# Transilvania University of Braşov, Romania
# Study program: Industrial Design (taught in Romanian)
## Syllabus for ERASMUS + students

**Faculty:** Product Design and Environment
**Study period:** 4 years (bachelor)

### 1st Year

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Mathematical Analysis | DIAM01 | Romanian | 5 | 2 | 2 | | |

**Course description (Syllabus):** Set. Figures. Relations. Series of figures; Real functions on R. Sequences and series of functions; Multidimensional real space; Limits and continuity; Functions. Limits. Continuity. Differentiation on Rn; Applied differential calculus; Riemann integrals. Multiple integrals. Improper integrals. Parameter integrals. Euler Functions; Lines and curves. Line integrals.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Chemistry | DICH01 | Romanian | 3 | 2 | | 1 | |

**Course description (Syllabus):** The Chemistry laws; The modern view of atomic structure; Electronic structure of atoms; The periodic table; Periodic properties of elements; Basic concepts of chemical bonding: Molecules and molecular compounds; Intermolecular forces; Ions and ionic; compounds; Metallic bond; Aqueous solutions and general properties of aqueous and non aqueous solutions; Chemical equilibrium; Acid-base equilibria; Chemical energy conversion: Electrolysis and Galvanic Cells; Modern materials: Ceramic materials; Metals and alloys; Macromolecular compounds (chemical structure; physical and chemical main properties; applications).

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Technical Drawing and Computer Graphics I | DIDT01 | Romanian | 5 | 2 | | 3 | |

**Course description (Syllabus):** General standards of engineering drawing; Presentation methods. Multi-view orthographic projections and pictorial views (isometric projection); Sectioning standards and conventions; General dimensions - basic rules of dimensioning; Geometric and positional tolerance: finishes, basic tolerances, geometric tolerances; Drawing conventions of external and internal threads. Screw fasteners; Graphical representation of: shafts, keyways, splines and gears; Assembly drawings of machine parts and components.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
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| | | | | course | seminar | laboratory | project |
| Computer Programming and Programming Languages I | DIPC01 | Romanian | 3 | 1 | | 2 | |

**Course description (Syllabus):** The discipline objective is to acquire the basics of using a computer hardware, central unit (motherboard, microprocessor, internal memory, external memory) input & output units peripheral (keyboard, mouse, table digitizers, scanners, monitor, printer, plotter), the physical organization of data on disk (files and folders) logical organization of information systems (FAT, NTFS), management computer software (operating systems and graphical user interfaces), word processing, spreadsheet, programming of the Web page.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Descriptive Geometry | DIGD01 | Romanian | 4 | 2 | | 1 | |

**Course description (Syllabus):** History. Projectors and projection systems. Double and triple point representation in orthogonal projection; Line representation; Representation of the plan. Plan in particular positions to projection planes; Representation of lines in the plane. Line contained in the plan; The relative position of two planes. The relative position of a line to a plane; Methods of descriptive geometry; Polyhedron. Representing polyhedra. Edges visibility. Planar sections through the prism and pyramid.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Materials Science and Engineering I | DISM01 | Romanian | 5 | 3 | | 2 | |

**Course description (Syllabus):** The course is a concise introduction to the *microstructures and processing of materials* (metals, ceramics, polymers and composites) and shows how these are related to the properties required in engineering field. The main subjects are: Orientation and Introduction. Electronic and Atomic Structure and Metallic Bonding; Crystal Structures, Miller Index, Single crystals, Polycrystalline and Monocrystalline materials; Imperfections in Crystals, Diffusion, Thermal, Magnetic, Mechanical and Electrical Properties. Failure and Corrosion; Phase Diagrams, Phase Transformations. Heat treatments; Metals and alloys. Polymers. Ceramics. Composites materials; Industrial casting processes, Plasticity theory and friction, Forging, Rolling, Extrusion; Welding.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Industrial Design Fundamentals I | DIDI01 | Romanian | 3 | 1 | 1 | | |

**Course description (Syllabus):** Design understanding. Design. Industrial design. Engineering design. The role of the designer in a design team. Position of designer and engineer in present and future companies. Simultaneous engineering. Human need - the main motivation of design. Sustainable design. Understand the context of product use. Product categories. The quality of products. Innovation in design.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Linear Algebra, Analytical and Differential Geometry | DIAGAD | Romanian | 4 | 2 | 2 | | |

**Course description (Syllabus):** Euclidean vectors. Scalar (dot) product, vector (cross) product, triple mixed (box) product and their applications. Equations of planes and lines in space. Angles and distances. Coordinate transformations in plane and in space. Polar coordinates in plane. Cylindrical and spherical coordinates in space. Vector spaces and subspaces. Examples. Linear dependence and independence, basis and dimension of a vector space. Changes of bases. Linear transformations on finite-dimensional vector spaces. Conics. Center, axes, asymptotes. Reduction to the canonical form. Quadrics: sphere; canonical (reduced) equations of other quadrics. Generation of surfaces: cylinders, cones, conical surfaces, surfaces of revolution. Plane curves: arc length; contact of two curves at a common point; tangent and normal line at a regular point. Osculating circle, curvature and curvature radius of a plane curve. Curves in the 3-dimensional Euclidean space: arc length, Frenet-Serret frame, curvature and torsion. Differential geometry of surfaces: curves on a surface, tangent plane, first fundamental form and its applications.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Communication - Ethics | DIEG02 | Romanian | 2 | 1 | 1 | | |

**Course description (Syllabus):** Definitions, models and theories of communication. The components of the communication process. Forms of communication. Communication barriers; Forms of interpersonal communication; CV; Tactics used in conflict - negotiation and mediation; **Communication** within the group. Group processes. Roles within the group. Leadership and communication; **Oral** and written scientific communication; report; scientific article.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Technical Drawing and Computer Graphics II | DIDT02 | Romanian | 4 | 1 | | 2 | |

**Course description (Syllabus):** Introduction to AutoCAD. Editing objects in AutoCAD. Ordering information visualization commands. OSNAP ways, orders Circle, Arc, Ellipse, Polygon, Rectangle, Donut. View commands: Zoom, Redraw, Pan, Polar Traking. Working with layers, line types and colours. Applications. Other drawing commands: Solid, Sketch, xline, Ray, Mlini, etc., the selection means. Basic techniques of editing and modification. Editing commands. Modify commands. Applications. Advanced techniques work. Modify commands below. Advanced editing commands. Applications. Advanced drawing controls: draw polylines. Creating Hatch Patterns. Defining a new text style, types of writing, writing in AutoCAD with examples. Applications. Other useful commands: MSlide, VSLIDE, script, plot designs, Egen, Boundary. Preparing a design pattern. Isometric representation, etc.. Word OLE Relations AutoCAD. Orders for insertion of images: Raster Image. Applications.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Computer Programming and Programming Languages II | DIPC02 | Romanian | 4 | 1 | | 2 | |

**Course description (Syllabus):** 1. Basics of the object oriented programming (Objects; Classes; Delphi Integrated Development Environment (IDE); The Main Window; The Object Inspector; The Delphi Workspace; Component Palette) **2.** Applications development (Forms; Properties and Events; Label Component, Edit Component, Memo Component; Conversion Functions (The IntToStr, StrToInt, FloatToStr, StrToFloat Functions); MainMenu, Button, BitBtn Components Menu Designer; How to enable and disable Menu Items and Buttons; Modal Result Property used for Button Components; **3.** Graphics in DELPHI (CANVAS Object; Properties and Methods; Image Component; ImageUsr Component) **4.** Setting the user window (Specific methods of the ImageUsr Component) **5.** Simulation by graphic animation

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Physics | DIFZ02 | Romanian | 4 | 2 | | 1 | |

**Course description (Syllabus):** Mechanics and acoustics, oscillations and waves ; Thermodynamics and statistical physics; Electromagnetics- introduction in electromagnetic field; Optics; Physics of atom; Solid state physics and semiconductors; Nuclear physics. The course is joined by a supplementary schedule containing applications: theoretical by seminary (1hour/week) and experimental by physics laboratory (1 hour/week).

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Mechanics | DIMC02 | Romanian | 6 | 3 | 2 | | |

**Course description (Syllabus):** To know and work with the basic concepts and main theorems in Mechanics, the interdependencies between them and to be able to correctly orient their search when they require a certain information. To create a basis for a general technical education, which is necessary in other studied subjects. To know how to approach practical challenges concerning the application of forces, their influence on equilibrium and motion, the possibilities of balancing a system, the different rigid motions within mechanisms (planetary, differential, worm-worm gear, etc.). To know and use correctly the new concepts, both in writing and discussing with the teaching staff, to be capable of working in a team but also to lead a team during the laboratory or home assignments. To correctly create the connections with other subjects using the concepts in Mechanics, permanently enhancing this way their knowledge and based on a solid ground.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Industrial Design Fundamentals II | DIDI02 | Romanian | 2 | 1 | 1 | | |

**Course description (Syllabus):** The quality of products. Instruments of a designer. Hand drawing, technical drawing, computer assisted design, assisted modeling, CAD. Software tools used in engineering design. Activities in the design studio. From idea to product. Steps in the design process. Product design and development. Materials and manufacturing technologies. Working model, scale model, prototype. The Design Workshop.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Artistic Drawing | DIDA02 | Romanian | 2 | | | 2 | |

**Course description (Syllabus):** Drawing Techniques – The sketch; Drawing Techniques – Constructive drawing (Drawing the static nature, still life); Anatomic Drawing; Perspective; Composition; Representation techniques – charcoal, pencil, pen; Representation techniques - aquatint, monotyping, logography, markers, combined techniques.

## 2nd Year

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Special Mathematics | DIMS03 | Romanian | 3 | 2 | 1 | | |

**Course description (Syllabus):** Differential Equations with constant coefficients; Fields theory; The theory of complex functions; Fourier series; Laplace Transform; Elements of mathematical statistics.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Mechanisms I | DIME03 | Romanian | 7 | 3 | | 2 | 1 |

**Course description (Syllabus):** Role, applications and history of mechanisms; Geometry and kinematics of involute gears; Structure of mechanisms; Structure, kinematics and dynamics of linkages; Geometry and kinematics of cam mechanisms.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Strength of Materials | DIRM03 | Romanian | 7 | 3 | 2 | 2 | |

**Course description (Syllabus):** Fondamental concepts. Internal Forces. Geometrical Properties of Plane Areas. Strength of Materials Basic Assumptions. Displacements, stresses and strains. Axial loading. Stresses and strains. Stress-strain diagram. Transverse contraction. Factor of safety. Statically indeterminate problems. Conventional Shear Calculus. General aspects. Stresses and strains. Riveted joints. Welded joints. Fundamental Concepts of the Theory of Elasticity. General aspects. Axial stress. Plane state of stress. General state of stress. Generalized Hooke's Law. Strain energy. Torsion. Elastic bending. Deflections of Beams under Transverse Loading. Stress under Compound Loads.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Electrical Machines and Actuation | MAE03 | Romanian | 3 | 2 | | 1 | |

**Course description (Syllabus):** Electric transformer - Construction, operation of the single-phase transformer empty, in load. Determination of transformer parameters by tests, characteristics. Three-phase transformer; Synchronous machine. Equation and voltage diagrams of the synchronous generator. Synchronous generator features. Electromagnetic torque and electromagnetic power. Synchronous machine with permanent magnets; Asynchronous machine - Basic construction elements. Operation of the asynchronous machine as an electric motor. Electromagnetic torque and regimes asynchronous machine operation. Asynchronous machine operation as generator; DC machine - Basic construction elements. The principle of operation. Induced reaction. Electromagnetic torque. Features DC generators. DC machine with magnets permanent; Elements of electric drives - Fundamentals. Electric motor regimes and services. Choosing the power of electric motors.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Numerical Methods | DIMN03 | Romanian | 4 | 2 | | 1 | |

**Course description (Syllabus):** Errors in computing. (Absolute and relative errors, errors sources, errors classification, errors of the elementary operations); Numerical approximation of functions (interpolation: linear interpolation, Lagrange interpolation formula, spline functions of interpolation; regression: linear and polynomial regression); Nonlinear algebraic equations solving (one variable equations: bisection method, secant method, fixed point iteration

method, Newton-Raphson method; nonlinear equations systems); Linear equations systems (Gauss method, Gauss-Jordan method, Jacobi method, Gauss-Seidel method); Numerical integration and differentiation (numerical differentiation formulas, Newton-Cotes integration formula, trapezoidal integration rule, Simpson integration rule); Ordinary differential equations (Taylor method, Euler method, Runge-Kutta methods); Design and optimization (optimization methods, case studies).

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Design (Semiotics) | DIDS03 | Romanian | 4 | 2 | | 1 | |

**Course description (Syllabus):** understanding, analysis and interpretation of design concepts in a historic, analytic and comparative context. The students are expected to go through the mains steps of the evolution of design, starting with the genesis of the design concept and continuing with 20$^{th}$ century design highlights, with a special emphasis upon the innovations regarding functionality, form, composition, materials, technology, and ecology. Trends of the future are also discussed, attempting to understand the configuring of the 21$^{st}$ century challenges in industrial design. During the laboratory works the students are expected to develop their ability to analyze and understand several important design concepts and innovative personalities. Also they are expected to develop representational skills as well as personal creativity.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Conceptual Design I | SPDP04 | Romanian | 3 | 2 | | | 1 |

**Course description (Syllabus):** Product design specifications: content and importance; IT revolution, globalization, personalized production, knowledge society, sustainable development; Design as a process. New products and patents; Maslow necessities pyramid; Performance. The identification of customer needs. Customers' identification and quantities quantification; Market study of competitive products; Costs, ergonomics, appearance, testing, quality and environment; Standards, quality, safety, packing, storage, shipping, service; Establishing product attribute hierarchy using analysis of compensation method.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Fluid Mechanics | DIMF04 | Romanian | 3 | 2 | | 1 | |

**Course description (Syllabus):** Introduction. Physical properties of fluids; Basics on static of fluids; Kinematics, basic definitions; Basic equations of fluid Dynamics. Dynamics of inviscid fluids: Euler equation, Bernoulli law, law of momentum; Dynamics of viscous fluids: laminar regime and turbulent regime; Some topics in the dynamics of inviscid compressible fluids: water hammer; Measurement of various parameters of flowing fluids: velocity and flow rate; Hydraulic machines: introduction, classification, working parameters; Turbo machines: characteristic curves, efficiency definitions, similarity laws and factors for turbo machines, the ensemble pump-network, operating point, suction head of a pump, cavitation, pump regulation; Volume machines. Hydrostatic pumps and motors. Hydraulic and pneumatic drives. The operating principle. Characteristics of pneumatic drives.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Mechanisms II and Machine Elements I | DIOM04 | Romanian | 6 | 3 | | 2 | 1 |

**Course description (Syllabus):** Engineering principles (the failure perspective, material selection, response of machine elements to loads and environments, geometry determination, design-stage integration of manufacturing and maintenance requirements); Machine joints and fastening methods (threaded fasteners, keys, rivets, welds, adhesive bonding); Springs (uses and characteristics, types of springs, general guidelines for spring design); Couplings, brakes and clutches (uses and characteristics, types, potential failure modes, materials, basic concepts for design of couplings, brakes and clutches); Power transmission shafting (uses and characteristics of shafting, potential failure modes, materials, .shaft vibration and critical speed, general guidelines for shaft design); Structure, kinematics and

dynamics of gear trains (transmission functions, efficiency, dynamic response); Structure, kinematics and dynamics of planetary gears (transmission functions, efficiency, synthesis conditions).

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Technical Drawing and Computer Graphics III | DIM3D | Romanian | 3 | 1 | | 3 | |

**Course description (Syllabus):** Introduction; 2D drawing (geometry, constraints, symbols and colors); 2D geometric modeling techniques (elementary shapes drawing, geometrical constraints); Relimitation features (corner, chamfer, trim, break, complement); Multiplication features (symmetry, translate, rotate, scale); 3D geometric modeling, basic features (pad, pocket, hole, groove, shaft, rib, slot, stiffener); 3D geometric modeling, dress-up features (edge fillet, chamfer, draft angle, shell, thickness, thread, pattern); Boolean operations (inserting new bodies, assemble bodies, intersect bodies, add bodies, removing bodies, trimming bodies); Assembly design (bodies assembly, coincidence constraint, contact constraint, angle constraint); Technical documentation (ensemble drawing, sections, detail drawing).

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Processing Technologies and Cutting Tools | THPL04 | Romanian | 3 | 2 | | 1 | |

**Course description (Syllabus):** Processing methods. Classification, structural features, kinematics characteristics; Techniques and mechanical cutting and micro cutting methods: classification, processing principles; Machining techniques and methods (micro) plastic deformation; Machining techniques and methods (micro) injection; Machinability characteristics of materials.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Industrial Management | DIMI04 | Romanian | 3 | 2 | 1 | | |

**Course description (Syllabus):** Management appearance and evolution; Companies in Romania; Company, company environment, company functions; Management attributes and functions; Incomes and outcomes budget; Company patrimony and resources; Company accounting; About staff selection and payment; About VAT, added value and surplus value, duties and taxes, fiscal documents; About planning; Production planning and organization; Stock organization, planning and management; Inventory and administration issues.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Heat Engineering and Thermal Machines | DITMT | Romanian | 3 | 2 | | 1 | |

**Course description (Syllabus):** Thermodynamics. Fundamental measures; First principle of thermodynamics; Ideal gas. Mixture of ideal gases. Ideal gas state transformations; Second principle of thermodynamics. Thermodynamic cycles. Entropy; Fuel combustion; Internal combustion engines; Reciprocating compressors; Gas turbine installations; Heat transfer. Conduction, convection, radiation.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
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| | | | | course | seminar | laboratory | project |
| Practical work 90 hours | DIPr04 | Romanian | 4 | | | | |

**Course description (Syllabus):** The practical work proposes to familiarize the students with the real problematic from companies and to stimulate the appliance of the knowledge gained in faculty in the practical activity.

## 3rd Year

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Machine Elements II | DIOM05 | Romanian | 4 | 2 | | | 2 |

**Course description (Syllabus):** Shafts (stresses and cycles; forces; calculations); Couplings and clutches (classification; permanent rigid couplings; mobile couplings; elastic couplings; clutches); Tribology and sleeve bearings (friction; usage; lubricants; constructions sleeves; hydrodynamic bearings); Ball and roller bearings (kinds of bearings; failures; calculation; ball and roller bearing mountings); Sealing devices; Chain drives (constructive types; geometric calculation, kinematic elements; contact calculation; maintenance); Belt drives (constructive types; geometric calculation, kinematic elements; forces and stresses; traction diagram, strength calculation, maintenance); Friction drives. Variable speed drives (failures, calculation); Consideration on the design of mechanical transmissions with variable load.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Measurement Techniques and Systems | INGTCD | Romanian | 4 | 2 | | 2 | |

**Course description (Syllabus):** Dimensional accuracy. 1.1 Accuracy 1.2 Interchangeability dimensions; the geometric shape 2.1 Accuracy 2.2 Precision of surface orientation, position and roughness; Tolerances of cylindrical parts. Tolerances of conical parts; Tolerances of bearing assembly, of threaded parts, gears; Size chains, methods for solving size chains; Methods to measure linear and angular dimensions. Optical-mechanical devices to measure length, Pneumatic length measuring devices, Electrical and electronic length measuring, Microscopes for measuring lengths and angles.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Materials Science and Engineering II (Recyclable Materials) | DIMR05 | Romanian | 3 | 2 | | 1 | |

**Course description (Syllabus):** Metallic recyclable materials: structure, properties (physical, mechanical, chemical), applications. Corrosion and anticorrosion protective methods; Glasses and ceramic materials: definition, classification, obtaining, special uses; Polymeric materials: definition, classification, obtaining, properties, preparation technologies, special applications; Composite materials: definition, obtaining, properties, uses. Metallic, polymeric and ceramic composites - special applications.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
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| | | | | course | seminar | laboratory | project |
| Finite Element Analysis | DIMEF5 | Romanian | 5 | 2 | | 3 | |

**Course description (Syllabus):** The course presents the main issues related to the analysis with the finite element's method: the general analysis problem; the general analysis algorithm; modeling methodology; finite element typology; materials modeling; modeling of loads and constraints; reference frames in FEM; geometrical modeling of 1D, 2D, and 3D domains; the modeling of the unknown physical parameters; the numerical model of the axial loaded bars; software based on FEM. The laboratories are referring on applications in the field of static (with loads as forces, moments, pressures, temperatures) and free frequencies analysis considering, 1D, 2D AND 3D domains.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Mechanism III (Computer Aided Modelling) | MAS05DI | Romanian | 6 | 3 | | 2 | 1 |

**Course description (Syllabus):** Fundamental notions: mechanical system, modelling mechanical systems, computer aided modelling of mechanical systems. Structural modelling of mechanical systems using traditional methods. Structural modelling using the Theory of Multibody Systems (MBS): defining a multibody system. MBS kinematic modelling: the kinematic model, forward and invers kinematic, kinematic modelling of geometric restriction, general form of the positions, velocities and accelerations functions, examples.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| General Economy | DIDC | Romanian | 3 | 1 | 1 | | |

**Course description (Syllabus):** Fundamental Issues of Economic Theory; Market and Its Competitive Structures; Production - between Economic Theory and Practice; Income Distribution; Macroeconomics and the Importance of the Macroeconomic Analysis. Aggregated Indicators; Monetary Market, Capital Market, Labour Market; Unemployment; Fluctuations in the Economic Activity. Anti-crisis Policies.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Study of Colour for Design | DICDP6 | Romanian | 4 | 2 | | 2 | |

**Course description (Syllabus):** Introduction in the science of color; Amplification of chromatic sensations: study of the color by subtraction, subtraction of non-chromatic colors, reciprocal subtraction of the basic colors, obtaining the integrated colors by subtraction, Colors and their characteristics, Perception of the colors, The essence of contrast, Chromatic gamma; Relations between color and shape: Colors and their dynamic, Balance of the colors, Shape activation by color, Deforming the shape by color; Color in product design.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Actuation, command and control of mechanical systems | DIACC6 | Romanian | 6 | 3 | | 3 | |

**Course description (Syllabus):** Electric drives; DC machine; Step-by-step motors. Synchronous machine; Pneumatic drives and hydraulic systems; Sensors and sensory systems; Elements of systems theory; Signal conditioning circuits; Continuous linear behavior of control systems; Discrete-time linear systems; Control system structure.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Aesthetics and Ergonomics | DIEE06 | Romanian | 4 | 2 | | | 2 |

**Course description (Syllabus):** Industrial aesthetics. Industrial aesthetics laws. Industrial aesthetics functions. The aesthetics of forms. Form, shape, image. Methods and means for shaping the objects. Psychological effects of shapes. The relationship between form and function, material, technology. Color. Visual perception. Elements about rhythm, visual balance, visual weight and visual dynamics. The contrast. The space. The wrong perception: optical illusions. The Gestalt principles in visual perception. Textures. Methods for obtaining proportionality. Triangulation. Recurrence. Modulation. Ergonomics. Domains connected to ergonomics. Conceptual ergonomics and correctional ergonomics. The working conditions. Posture. Active space. Manual and foot commands. Working place safety. Physical environment factors: lighting, chromatics, pollution factors, vibrations and noise. Psychological environment factors. The working place design. The human-product system. Anthropometric measures. Human-product -environment relationship. Ergonomic product design.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Form-giving in design I (Mock-up making) | DIMA06 | Romanian | 4 | 2 | | 2 | |

**Course description (Syllabus):** The discipline presents the function of the model in the conception of the new design products, the technologies and the modeling materials used in industrial design. Through practical works it is pursued to test the technology and the materials presented during the theoretical presentations and to train the specific abilities for the modeling activities. Design model: definition, model types and their purposes; Designing with drawings and models; Choice of materials and techniques; The use of paper and cardboard in modelmaking; The use of foams in modelmaking; The use of styling clay in modelmaking; Thermoplastics and thermosets – basic differences; The thermoforming method for modeling; The casting method in modelmaking; Sanding and finishing the models.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Conceptual Design II | DIDC06 | Romanian | 4 | 2 | | 2 | |

**Course description (Syllabus):** Basic notions used in the Product Conceptual Design (Overall function of a product, Product structure and structure of the overall function, Solving principles and solving structures, Conceptual synthesis of a compound function), Modelling of the technical products design process (Modelling of the technical product life cycle, Design modelling of technical products), Conceptual Design modelling of technical products (Requirements list, Conceptual design modelling algorithms, Principle solution establishment by solving structures evaluation), Conceptual design examples, Solving examples for functions with usual technical use.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Conceptual Design II - project | DIDCP | Romanian | 2 | | | | 2 |

**Course description (Syllabus):** Conceptual analysis of a given technical product. According to the requirements list of the indicated product it is required to perform the conceptual synthesis for a specific sub-function.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Practical Work 90 hours | DIPr06 | Romanian | 4 | | | | |

**Course description (Syllabus):** The practical work proposes to familiarize the students with the real problematic from companies and to stimulate the appliance of the knowledge gained in faculty in the practical activity. The students have to compile a project regarding the development of a concept of innovative product from the company field of activity.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Product Design for Sustainable Development | DIDD04 | Romanian | 3 | 2 | | 2 | |

**Course description (Syllabus):** Sustainable development: history, concept, national and international support legislation. Chapters of sustainable development: sustainable industry, sustainable agriculture, sustainable transportation. Energy – the key problem of sustainable development. Sustainable energy: energy efficiency, energy saving and renewable energy systems. Overview of the renewable energy sources and systems (solar energy conversion systems, wind systems, small hydro systems, biomass systems, systems for geothermal conversion). Education and training for sustainable development. Sustainable communities.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Creativity and Innovation in Design | CID07DI | Romanian | 5 | 2 | | | 2 |

**Course description (Syllabus):** The course objectives are: Development of personal creative capabilities. Effecting specific tests. Development of acquiring group techniques abilities. Introduction of some rigorous engineering calculations in the design of the interior (structure, composition, dimensions etc.) of products, as well as for the conception, as form and aesthetics, of their exterior. The study and rigorous application of some data and calculus regarding the proportions of components and products. The calculations for colouring the exterior of products. Surface-colour correlations.

## 4th Year

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Computer Aided Shape Modelling in Design | MAF07DI | Romanian | 4 | 2 | | 2 | |

**Course description (Syllabus):** Designing to Standards (Objectives of Standardisation; Types of Standards; Using Standards; Developing Standards); Geometric, Functional and Constructive Form of Products (Geometric Form; Functional Form; Constructive Form; Mathematical Determination of the Products Shape. Surfaces and Edges Equations). Constructive and technological form of the products (Dimensioning and tolerances establishment; Constructive and technological shape of the products in the mechanical process). Guidelines for Embodiment Design (Designing for Production; Designing for Easy Assembling (Types of Assembly; General Guidelines for Easy Assembly; Guidelines for Improving Assembly Operations; Evaluating Ease of Assembly)). Techniques of 3D Curves Modelling (Hermite Curves; Bezier Curves; B-Spline Curves).

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Embodiment Design | DC07DI | Romanian | 3 | 2 | | | |

**Course description (Syllabus):** Introduction (embodiment design steps, interactions); Basic rules of embodiment design (clarity, simplicity, safety); Principles of embodiment design; Elements of embodiment design (Designing to allow for expansion, designing to allow for creep and relaxation, designing against corrosion damage, designing to standards).

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Embodiment Design - project | DC07DI | Romanian | 3 | | | | 2 |

**Course description (Syllabus):** Starting from the product design specification (PDS) and a structural scheme (result of the conceptual design phase), embodiment design of part of a mechanical device will be developed. There will be evaluated elements of the embodiment design process (basic rules, principles, guidelines). Assemble and part drawing will be presented. The model will be created using CATIA package.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Design of Mechatronic Products | DIMDP7 | Romanian | 4 | 2 | | 1 | 1 |

**Course description (Syllabus):** Definition of mechatronics. Mechatronic systems. Definition of mechatronic systems. Sensors for mechatronic products. Examples of sensors integrated in mechatronic products. Motors and actuators used in mechatronic products. Classification of actuators for mechatronics. Biological, chemical, form memory, piezoelectric, magneto-strictive, thermal, optical, pneumatic actuators. DC motors – structure, dimensioning, functions. AC motors. Stepping motors – principles, characteristics, examples. Selection of a necessary motor. Examples of motors and actuators for representative mechatronic products. Command and control. Feed before control. Feedback control. Analysis and design of control mechanisms. Microprocessors and microcontrollers. Applications of microcontrollers. Examples of representative mechatronic products.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Furniture Design | DO07 | Romanian | 4 | 2 | | 2 | |

**Course description (Syllabus):** Furniture functionality. Functional furniture. Decorative furniture; Furniture styles. Style in furniture design. Furniture style in historical context. Style in art and architecture; Furniture aesthetics. Sensory perception. Furniture and the visual perception. Elements like rhythm, visual balance, visual weight and visual dynamics; Materials used for making the furniture. Natural materials. Artificial materials. Characteristics and properties of materials for furniture making. Texture perception. Materials, generating the textures. Furniture aspect and surface finishing; Fabrication techniques and technologies. Furniture components fabrication. Surfaces quality. Finish. Surfacing technologies; Form design. Organic and geometric forms. Internal dynamic of forms. Form semiotics. Product expressiveness. The form expressing the product functionality (form follows function); Furniture dimensioning. Anthropometrics. The functional dimensions correlated with the anthropometric dimensions; Furniture design. Wooden furniture. Metal furniture. Glass furniture. Composite materials furniture. Other materials and combination of materials furniture; Furniture design. The ensemble and components design. Modular design. 3D models. Detailed designs; Furniture accessories. Materials for furniture accessories. Materials combinations; Furniture

design for different layouts. Combining pieces of furniture with different functionalities. The furniture layout aesthetics.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Graphic Design | DGDI7 | Romanian | 4 | 2 | | | 1 |

**Course description (Syllabus):** Introduction in graphic design; Perception; Toward Dynamic balance; Gestalt Theory applied in Graphic Design; Using Text types; Color balance; Composition; Composition balance; Size and proportions; Theme and visual rhythm; Illustration and photography in design; Advertising design; Printings Production –tools and processes.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Object Design (10 weeks) | DOB08 | Romanian | 3 | 2 | | 1 | |

**Course description (Syllabus):** In this study the students are encouraged to create new objects, to think creatively, to be innovative and dedicated to improving the quality of life through design. Principles used to define the style of the products. Guided study of the various influence trends. Functional Analysis-effective tool for broadening the search range of design solutions. Analysis of user needs; analysis of the typology of users; analysis of the user rituals Technical specifications; study of materials; environmental analysis and life cycle Identify the main objectives, project planning, synthesis specification Creative research Development of the chosen concept - Case Study

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Innovation Management in Product Design (10 weeks) | DPRESDI | Romanian | 4 | 2 | | | 2 |

**Course description (Syllabus):** Methods and techniques used in the intuitive technical creation. Preliminary formulation of the creation theme. Analysis of the creative theme. Specification and detailing of the creativity and brainstorming solutions and the physical principles of operation. Analysis of selected engineering solutions; theoretical analysis of the technical - economic estimation and implementation. Steps submitting a proposal for invention.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Virtual Prototyping (10 weeks) | PV08DI | Romanian | 5 | 2 | | 1 | 2 |

**Course description (Syllabus):** General aspects and applications in engineering of the virtual prototyping technique; Basic principles of the virtual prototyping process; Critical success and limiting factors; virtual prototyping enablers; Modeling the systems in the virtual prototyping concept; Software platform for virtual prototyping: software components, communications between components; Virtual prototyping phases; Parameterization and optimization in virtual environment; Virtual prototyping of the mechatronic systems in the concurrent engineering concept; Operating characteristics of the virtual prototyping software solutions.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Web-design (10 weeks) | CDP08DI | Romanian | 3 | 2 | | 1 | |

**Course description (Syllabus):** The course presents the main aspects regarding the development, upgrade and management of dynamic websites using software like Microsoft Frontage or Macromedia Dreamweaver: inserting and modifying objects like text, images, tables and other similar HTML objects; creating interactive behavior of websites (actions triggered by different events); designing of forms, which enables to capture information from the user who visits the website; information and examples of how a website can be transferred (uploaded) to a dedicated webserver and maintained.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Project Management (10 weeks) | MP08DI | Romanian | 2 | 1 | 1 | | |

**Course description (Syllabus):** Project. Definition. Concepts (time, budget, quality, participants' expectations); Project structure; Planning (structure and stages of a project, SWOT analysis, pest analysis, feasibility study, impact report, riqs, team selection, 7 p of planning, dwp- detailed working program, Gantt diagram); Project realization; About changing. Lewin diagram; Project quality. TQM; Cause- effect diagram; Pareto diagram; Control and evaluation; Authority (team building, motivation, conflicts, communication, stress management, time management).

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Detail Design (10 weeks) | PRDET08 | Romanian | 3 | 1 | | | 3 |

**Course description (Syllabus):** Information extracting from the assemble; Establishing the detail drawings shape (number of views, sections, details); Quotation rules (rules, conventions, quotations types, functional quotation ); Surfaces state (manufacturing, roughness, thermic treatments); Dimensional exceptions (tolerances fields, adjustments types); Shape and position exceptions. Component assembling; Product using and maintenance; Dimensional control; Recycling; Applications.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Diploma Project (14 weeks x 4 hours) | DIPrII | Romanian | 4 | | | | 4 |

**Course description (Syllabus):** Familiarize students with the stages of a complete process of product development from idea to marketing issues. Students prepare the product technical documentation, design, optimize a set of product solutions, promote and establish a marketing strategy.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Practical work for diploma project (4 weeks x 24 hours) | Pr08 | Romanian | 4 | | | | |

**Course description (Syllabus):** The students have to accomplish the design of the product developed within the diploma project, covering aspects related to conceptual design, embodiment design, aesthetics, detail design, ergonomics etc.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Form-giving in Design II | CFD07DI | Romanian | 4 | 2 | | 2 | |

**Course description (Syllabus):** Understanding the complexity of the aspects influencing the final shape of the new industrial objects. The presentation of the fundamental principles of the design creation and of the most important aspects of the perception psychology applied in design. The development of the 3D imagination and thinking through practical works. Understanding the way the esthetic creation of the artistic shapes is integrated into the conception of the new products: Industrial object - definitions, properties, creation; Methods used in form design; Form factors, form requirements; the appearance of the product; Case history.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Eco-design and Products Recycling | RP07DI | Romanian | 4 | 2 | | 2 | |

**Course description (Syllabus):** Why Eco-design? (industrial design and eco-design motivation, eco-design. some definitions); Environment in product life cycle (the environmental impact of human activities, the environmental impact of a product); Eco – alternatives in product life cycle (energy resources, raw materials, manufacturing, clean technologies, transport, product use, product end of life options); Designing eco-products (design to minimize material usage, design for disassembly, design for remanufacture, design for waste minimization, design to minimize

hazardous materials, design for energy efficiency); Eco-product management (legislation supporting eco-products, managing eco – product development, eco-labeling); Eco-design perspectives.

| Course title | Code | Language of instruction | No. of credits | Number of hours per week | | | |
|---|---|---|---|---|---|---|---|
| | | | | course | seminar | laboratory | project |
| Package Design | DA08 | Romanian | 2 | 1 | | 2 | |

**Course description (Syllabus):** Package definition. Package types. Materials used for packages; Package functions. Package characteristics. Functional characteristics. Psycho-sensorial characteristics. Economic characteristics. Technical-economic characteristics. Package quality; Visual perception of package. Types of perception used to assess the aesthetic values of package. Package form. Package colour and graphics; Package design. Stages in package design. Package aesthetics. Technical efficiency and aesthetic qualities in package design. Ergonomic principles in package design; Specific items in package design. Package layers. Mono-functional package: protective packing. Poly-functional package: protective, aesthetic and promotional; Ergonomic and safety principles in package design. Human protection. Ethical aspects in package design; Eco-package design. The environment protection in package design. Recyclable package and package made from recyclable materials. Reusable packages. Collecting, sorting and recycling the package or materials from package. Bio-degradable packages; Modern concepts of industrial design in package design. Standardization and modular construction of package. Normalized dimensions in packaging industry. The importance of packaging for a successful product. Product/package rebranding.