**Course Syllabus**

Academic year: 2020-2021

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| Institution | University of Petroşani |
| Faculty | Mechanical and Electrical Engineering |
| Field of study | Power Engineering |
| Level | Bachelor |
| Program of study | Industrial Power Engineering |

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| Course | **Heat and Mass Transfer** |
| Code | 2II4OD27 |
| Year of study (semester) | II (II) |
| Number of hours | 42 |
| Number of credits | 3 |
| Professor | Assoc. Prof., Ph.D. DOSA Ion |

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| **No.** | **Topic** |
|  | Introduction. Units and Dimensions. Electrical Analogy of Heat Transfer. Thermal Resistance. |
|  | Modes of Heat Transfer. Heat Transfer Basic Laws. Combined Heat Transfer Processes. Basics of Thermal Conduction. Differential Equations of Thermal Conduction. Thermal Conductivity of Solids, Fluids and Gases. |
|  | Steady-State One-Dimensional Conduction. Homogeneous Bodies with Simple Geometric Shapes, without Interior Heat Sources. Conduction Through a Flat Wall. Conduction Through a Cylindrical Wall. Conduction through a Spherical Wall. Thermal Contact Resistance. |
|  | Non-homogeneous bodies without internal heat sources. Conduction Through a Flat Wall. Conduction Through a Cylindrical Wall. Heat Conduction through Complex Shaped Wall. |
|  | Introduction to Convection. Introductory Hydrodynamics. Types of Fluid Flow. Pressure Loss. The Velocity Boundary Layer. The Thermal Boundary Layer. Convection coefficient. |
|  | Convection Coefficient Calculation. Dimensional Analysis. Criteria, Criterion Relations. Analytical Solutions of Boundary Layer Equations. Approximate Solutions of The Boundary Layer Equations. Analogy Between Heat, Mass and Momentum Transfer. |
|  | Free Convection. Introductions. Free Convection in Large Spaces. Free Convection on a Vertical Flat Plate. Dimensionless Parameters. Free Convection on a Flat and Cylindrical Vertical Surface. Free Convection on a Flat and Cylindrical Horizontal Surface. Simplified Calculation Relationships for Air. |
|  | Free Convection in Finite Spaces. Combined Free and Forced Convection. Single-Phase Forced Convection in Pipes and Channels. Analytical Solutions for Forced Convection. Equation of Fully Developed Convection. |
|  | Constant Wall Temperature Forced Convection. Constant Heat Flux Laminar Convection. Constant Wall Temperature Laminar Convection. Criteria for Forced Convection Calculation. Single-Phase Forced Convection on The External Surfaces. |
|  | External Flow. Forced Convection over Cylinders and Spheres. Forced Convection over Tube Banks. Convective Heat Transfer Enhancement. |
|  | Complex Heat Exchange Processes. Overall Heat Exchange Coefficient. Heat Transfer through Walls Separating two Fluids. Overall Heat Transfer Coefficient Enhancement. Mass Transfer. Introduction. Modes of Mass Transfer. Mass Transfer Basic Laws. |
|  | Differential Equations of Mass Transfer. Initial and Boundary Conditions. Diffusion Mass Transfer. Mass Diffusivity. Diffusion Through a Stagnant Gas. Simultaneous Heat, Mass and Momentum Transfer. |
|  | Convective Mass Transfer. Basic Equations. Laminar Boundary Layer Analysis of Mass Concentration. The Analogy Between the Transfer of Mass, Energy and Momentum. Interphase Mass Transfer. |
|  | The State of Equilibrium. The Model of Two Films. Individual Mass Transfer Coefficient. Overall Mass Transfer Coefficient. Mass Transfer Equipment. |