

Introduction to combustion. Fires, compartment fires, wild land fires. Industrial accidents. Explosions. Combustion thermo-chemistry. Heating value. Adiabatic flame temperature. Free radicals. Toxicity of combustion products. Ignition requirements. Fire tetrahedron. Ignition and auto-ignition temperatures. Flammability limits. Fire suppression concepts. Fire suppression agents. Fire initiation and fire spreading mechanisms. Mass, momentum and energy transport phenomena. Combustion stages for liquid and solid fuels. Fundamental physical phenomena governing the combustion of solid fuels. Pyrolysis reactions. Main fire stages: ignition, growth, development, decay. General characteristics of compartment fires. Fire stages. Ventilation effects. Flashover. Backdraft. Main characteristics of the developing flow- and thermal-field. Fire risk analysis. Estimation of main quantities. Heat release rate. Fire load. Standard gas temperature curves. Numerical simulation methodologies. Main equations. Fluid flow. Conjugate heat transfer. Chemical reactions. Two-phase flows. Fires in means of transportation. Aircraft-, ship- and train-fires. Fires in road and rail tunnels. Human behavior during a fire. Behavior of materials exposed to fire. Reaction to fire tests. Fire resistance tests. Temperature-dependent thermo-physical properties. Fire behavior of common construction materials. Fire legislation and legal requirements. Passive and active fire safety protection.