# Fire and evacuation modelling

| | |
|---|---|
| profile | general academics |
| degree | first degree |
| programme | ERASMUS |
| semester | 1 |
| part time / full time | full time |
| ECTS | 3 |
| coordinator | kpt. mgr inż. Wojciech Kowalski |

## form of the activity: exercise

| | |
|---|---|
| hours | 30 |
| prerequisites | Basic mathematics and physics knowledge. Basics of integral and differential calculus. Basic knowledge on thermodynamics and fluid mechanics. |
| objectives | The purpose of teaching the subject in the fire modeling is to acquire knowledge on tools for calculation of fire – analytical, zone and field models. Knowledge on basics of analytical and numerical methods of fire modeling. Evacuation modeling part of the class provide student with knowledge on analytical and advanced tools to model evacuation. Getting familiar with both, deterministic and probabilistic, ways to model fire phenomena and process of evacuation is an ultimate goal of the class. |
| methods | Computer modelling and hand calculations performed by students assisted by the teacher. |
| own work | Preparation of the semester project. Study of the subject literature in the pursue of experimental data for the models and preparation for classes in the topics assigned by the teacher. Attempts to select methods and tools adequate to model specific engineering problems and solving them. Performing hand and computer calculations and analyzing their results. |
| basic literature | Hurley, Morgan J. i in. (2016). SFPE Handbook of Fire Protection Engineering, Fifth Edition. Springer New York. Guan Heng Yeoh i Kwok Kit Yuen. (2009). Computational Fluid Dynamics in Fire Engineering. Elsevier. DeCicco, P. (2019). Evacuation from Fires (P. R. DeCicco, Red.; 1. wyd.). Routledge. Krasuski, A. (2019). Multisimulation: Stochastic simulations for the assessment of building fire safety. The Main School of Fire Service. |

| | |
|---|---|
| supplementary literature | Peacock, R. D. i in. (2015). CFAST – Consolidated Model of Fire Growth and Smoke Transport (Version 7) Volume 1: Technical Reference Guide. National Institute of Standards and Technology. Peacock, R. D. i in. (2015). CFAST – Consolidated Model of Fire Growth and Smoke Transport (Version 7) Volume 2: User's Guide. National Institute of Standards and Technology. McGrattan, K. i in. (2024). Fire Dynamics Simulator. User's Guide. National Institute of Standards and Technology. McGrattan, K. i in. (2024). Fire Dynamics Simulator. Technical Reference Guide. Volume 3: Validation. National Institute of Standards and Technology. Thunderhead Engineering. (2024). Pathfinder Technical Reference Manual Version: 2024-1. Korhonen, T. (2018). Fire Dynamics Simulator with Evacuation: FDS+Evac. Technical Reference and User's Guide. VTT Technical Research Centre of Finland. Cleef, L. i in. (2024). Fire risk assessment tools for the built environment—An explorative study through a developers' survey. Fire Safety Journal, 146, 104169. Krasuski, A. i in. (2022). Risk-aware decision making in the safety investments—Application of stochastic simulations and judgment value method. Fire Safety Journal, 127, 103491. |

| contents | hours |
|---|---|
| Introduction. Health and safety practices. | 1 |
| Analytical fire models. Nominal fire curves. Zukosky, Heskestad and Thomas models. | 4 |
| Zone fire models. CFAST, OZone, B-RISK. | 4 |
| Field fire models. FDS, OpenFOAM (FireFOAM). | 6 |
| Analytical evacuation models. Calculation method acc. to PD 7974-6. | 4 |
| Advanced evacuation models. Pathfinder, FDS+Evac. | 4 |
| Probabilistic modelling of fire and evacuation. Basics of fire risk analysis. Monte-Carlo-based sampling methods. AAMKS framework. | 6 |
| Defence of semester project. | 1 |