Thermofluid dynamics applied to fire prevention design

Finalità
Aim of the course is to provide theoretical and applicative knowledge on physics applied to fire safety engineering. Part of the course is devoted to numerical analysis applied to heat transfer and fluid flow problems in fire modeling.

Programma
Fire science and combustion. The combustion process. Theoretical air for combustion. Combustion by-products and energy release. Oxygen required for combustion. Tempertaures of flames. Adiabatic flame temperature.
Limits of Flammability and premixed flames. Measurement of flammability limits. Flammability diagram. The structure of a premixed flame. Heat losses froma a premixed flame. Measurement of burning velocity. -Diffusion flames and fire plumesLaminar and turbulent jet flames. Flames from natural fires: the buoyant plume, the fire plume.
Ignition. Ingnition of flammable vapour/air mixtures. Ignition of liquids. Pilot ignition of solids. Spontaneous ignition. Extinction of flame.
Spread of flame. Flame spread over liquids and solids.
The pre-flashover and post-flashover in compartment fire. The growth period and the definition of flashover. Regimes of burning. Fire resistance and severity.
The productuion and movement of smoke. Rate of smoke production in fires.
Fire modeling. Two zone and field **models. C.Fast amd FDS codes. Practical applications**.

Attività d'esercitazione
Part of the course is devoted to the numerical analysis applied to heat transfer and fluid flow problems involved in fire safety engineering.

Modalità d'esame
Practical and oral exam.

Propedeuticità
Applied Physics

Testi consigliati
INGEGNERIA DELLA SICUREZZA ANTINCENDIO (IV EDIZIONE)
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An Introduction to Fire Dynamics, by D. Drysdale, John Wiley Edition