HEAT AND MOISTURE TRANSPORT IN BUILDING COMPONENTS:
FROM FUNDAMENTALS TO NEW ADVANCES

Surname _____

Name _____

Affiliation _____

Address _____

Email _____

Phone _____ Fax _____

If M.A.Sc. or Ph.D student, indicate research subject and/or program

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Date _____ Signature _____

International participants to send to: J. Carmeliet, Kasteelpark Arenberg 40, 3001 Heverlee (Belgium)

COURSE INFORMATION

The format of this course includes morning sessions, where the fundamentals are thought by experienced researchers and afternoon sessions, where theory is applied through practical exercises and experimental testing. The course is divided in two blocks: transport and boundary conditions.
Wednesdays are attributed to exchange of personal research, discussions and software and practical workshops.
All lectures will be given in English. Lectures notes can be downloaded from IABP web site. Instructions on the course will be sent to accepted participants.

ADMISSION AND ACCOMMODATION

To get course credits or to audit the course students must register through Concordia University by contacting Ms Kaki Narh (kaki.narh@bcee.concordia.ca). This is an advanced graduate course and it requires a prerequisite of a course in building science or equivalent. The registration fee for international participants is 450.00 €. They must register before June 11th through the IABP-website and will receive an attendance certificate. A letter of confirmation will be sent to accepted participants.
A list of accommodations is available at http://residence.concordia.ca/summer.html
http://www.ece.concordia.ca./~glitho/CSS/Hotels.htm
For registration and further information see:
http://www.kuleuven.ac.be/bwf/projects/IABP/BLDG_A791.php

Concordia UNIVERSITY

HEAT AND MASS TRANSPORT IN BUILDING COMPONENTS

FROM FUNDAMENTALS TO NEW ADVANCES

Coordinated by

P.FAZIO, CONCORDIA UNIVERSITY, CANADA
H. HENS, K.U.LEUVEN, BELGIUM

AS A COURSE FOR CREDIT AT CONCORDIA UNIVERSITY AND AS INTERNATIONAL COURSE-WORKSHOP FOR INTERNATIONAL PARTICIPANTS

Lecturers

B.BLOCKEN, J.CARMELIET, H. JANSSEN

Montreal, July 11-29, 2005

BLDG A791 Modeling of non-linear coupled transport processes in building envelope

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When analyzing hygrothermal performance of building materials, components or whole buildings, computational modeling of heat, air and moisture (HAM) transport becomes of major concern. Computational HAM modeling covers the numerical solution of the coupled differential equations supplied with initial and boundary conditions. The quality of the predicted responses depends on the quality of input data, - material properties and boundary conditions - and on the robustness, precision and efficiency of the applied numerical techniques.

This first series of courses aims at providing the participants with the knowledge of the fundamentals of heat, liquid water and water vapor transfer as well as with the latest advances and developments in this field. To this extent, the course has been composed as a unique combination of theory and exercise, covering a wide range of topics including material properties, experimental techniques, state-of-the-art models, special materials, basic and advanced numerical procedures, an introduction to Computational Fluid Dynamics, detailed indoor and outdoor boundary descriptions, climate, etc.

The second series of the courses will be given in 2006 and will deal with coupled air and heat-moisture transport including whole building simulation. Current and new research directions in moisture durability assessment will be presented.

Because of its nature and content, the course is valuable for both researchers, graduate and Ph.D students and engineers.

J. CARMELIET – *Moisture 1*: porosity, image analysis, sorption isotherms, capillary pressure curve, hysteresis, experimental techniques. *Moisture 2*: liquid transport, vapor transport, network and continuum models, permeability and diffusivity, experimental techniques. *Moisture 3*: heat and moisture transport, material properties modeling. *Moisture 4*: heterogeneity, cracks, wood, salt.

H. JANSSEN – *Simulation* 1: control volumes, finite elements, accuracy considerations, preprocessing. *Simulation 2*: explicit and implicit methods, stability and efficiency, conservative modeling *Simulation 3*: Picard iteration, convergence criteria, coupled and staggered modeling. *Simulation 4*: boundary conditions, dynamic time stepping, Newton-Raphson iteration, adaptive integration

B. BLOCKEN – *Boundary 1*: wind, building aerodynamics, CFD, wind pressures, boundary layers. *Boundary 2*: wind-driven rain, runoff, surface condensation, evaporation, hygric boundary layers, vapor transfer coefficients. *Boundary 3*: convection, thermal boundary layers, solar radiation, long-wave radiation, heat transfer coefficients. *Boundary 4*: indoor and outdoor climate, comfort, global change and HAM modeling.

DAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
11 – 15 JULY BLOCK IA	MOISTURE 1 *Properties of porous materials* CARMELIET	MOISTURE 2 *Transport models* CARMELIET	*PhD – M.A.Sc. presentations*	SIMULATION 1 *Spatial discretization* JANSSEN	SIMULATION 2 *Temporal discretization* JANSSEN
18 – 22 JULY BLOCK IB	MOISTURE 3 *Heat-Mass transport* CARMELIET	MOISTURE 4 *Special materials* CARMELIET	*Software workshop, visit, case studies*	SIMULATION 3 *Nonlinear and coupled* JANSSEN	SIMULATION 4 *Special issues* JANSSEN
25 – 29 JULY BLOCK II	BOUNDARY 1 *Air* BLOCKEN	BOUNDARY 2 *Moisture* BLOCKEN	*Software workshop, visit, case studies*	BOUNDARY 3 *Heat* BLOCKEN	BOUNDARY 4 *Climate* BLOCKEN