
    4.2. Methods and processes for processing materials by cutting and cold plastic deformation;
    4.3. Unconventional technologies.
5. Innovative technologies in material processing
    5.1. Plasma cutting technology;
    5.2 Friction rotation with rotating element;
    5.3. 2D and 3D Laser Testing;
    5.4. Non-destructive processing of materials;
    5.5. Laser processing by shock;
    5.6. Innovative pressing processing
6. Corrosion and corrosion protection of metals and alloys
    6.1 Corrosion of metals;
    6.1.2. Chemical corrosion;

6.1.3. Electrochemical corrosion;

6.2. Corrosion protection of metals and alloys.

Modern languages I – Simona ABRUDAN CACIORA

1. Introductory Seminar. English language assessment test.
2. What is Engineering? Reading; Vocabulary and conversation exercises.
3. The Plural of Nouns: Revision and Exercises.
4. Engineers - Education and Specializations. Reading, introducing new phrases, applicative exercises.
5. Adjectives – Degrees of Comparison (Revision exercises).
6. Engineering Design. Technical Drawing in Engineering. Types of Views Used in Engineering Drawing. Listening and conversation exercises.
7. Present Tense Simple and Present Tense Continuous. Revision and exercises.
8. Computer-Aided Design and Drawing. Reading, introducing new phrases, applicative exercises.
9. The Past Tense Simple and The Past Tense Continuous.
10. Engineering Materials. Types of Materials and Properties of Materials Used in Engineering. Listening and vocabulary exercises.
11. The Present Perfect Tense Simple: The Present Perfect Tense Continuous. (Revision and exercises)
12. Processes Applied to Engineering Materials. Forming Materials into Shapes. Reading and conversation.
13. The Past Perfect Tense Simple and The Past Perfect Tense Constinuous. (Revision and Exercises)
14. Basic Concepts Related to Electrical Engineering: The Electric Field, The Magnetic Field, Electrostatics, Electrokinetics.

Physical Education and Sport I -

1st year of study – 2nd semester (spring)

Special mathematics - Dorina FECHETE

1. First-order ordinary differential equations
   - Generalities
   - Separable equations
   - Euler homogeneous equations
   - Linear differential equations
   - Existence and uniqueness of solutions
   - Numerical methods for ordinary differential equations
2. Higher order differential equations
   - Generalities
   - Reduction of order
   - n-th order linear differential equations
   - n-th order linear differential equation with constant coefficients
3. Systems of linear differential equations
   - General properties
   - Solution formulas
4. Differential operators
5. Fourier series
6. Fourier transform
7. Laplace transform

Computer programming and programming languages – Mirela PATER

1. Structures of C++ programs – labels, constants, types, variables
2. C++ data types and operators
3. C++ instructions (read, write, if, switch, while, do while, for)
4. Arrays in C++ (vectors, matrices)
5. Strings in C++
6. Structures in C++

7.   Text files in C++

Computer-Assisted Graphics II - Radu SEBEŞAN

1. Introductory computer-aided graphics
      1.1. Integration of CAE-CAD-CAM components
      1.2. CAD software package categories
      1.3. CAD Resources for Internet
      1.4. Manufacturers and CAD software
2. The graphic elements in the realization of electrical and electronic projects with the help of the computer
      2.1. Automatic Electronic Design (EDA)
      2.2. Electronic Documentation
      2.3. Conventional signs used in electrical and electronic diagrams
3. Basic rules in the representation of electrical and electronic diagram on computer.
      3.1. Conditions imposed on control systems
      3.2. System flexibility and order convenience
4. Electrical diagrams. Computer-aided graphic representation methods
      4.1. Electrical diagrams
      4.1.1.Explicatives (functional, circuit, equivalent)
      4.1.2. Connection (external, internal, terminals)
      4.1.3. Location
5. Presentation of the OrCAD program
      5.1. Overview of the OrCAD software package
      5.1.1. OrCAD Capture
      5.1.2. OrCAD Layout
6.Creating the OrCAD Capture PC Board Wizard project
      6.1 Launch of the Orcad Capture program and the project management application.
7. Presentation of the Electronics Workbench p software.
      7.1.Electron Workbench menu, editing the electronic drawing

Strength of materials and mechanisms - Marius FAZEKAS

Electromagnetic field theory - Marius SILAGHI

1. INTRODUCTORY CONSIDERATIONS
      1.1. Electromagnetic phenomena
      1.2. Theories of electromagnetic phenomena
      1.3. Electromagnetic phenomena
2. ELECTROMAGNETIC FIELD IN ELECTROSTATIC MODE
      2.1. Vacuum electrostatic field
      2.2. The electrostatic field in the bodies
      2.3. The electrostatic theorems
3. ELECTROMAGNETIC FIELD IN ELECTROCINETIC REGIME
      3.1.Dielectrici. The electrical dipole.Dielectric polarization.Polarization. Polarization tasks
      3.2. Intensity of the electric field inside the bodies
polarized. Electrical induction
      3.3. Electricity Conservation Law.
Electrical conduction lever. The Law of Energy Transformation in
Conductors
4. MAGNETIC FIELD IN WATER AND SUBSTANCE
      4.1. Vacuum magnetic field
      4.2. The magnetic field in the substance
      4.3. The Law of Electromagnetic Induction
5. ENERGY AND MAGNETIC FORCE
      5.1. The magnetic field energy
      5.2. Magnetic forces

5.3. Electromagnetic waves

Computational methods for engineers - Adriana GRAVA
1. Vectorial calculation with applications in the study of electrostatic and electromagnetic fields
2. Vector operations used in electrostatic field computation and electromagnetic field calculation
3. Theorems and formulas useful in calculating the electric field, electromagnetic
4. Fourier Series. Fourier Integral
5. Fourier Transform
6. Spectral frequency display
7. Laplace Transform
8. Operational calculation usedto determine thefunctionsof transfer of theelectricalcircuits
9. State equations of electricalsystems, state matrix, Bode characteristic.

Modern Languages II - Simona ABRUDAN CACIORA
1. The Electromagnetic Field. The Laws of Electrimagnetism. Vocabulary and conversation exercises.
2. Electromagnetic Radiation. Radio waves. Radio Frequency. Microwaves. Reading, introducing new phrases, applicative exercises. Cardinal and Ordinal Numerals: Revision.
3. Processing Techniques in a High-Frequency Electromagnetic Field. Capacitive and Microwave Heating. Drying. Reading: Identifying subject development within the paragraphs. Abbreviations and acronyms.
4. Electric Heating. Conduction and Induction Heating. Listening: following the role of accent in underlining ideas. Conversation: means of asking for clarifications.
5. Ohmic (Resistive) Heating. Electromagnetic Induction Heating. Reading, introducing new words. The Plural of Nouns: Revision and exercises
6. Materials Used in the Construction of Heating Equipment. Insulators. Refractories. Text reading, vocabulary exercises. Countable and uncountable nouns (revision exercises).
7. Types of Electric Heating Equipment. Radiant and Convection heaters. Electric Stoves. Electric Arc Furnaces. Induction Furnaces. Text reading, conversation. Invariable Nouns (revision and exercises).
8. Electrical Energy Sources. Conventional Methods of Generating Electricity: Fossil Fuels and Nuclear Fusion. Reading.
9. Renewable Energy Sources. General Considerations. Reading. Modal verbs (revision).
10. Hidropower and Wave power. Reading, conversation.
11. Geothermal Energy. Reading and paraphrasing exercises in writing.
12. Solar energy.
13. Wind Power and Bioenergy. Reading of texts, expression of opinions.
14. Devices used in Power Stations and Other Types of Electricity-Generating Stations.

Physical Education and Sport II

2nd year of study – 1st semester (autumn)
Numerical methods - Mihaela NOVAC
1. Matlab programming fundamentals.
2. Introduction in Matlab programming
3. Errors in numerical calculation (sources of error, absolute and relative errors, error propagation, measurement errors).
4. Numerical methods to solve algebric linear systems equations. Exact methods. (Gauss's elimination method, the inverse matrix method, the Gauss-Jordan method, LU factorization method.)
5. Numerical methods to solve algebric linear systems equations. Iterative methods. (The iterative method of Jacobi. Gauss-Seidel iterative method. Successful relaxation method).
6. Numerical methods to solve nonlinear equations (Bisect method, sequence method, false position method, resolution of nonlinear equation systems).
7. Interpolation (Lagrange interpolation polynomial, finite differences and generalized powers (Newton-Gregory polynomials with finite differences), Newton's divided differences formula,

Spline functions).

8. Functions approximation (functions approximation using least squares method).
9. Numerical integration (Trapezoidal method, Romberg method, Simpson's method).
10. Numerical derivation (numerical derivation formulas using Taylor series expansion).
11. Numerical methods to solve differential equations (Euler's method, Milne's method, Runge-Kutta method).

Electric and electronic measurements I - Mircea GORDAN

1. Introduction.
2. Methods and means of electrical measuring. Metrological characteristics.
3. Measurement errors.
4. Means of electrical measuring in dynamic mode.
5. Analogue measuring instruments. Operating principles.
6. Digital measuring devices. Operating principles.

Analogical and digital electronics I - Cornelia GORDAN

1. Overview
2. Diodes
3. The bipolar transistor
4. Field effect transistors
5. The thyristor
6. Operational amplifiers
7. Rectifiers
8. Circuits with thyristors

Theory of electrical circuits I - Darie ȘOPRONI

DC CIRCUITS

1. Definition of the electric current and the quantity of electricity. Ohm's law. Joule-Lenz law.
2. Potential difference and resistance. Voltage variation in an open circuit, closed circuit and with an resistor. Electrical power and energy
3. Nodes, branches and loops. Circuit elements. Standard symbols of electrical components. Kirchhoff's laws. Series resistors and voltage division. Parallel resistors and current division
4. Methods of circuits analysis: Kirchhoff's law, the superposition theorem, current and voltage mode.
5. DC nonlinear circuits.

AC CIRCUITS

6. AC circuits. Sinusoids and phasors. Phasors relationships for circuit elements.
7. Alternating voltages and currents. The ac generators. Waveforms. AC values.
8. Kirchhoff's and Joubert law.
9. Single-phase series ac circuits: L, C, RL, RC, RLC
10. Single-phase parallel ac circuits: L, C, RL, RC, RLC
11. Power in ac circuits. Determination of power in ac circuits. Power triangle and power factor. Power factor improvement
12. Transformations theorems. Transformations of ac series circuits. Transformations of ac parallel circuits. Delta-star and star-delta transformations. Maximum power transfer theorems and impedance matching
13. Sinusoidal steady-state analysis
14. Frequency response. Series and parallel resonance. Resonance in magnetically coupled circuits

Professional communication - Simona ABRUDAN

1. Introduction: Defining communication. Factors involved in communication: the message, the issuer and the receiver. The role and importance of communication for companies. Attributes of corporate communication.
2. Types of communication. Verbal communication, written communication, non-verbal communication: features and functions. Types of non-verbal communication: gesture, posture, tactile communication, clothing. Link between verbal and non-verbal signs.
3. Active listening. The role of feedback in communication. Listening and active listening. Factors

that determine the success or failure of communication.

4. Oral communication (1). 4.1 Speeches. 4.2 Preparing the speech. 4.3 Writing the speech. 4.4 Structure of a speech: the beginning of the speech, the introduction of the speech, the content of the discourse, the conclusion. 4.5 Style elements.
5. Oral communication (2) Training seminars and workshops. 5.1 Ways to encourage interactivity. 5.2 The brainstorming method. 5.3 Focus group. 5.4 The "I Know / I Want to Know" / I learned" Method. 5.5 Role Playing
6. Oral communication (3). Meetings. Way of communication within the organization.
7. Oral communication (4). The interview as form of communication within the organization. 7.1 Types of questions specific to interviews within the organization. 7.2 Methods of answering questions during an interview.
8. Written communication (1). Business Letters. 8.1 Elements of a business letter: layout and format. 8.2 Language specific to business letters. 8.3 Types of letters: Pre-contractual letters: requests for information, answers to requests for information, requests for tenders, orders, confirmations, etc.
9. Written communication (2). The Memorandum. 9.1 Presentation. Types of memoranda. 9.2 Format and content of a memorandum. 9.3 Examples.
10. Written communication (3). Writing a scientific report and a bachelor thesis.
11. Written communication (4). The report. 11.1. Report types. 11.2 Format and parts of a report. 11.3 Examples.
12. Written communication (5). Means of online communication. 12.1 Email: Advantages and Disadvantages. 12.2 Electronic Messages: Internet and Information Technology Jargon 12.3 Writing an Email. 12.4 Writing and sending a fax.
13. Written communication (6). Drawing up the Curriculum Vitae. 13.1. Types of Curriculum Vitae.
14. Written communication (7). Writing a letter of intent. 14.1 The format of a letter of intent. 14.2 Examples of Letters of Intent.

Bond graphs in electrotechnics - Adriana GRAVA

1. The mainelements of the bondgraphs.
2. Procedure for building and modeling thebondgraphs of electricalsystems.
3. Causalrepresentation of bondgraphs.
4. Mason'sRuleappliedtoelectricalcircuits.
5. Modeling three-phase electric circuitsusingbond graphs.
6. Determination of loops and transmittance calculation for loops of three-phase circuits
7. Transmittance calculationfor three-phase circuits applyingthe Mason Rule, usingbond graphs
8. Transmittance calculationfor circuits found in non-sinusoidal regimeusingbond graphs

Foreign Language III - Simona ABRUDAN

1. Electric Light Sources. Incandescent lamps. Halogen Lamps. Vocabulary and conversation exercises.
2. Gerunds and Participles: Revision.
3. Low-pressure and high-pressure discharge lamps. Text reading, vocabulary exercises.
4. Infinitives (revision exercises).
5. Electric Power Distribution Systems. The Electric Circuit. Writing exercises: Paraphrasing, converting notes into complex sentences.
6. Computer Games Today. Reading, introducing new words, means of formulating arguments and counter-arguments.
7. Changing the Structure of Information in a Sentence: the Passive Voice (revision).
8. Electric Machines: Electric Motors, Electric Generators. Transformers. Reading, Speaking.
9. Review of Conditionals.
10. Distribution Boards. Discussions, arguments and counter-arguments.
11. The Subjunctive Mood.
12. Considerations on Electric Power Conversion. Text reading and vocabulary exercises.
13. DC to DC Conversion. AC to DC Conversion. Listening to the expression of various opinions. Scoring ideas based on the materials to be listened to.

14.   DC to AC Conversion. AC to AC Conversion. Exercises for conversation.

Physical Education and Sport III

2nd year of study – 2nd semester (spring)

Theory of electrical circuits II - Francisc HATHAZI
1.   The electric linear circuits in periodic nonsinusoidal state.
2.   Three phase electric circuits
3.   The electric linear circuits in transition regime
4.   Teoria cuadripolului electric

Electrical machines I - Dan TONȚ
1.   Basic notions and laws of electrical engineering applied to electric machines
2.   Constructive and operational principles of electrical machine
3.   Electric transformer
4.   Synchronous machine
5.   Asynchronous machine
6.   DC machine
7.   Running regime of electric machine in transient mode

Analogical and digital electronics II - Cornelia GORDAN
1.   Stabilization circuits
2.   Basic amplifier circuits
3.   AC Amplifiers
4.   DC Amplifiers
5.   Oscillation circuits
6.   Switching circuits
7.   Logical circuits

Electrotechnic materials - Dorel HOBLE
1.   Aggregation states of bodies. Crystalline structure.
2.   Defects of crystal network
3.   Electron energy strips in the crystal
4.   Electrical conduction of metals
5.   Electrical conduction of semiconductors
6.   Electrical polarization of dielectrics
7.   Magnetization
8.   Technical and technological properties of electrotechnical materials
9.   Conductive materials. Metals
10.   Semiconductor materials
11.   Gaseous and liquid electro-insulating materials.
12.   Solid electro-insulating materials
13.   Magnetic materials
14.   Magnetic fluids

Electric and electronic measurements II - Mircea GORDAN
1.   Measurement of current and electrical voltage.
2.   Measurement of resistance and impedance.
3.   Measurement of electrical power.
4.   Measurement of electrical energy.
5.   The acquisition system architecture and the architecture of analog data generation systems.
6.   Electrical transducers.
7.   The cathodic oscilloscope

Practice I

Foreign Language IV - Simona ABRUDAN
1.   Computer Modeling and Software Used in Electrical Engineering. Text reading and vocabulary exercises.

2. Computational electromagnetic (electromagnetic modeling): FDTD, FEM, BEM. Writing exercises.
3. Programming Languages. Written communication: organization, keywords.
4. Simulation Software. Text reading and theme-specific vocabulary analysis.
5. AutoCAD. Reading text and editing a report. Presentation of various types of reports and their specific format.
6. COMSOL Multiphysics. Text reading, vocabulary exercises.
7. Mathcad. Conversation.
8. MATLAB. Text reading and vocabulary exercises.
9. Professional ethics Specific ethics, rights, corruption, etc. Vocabulary
10. Finding a Job in the Field of Electrical Engineering. Persuasion techniques.
11. Listening: History of Electrical Engineering. Understanding the elements of speech that draw our attention to the main ideas.
12. Interview: Job interview. Role play.
13. Writing Leaflets Promoting Education in Electrical Engineering. Writing and vocabulary exercises.
14. Revision

Electrical technologies - Claudia STAŞAC
1. The sides and the structure of the production process
2. Structure of execution projects
3. Technology of the execution of the electrical schemes
4. Design technology of the network transformer of low power
5. Study of the technology of making magnetic cores
6. Magnetic core technology for rotary electric machines
7. Winding technology
8. Implementation technology of the coil windings and profiled conductor buckets
9. Technology of contact elements and electricity paths
10. Technology for the manufacture of brushes and electric brushes
11. Technology of contacts manufacturing for electrical appliances
12. Technology of design of printed wirings
13. Technology of execution of the printed wiring
14. Modern Trends in Electrical Technologies

Physical Education and Sport IV

3rd year of study – 1st semester (autumn)

Computer aided design in electrical engineering - Monica POPA
1. Solving differential equations in Matlab
2. Applications of computer aided design
3. Graphical user interfaces
4. Differential models of electromagnetic and thermal fields applied in the study of electrical devices
5. Finite element method. PDE Matlab Toolbox.
6. FLUX software – presentation and applications
7. Optimization problems – presentation and applications

Electrical machines II - Mircea PANTEA
1. The operating modes of electrical transformers for empty operation, short circuit and their analysis. Special Transformers
2. Special Transformer Modes
3. The non-symmetric mode of synchronous machines
4. Induction machine. Special arrangements
5. The Transition to Electric Machines
6. DC machine. Transitional regime.
7. DC motors. Switching

8. Braking induction machines
9. Synchronous machines. Transitional regime.
10. Internal angle change, Synchronous motor start, Autosynchronization, Determination of maximum load
11. Concluding the course with a review of studied theoretical aspects and preparation of the details of the examination

Superconductors and superconducting systems - Francisc HATHAZI

1. The superconductivity phenomenon.
2. The perfect diamagnetism.
3. Electrodynamic issues applied to superconducting elements.
4. The influence of critical magnetic field on the superconducting state.
5. Thermodynamic analysis of the transition from normal to superconducting state.
6. Intermediate state analysis.
7. The moving mode of the currents in superconductors.
8. Properties of the small size superconductors.
9. The use of microscopic energy in the superconductivity phenomenon analysis.
10. Tunelage and the forbidden band.
11. The wave coherence of electron pair. Quantum interference.
12. The mixed state of type II superconductors.
13. The critical currents of type II superconductors.
14. The past, present and future of superconductors with high critical temperature in applications.

Electrical equipments - Dorel HOBLE

1. Location and importance of electrical equipment in industrial installations
2. Classification of electrical equipment
3. Electrical contacts
4. Calculation of resistance and heating of contacts
5. Thermal effects in electrical appliances
6. Electromagnet as a component of electrical appliances
7. Fuses. Features. Constructive elements
8. Fusible burning control and electric arc extinguishing in fuses. Circuit breakers
9. Relays. Features of operation. Constructive types.
10. Intermediate, current and time relays. Role play, construction and typical usage patterns
11. Contactors. Their role, construction and typical usage patterns
12. Low Voltage Switches. Principles of extinguishing the electric arc
13. Medium and high voltage circuit breakers. Roller separators
14. Modern Trends in Electrical Equipment Construction

The theory of automatic adjustment and industrial automation – Sanda DALE

1. Introduction in Automation.
2. Elements of control system's theory.
3. Control system's structures.
4. Control system's properties.
5. Standard controllers.
6. Performances indicators for control systems.
7. Automation equipment.

Servo systems - Dan TONȚ

1. Introduction
2. Structure and control systems in the running processes
3. Positioning transducers used in servo systems
4. Regulators
5. Mechanical transmission
6. Automatic positioning systems analysis
7. Materials used in the construction of servomotors
8. DC servomotors

9.   Step by stepmotors
10.   Synchronous servomotors with permanent magnets
11.   Electronic command of DC servomotors with permanent magnets
12.   Positioning systems with DC servosystems
13.   Analysis of electro-mechanical systems. Continues command. Discrete command

Microwave technique - Marius SILAGHI
1.   INTRODUCTION
        1.1. Overview
        1.2. Electromagnetic waves
2.   MICROWAVES
        2.1. International allocation of frequencies
        2.2. Propagation of microwaves
3.   GUIDES OF UNDER
        3.1. Wave Guides
        3.2. Propagation modes
4.   MICROWAVE GENERATOR SOURCES
        4.1. Microwave oscillators
        4.2. Lines of transmission
5.   MICROWAVE CIRCUITS
        5.1. Microwave circuit elements and devices
        5.2. Modeling microwave circuits
        5.3.Measuring technology in microwave circuits
6.   APPLICATIONS
        6.1. Applications of microwave techniques
        6.2 Influence of microwaves on biological tissues. Security Techniques.

3rd year of study – 2nd semester (spring)

Electrically driven systems - Helga SILAGHI
1. Subject of electrical drives
        1.1. Introduction in electrical drives
        1.2. Structure and construction of electrical drive systems
2. General problems of electrical drives technology
        2.1. The object of the kinematics and dynamics of electrical drives. Motion equation
        2.2. Reporting of couples, moments of inertia, strength and mass
        2.3. Mechanical characteristics of electric machines and working mechanisms
        2.4. Transmission of the movement from the electric machine to the working mechanism 2.5.
        Electromagnetic couplings
        2.6. Stability of electrical drives systems
3. Electrical drives with DC machines
        3.1. General relationships and mechanical features for electrical drives with DC machines
        3.2. Methods of starting for electrical drives with DC machines
        3.3. Braking methods for electrical drives with DC machines
        3.4. Speed adjustment for electrical drives with DC machines
4. Electrical drives with asynchronous machines
        4.1. General relationships and mechanical features for electrical drives with asynchronous
        machines
        4.2. Methods of starting for electrical drives with asynchronous machines
        4.3. Braking methods for electrical drives with asynchronous machines
        4.4. Speed adjustment for electrical drives with asynchronous machines

Industrial and residential electrical installations - Sorin PAŞCA
1.   Installations for the electric power generation, transport, distribution and use
2.   Electrical installations – basics: categories of electrical installations, components, structure and
        technical documentation of an electrical installation

3. Quality conditions in the power supply of consumers
4. Transformer stations and posts (2 courses)
5. Power supply of electric consumers in industry
6. Loads in electrical networks. Calculus of electrical loads
7. Conductors used in electrical installations. Sizing of conductor cross-section
8. Switchgear and protective apparatus/devices used in electrical installations
9. Power Factor compensation in industrial electrical installations
10. Electrical shock protection installations
11. Voltage drop in low voltage electrical networks
12. Electrical installations for buildings

Electromagnetic convertors - Lucian MORGOȘ

1. The role of electromagnetic converters.
2. Power semiconductor devices
3. Selection, test and protection of the power semiconductor devices
4. AC - DC converters
5. AC voltage variators. Single-phase variators
6. AC voltage variators. Three-phase variators
7. Cycloconverters
8. DC voltage variators
9. Voltage and frequency converters
10. Inverters

Marketing and management in electrical engineering – Gabriela TONȚ

1. The framework and marketing issues. Marketing term. Basics concepts of marketing.
2. The marketing environment and its analysis.
3. Basic features of consumer behavior
4. Measure consumer reaction to market processes.
5. Market analysis.
6. Marketing research.
7. Management definition
8. Management functions
9. Production costs
10. Specific management techniques
11. Managerial team
12. Organization in the industrial enterprise

Practice II

Simulation algorithms in Electrical engineering / Electrical engineering simulation algorithms
Carmen MOLNAR

Introduction to Numerical Modeling of Electrical Circuits
The purpose of computer simulation of electrical circuits
Algorithms simulation using computer
The evolution of simulation and analysis programs electrical circuits

1. SPICE simulator
   1.1. Topological conditions
   1.2. PSpice Simulator Architecture
   1.3. Types of analysis
   1.4. Formulation of circuit equations
   1.5. The algorithm for solving the circuit equations
   1.6. Description of passive circuit elements
   1.7. Description of semiconductor circuit devices
   1.8. Description of voltage sources, and current sources
   1.9. Description of command lines
   1.10. Conventions for numerical values and expressions

           1.11.Presentation of simulation results
2.   Analysis of DC circuits
           2.1.Analysis of linear resistive circuits
           2.2.Presentation of the features of the DC circuits
           2.3.Determination of the static operating point
           2.4.Presentation of simulation results
3.   Analysis of AC circuits
           3.1.Presentation of Circuit Specificities
           3.2.Analysis of AC frequency circuits
           3.3Presentation of simulation results
4.   Time domain analysis
           4.1.Transient regime analysis
           4.2.Fourier analysis for linear circuits
           4.3.Presentation of simulation results

Modern Electric Traction Systems - Ovidiu POPOVICI

1. Introduction
2. Bases of dynamics for electrical vehicles
3. Fixed equipmentsfor electrical traction
4. Sustentation and guidance systems
5. Electrical vehicles feed in DC current
6. Electrical vehicles feeds in AC current
7. Self governing electrical vehicles
8. Electrical traction by cable

Microprocessor systems - Zoltan KOVENDI

1. Microprocessors
2. The I8086 microprocessor
3. The Intel Pentium
4. Pentium MMX
5. Pentium II
6. Pentium III
7. Pentium IV microprocessors
8. Motherboards
9. The main memory. Chipsets and support circuits. Extension buses.

General Economics - Constantin RADA

1. Subject of general economics
2. Law character of economics
3. Economical activity
4. Economical needs and interests
5. The enterprise
6. Consumer behavior
7. The market
8. Economic competition
9. Selling prices
10. Consumption and savings
11. Economic growth
12. Entrepreneur's profit
13. Cyclicality of economic activities
14. Relations with the international market

Robots - Gabriela TONŢ

1. The concept of manufacturing, automation of the manufacturing process, industrial robots in manufacturing systems.
2. Mobile robots trajectory in controlled surrounding environment
3. Position matrix for tool center point of a robot, position vector, orientation vectors

homogeneous transformations. Directional and rotational kinematic couplers, parameter, direct and reverse kinematics, transformation matrices, examples of kinematic analysis, the direct and inverse kinematics equations for robotic arm.

4. Programming robotic arm movements, data structures for position definition (pich and roll angle, Euler angle, quaternions).

5. Mobile platforms (Archetip mode, Steward, 3x3 Sibiu Module).

6. Robots' complex trajectories. Cartesian coordinates, polar, spherical, cylindrical coordinates; computation of the position matrix for a linear or circular trajectory; case of study for linear or circular trajectory command in ACL language.

4th year of study – 1st semester (autumn)

Special electrical drive systems - Helga SILAGHI

1. Special electric drives with asynchronous servomotors
    1.1. Three-phase asynchronous servomotors
    1.2. Control of asynchronous servomotors
    1.3. Direct torque control of asynchronous machines
    1.4. Biphasic asynchronous servomotors
2. Special electric drives with synchronous servomotors
    2.1. Synchronous servomotors with brushes
    2.2. Brushless synchronous servomotors
    2.3. Mathematical model of brushless synchronous servomotor in dynamic regime
    2.4. Speed control of brushless synchronous servomotor
3. Special electric drives with stepper motors
    3.1. Design and operation of stepper motors
    3.2. Stepper motors supply
    3.3. Control structures of stepper motors
    3.4. Field control of stepper motors with variable reluctance
4. Special electric drives with linear motors
    4.1. Constructive types of linear motors
    4.2. Linear motors applications
    4.3. Mathematical model of linear motors
5. Special electric drives with piezoelectric motors

Electrothermy - Livia BANDICI

1. General problems with electrothermal installations.
2. Materials used in the construction of electrothermal equipment
    2.1. Refractory materials.
    2.2. Heat insulating materials.
    2.3. Resistive materials.
    2.4. Materials for electrodes of electric arc furnaces.
3. Heat transfer in electrothermal equipment.
    3.1. Thermal conduction.
    3.2. Thermal convection.
    3.3. Thermal radiation.
    3.4. Means for measuring temperature
4. Electrical heating heaters.
    4.1. Discontinuous direct-heating systems.
    4.2. Continuous direct-heating systems.
    4.3. Direct heating ovens.
        4.3.1. Furnaces for grafting and for production of carborundum.
        4.3.2. Glass melting furnaces.
        4.3.3. Furnaces for the extraction and refining of aluminum.
    4.4. Electric furnaces with resistors for thermal treatments.
        4.4.1. Electric furnaces with melting resistors.
    4.5. Infrared heating.

4.6. Laboratory electric furnaces.
5. Electric arc furnaces.
    5.1. Electric arc furnaces with direct action for steel melting.
    5.2. Electric arc furnaces power at continuous voltage.
    5.3. Electric arc and resistance furnaces.
    5.4. Vacuum melting electric arc furnaces.
    5.5. Flow layer melting furnaces.
6. Electromagnetic induction heating.
    6.1. The principle of heating by electromagnetic induction.
    6.2. Applications of electromagnetic induction heating.
        6.2.1. Melting pot induction furnaces for metals.
        6.2.2. Channel induction furnace for melting metals.
        6.2.3. Deep heating by electromagnetic induction. Cross-flow heating.
        6.2.4. Surfacing.
    6.3. Special applications of induction heating.
7. Heating of dielectric materials.
    7.1. Capacitive heating.
    7.2. Applications of capacitive heating.

Industrial automations - Sanda DALE

1. Introduction in Automation.
2. Elements of control system's theory.
3. Control system's structures.
4. Control system's properties.
5. Standard controllers.
6. Performances indicators for control systems.
7. Automation equipment.

Generation, transportation and distribution of electrical energy - Ovidiu POPOVICI

1. Energy Systems
2. Electrical Plants
3. Generating electrical energy, using renewables sources
4. Electrical equipments to transport and distribution of electrical energy
5. Calculation methods for lack of balance
6. Calculations of the electrical lines, using the loss of tension method
7. Calculation of loss of power and tension for electrical grides
8. Stability of the energetic systems
9. The quality of the electrical energy

Industrial management - Liliana MAGDOIU

1. Introduction in management science
2. Concept and content of environmental factors
3. Planning as a process
4. Organizational and competitive strategies
5. Planning in the enterprise
6. Planning in the research and development function
7. Planning in the production function
8. Human resources planning
9. Organization in the industrial enterprise
10. Departments in industrial enterprise
11. Job analysis
12. Control in the industrial enterprise

Business law - Anca PĂCALĂ

1. Introduction to Business Law Definition. Object. Evolution. Sources.
2. The business activity. Business facts. Business Law Subjects. Acquiring and Ending the quality of Trader.

3. Business Company - Definition, Types of Commercial Companies. Establishment of commercial companies: the consensual stage, the legal stage, the stage of advertising, registration and tax registration.
4. Driving and controlling the business of the company. Legal personality of the commercial company. The General Assembly. The managers of the company. Dissolution and liquidation of the company: General causes of dissolution; Special causes of dissolution
5. Specificity notes of the societies of persons. Notes of the company's specificity in a collective name. Specificity notes of the company in simple comity.
6. Specificity notes of the capital companies Specificity notes of the joint-stock company Specific notes of the limited-liability company. Specificity notes of the limited liability company.
7. The General Meeting of Shareholders. Convening the General Assembly. Limits of power of the general shareholders meeting Management systems
8. Methods of constituting joint stock companies. Instant formation. Establishment by call for public subscription.
9. Securities issued by joint-stock companies. Actions - Definition, General Characters, Kinds. Bonds: definition, general characters, the issuing procedure.

Equipment for Heating, Ventilation and Air Conditioning - Mircea ARION

1. Fundamental aspects regarding the uses of industrial air conditioning systems
2. Physiological climatic bases. The physiological balance of human beeings in artificial environments.
3. Air treatment procedures
4. Systems for ventilation and air conditioning of industrial premises
5. Calculation and sizing of heating, ventilation and air conditioning systems
6. Ventilation and air conditioning systems for industrial buildings
7. Industrial air conditioning systems for severe working conditions. Air conditioning systems for technological processes
8. Installation and operation of industrial air-conditioning systems
9. Maintenance and repairing of industrial air conditioning systems

Electrical systems design - Monica POPA

1. Computation methods applied in low voltage electrical networks.
2. Computer aided design of low voltage electrical networks.
3. Ladder diagrams – presentation and applications
4. Computation of shortcircuit currents
5. Principles of overcurrents protection
6. Selection of protection devices
7. Energetical efficiency in electrical distribution

4th year of study – 2nd semester (spring)

Modern commutation techniques Adrian BURCA

1. General Problems of Power Electronics
2. Power electronic devices working in switching
3. Single-phase and three-phase power rectifiers
4. Single-phase and three-phase power rectifiers ordered
5. AC converters
6. Control of electronic power circuits
7. Inverters
8. Continuous voltage stabilizers
9. Operating principle of cc-cc converter. PWM command
10. Switching voltage sources
11. Cc-cc converters. Step-down converter (buck)
12. Step-up converter (boost)
13. Step-down-up converter (buck-boost)
14. Power Chopper

Industrial energetics and environmentally friendly energy sources - Mircea PANTEA

Micowave Technologies - Darie ȘOPRONI

1. Dielectric properties. Measuring techniques. The variation of complex dielectric permittivity with moisture content, temperature and frequency. The variation of Q factor versus moisture content response
2. Theoretical aspects of volumetric heating.
3. Single mode resonant cavities. Analysis of the cavity modes and quality factor. Impedance matching. Cylindrical cavities. Coupling apertures. Power transfer and efficiency of resonant cavity heaters.
4-5. Multimode oven applicators. Field distribution and heating uniformity. Q-factor, field intensity, wall currents and power density. Choice of wall materials. Doors and door seals.
6. Travelling wave applicators. Plane waves. Guided waves. Impedance matching. Voltage standing wave ratio. Axial and meander travelling wave applicators. Attenuation and uniformity heating.
7-8. Special applicators structures. Rectangular, disc loaded, dielectric loaded, travelling resonator, helix, radiator and elliptical applicators.
9. The microwave heating circuit, breakdown phenomena and vacuum processing
10. Safety precautions, exposure and emission standards
11-14. Industrial applications in the food industry, ceramics industry, wood drying, rubber processing, waste processing, waste water and soil decontamination, polymerization of insulating materials, seed disinsection, concrete maturing

Using electrical energy - Livia BANDICI

1. General concepts of the use of electrical energy.
2. Production of bright radiation.
3. Light sources.
   - 3.1. Incandescent lamp.
   - 3.2. Reflector incandescent lamp (RIL).
   - 3. 3. Halogen incandescent lamps (HIL).
   - 3.4. Sources of light with discharges.
     - 3.4.1. Low pressure mercury metal discharge lamp.
     - 3.4.2. High pressure mercury vapor lamp. High pressure mercury lamp and fluorescent balloon.
     - 3.4.3. High pressure mercury vapor discharge lamp and metal halides.
     - 3.4.4. Mixed light lamp.
   - 3.5. Lamps with high pressure sodium metal vapor discharges.
   - 3.6. Light sources with gas discharge.
   - 3.7. LED light sources.
4. Bodies and equipment used in lighting systems.
5. Electrical welding of metals.
   - 5.1.Welding processes.
   - 5.2.Manual arc welding with wrapped electrode.
   - 5.3.Electric arc welding in controlled atmosphere with fused electrode.
   - 5.4.Electric arc welding in a controlled atmosphere.
   - 5.5.Electric arc welding in a controlled atmosphere with a non-flammable electrode.
   - 5.6.Covered electric arc welding with fused electrode.

Practice for diploma project development

Electrical tractions - Ovidiu POPOVICI

1. Introduction
2. Bases of dynamics for electrical vehicles
3. Fixed equipmentsfor electrical traction
4. Sustentation and guidance systems
5. Electrical vehicles feed in DC current
6. Electrical vehicles feeds in AC current
7. Self governing electrical vehicles
8. Electrical traction by cable

Unconventional electrical technologies and equipment - Sorin PAȘCA

1. Introductory Course: Electrotechnologies / Special Electrical Technologies / Unconventional electrical technologies - history, examples, characteristics, advantages and disadvantages compared to classical processes
2. Heating and drying equipment with infrared radiation (IR); IR - characteristic quantities, specific laws, IR sources; Types of ovens / drying installations with IR; Sizing principles
3. Electrotechnologies based on industrial applications of ultrasounds; Ultrasounds characteristics; Phenomena that occur in ultrasounds propagation through different environments; Ultrasounds generation; Magnetostrictive and piezoelectric transducers; The general structure of an electroacoustic system
4. Electrotechnologies based on industrial applications of ultrasounds; Applications (dimensional processing, ultrasound welding of plastics and metals, cleaning - degreasing in ultrasonic activated baths)
5. Equipments for electrical processing of metals; Electro-erosion processing - process principle and analysis; Electric discharge machines with solid electrode; Specific power supplies / processing generators
6. Equipments for electrical processing of metals; Electric discharge machines with filiform electrode; Equipments for processing by electrical contact; Equipments for electrochemical processing; Anodo-mechanical processing equipments
7. Equipments for electrical processing of metals; High-speed plastic deformation equipments; Electromagnetic forming
8. Equipments for electrical processing of metals; High-speed plastic deformation equipments; Electrohydraulic forming
9. Unconventional metal surface coating processes and specific electrical equipment. Electrophoretic varnishing (chemical bonds, process analysis, power supply, constant current or constant voltage process, energy balance)
10. Unconventional metal surface coating processes and specific electrical equipment; Electrostatic painting (electrostatics - basics, types of electrostatic coatings, electrostatic coating installation, power supply, advantages/disadvantages of the process)
11. Electrotechnologies using thermal plasma and specific equipment; Thermodynamic characteristics of the plasma; Plasma generation; Plasmatron types (arc, induction, electronic), construction variants, power supply variants
12. Electrotechnologies using thermal plasma and specific equipment; Industrial applications of low temperature thermal plasma, plasma furnaces,remeltingfor refining, separation of useful components, obtaining of high temperature melting metals, cutting of metals
13. Electrical equipment for unconventional welding and soldering processes; Classification of unconventional welding processes; Welding with stored energy of thin metal sheets
14. Electron beam equipments: basics, features, equipment structure and applications

Diploma exam