

Teaching portfolio

1. Teaching CV: A list of teaching and supervision tasks, including specification of academic fields, scope, level (bachelor, master, continuing education, PhD). Please state the teaching method used (e.g. lecture, class teaching, exercises, supervision, examination, coexamination, distance teaching, internet-based teaching and evaluation of teaching). Please also indicate the language of instruction.

Control and Analysis of Building Energy Systems (CABES): 5 ECTS

Bachelor Program (previously Master program) in Indoor Environmental and Energy Engineering (IEEE 6) and Master Program in Building Energy Design (BED 3), Department of the Built Environment, 2013-2020.

I am responsible for the entire course, including 8-10 lectures, a 1-week long laboratory workshop and oral examinations.

Delivering knowledge and skills on:

- Programming and algorithms for data analysis, numerical modelling and measurement automation: MATLAB, Simulink, LabVIEW programming languages.
- Control systems, feedback controllers, PID controllers.
- White box, grey box and black box modelling.
- Tuning PID controllers for HVAC systems.
- HVAC commissioning.
- Advanced controllers for building systems.
- Sensor time constant.

Indoor Environmental Analysis and Measurements: 5 ECTS

Bachelor Program in Indoor Environmental and Energy Engineering (IEEE 5) and Master Program in Building Energy Design (BED 2), Department of the Built Environment, 2013-2022.

I am responsible for parts of the course, I give one lecture about experimental methodology, one lecture about the thermophysical properties of building materials, and I have 2 weeks of laboratory workshop for the measurement of the different thermo-physical properties of building materials. Delivering knowledge and skills on:

- Building material thermal properties and physical properties.
- Measurement methodology to conduct good scientific experimental investigations.
- Laboratory safety measures.
- Laser Flash Analysis method.
- Guarded Hot Plate method.

From 2013 to 2017, I was also responsible for the lectures and workshop about the measurement of the indoor environment quality and energy efficiency in buildings, and I had 1 lecture and 1-week workshop in laboratories to teach students how to use different instruments to measure the indoor environment and energy in buildings. Delivering knowledge and skills on:

- Using data loggers.
- Calibrating sensors and instruments.
- Using sensors for measurement of airflow, fluid flow, temperature, electrical energy, thermal energy, humidity, indoor acoustics, illuminance, pressure difference.
- Blower door test.
- Sensor time constant.

Building Heat, Moisture and Energy Modelling: 15 ECTS

Master Program in Building Energy Design (BED 1), Department of the Built Environment, 2014-2022.

I give 1 lecture + exercises about thermodynamics and finite volume numerical methods. Delivering knowledge and skills on:

- Numerical methods.
- Thermodynamics.
- Heat transfer.
- Finite volume method.

Stochastic Modelling and Design Optimization: 5 ECTS

Master program in Indoor Environmental and Energy Engineering (IEEE 8), Department of the Built Environment, 2022.

I am responsible for one lecture about the different numerical modelling approaches, and more specifically the metamodeling approach and its use for design exploration and optimization.

From 2018 to 2022, I have supervised 28 Master students (15 Master Thesis projects) for their master thesis (30 ECTS and 50 ECTS) on various topics of indoor environment and building energy for the Master Program of Building Energy Design (BED 4), the Master Program of Indoor Environmental and Energy Engineering (IEEE 9-10) and international student interns coming to AAU-BUILD for an internship.

In addition to my supervision activities for master students, I am active laboratory support and adviser for most projects involving experimental investigations in laboratories for both Master's projects and PhD projects.

2. Study/programme administration and management: Experience in programme management and coordination. A list of study administration tasks, e.g. study board membership, chair of study board, semester or course coordinator, accreditation tasks, etc. Experience in planning teaching activities. Experience in programme development. Participating in committees and commissions etc. on education issues.

In 2020 I was the leader of the post-corona pilot project for the digitalization of education at AAU-BUILD (Department of the Built Environment): the creation of digital twins (interactive numerical simulations) for experimental laboratory setups to be used for online teaching with students when laboratories are not available and online teaching is required (for example, during pandemics).

In reaction to the decline of student enrolment in the study programs of the Department of the Built Environment, I initiated in 2018 the creation of a task force focusing on the advertisement of our study programs to students from high schools and university colleges in Denmark and outside of Denmark. I have been leading (2018-2022) advertisement activities to attract international and Nordic students (Norway, Sweden, Finland, Iceland, Faroe Islands, Greenland) to integrate our bachelor and master programs. To that matter, I am visiting different institutions in Nordic countries to present our study programs, organize an online seminar to inform potential student applicants and organize information seminars and laboratory visits to students from external institutions.

3. Formal pedagogical training: A list of completed courses in university pedagogy, PBL courses, workshops, academic development projects, collegial guidance and supervision, etc. Written assessment from the course in university pedagogy for assistant professors. Participation in conferences on pedagogy and didactics. Please enclose any documentation of the above, such as course certificates, references, etc

Type you have participated in the training program "University Pedagogy for Assistant Professors" (Universitetspædagogikum) in 2021 and have received the diploma in 2022

4. Other qualifications: Conference contributions and attendance, contributions to debates, scientific articles on pedagogical issues etc. Peer supervision, editorials, mentoring experience or other types of competence development activities.

H. Johra, L. Rohde, E. Petrova (2020). Video game-based learning for teaching building thermodynamics and control of HVAC systems (Extended Abstract). Book of Abstracts of the BuildSim-Nordic Conference 2020. https://buildsimnordic2020.ibpsa-nordic.org/wp-content/uploads/2020/10/BuildSim-Nordic-2020_BookOfAbstracts_v6_FINAL.pdf

Johra, H., Petrova, E. A., Rohde, L., & Pomianowski, M. Z. (2021). Digital Twins of Building Physics Experimental Laboratory Setups for Effective E-learning. *Journal of Physics: Conference Series (Online)*, 2069(1), [012190]. <https://doi.org/10.1088/1742-6596/2069/1/012190>

Digital twin prototype of a simple hydronic heating system for the digitalization of experimental setup exercises at Aalborg University, Department of the Built Environment: https://youtu.be/F4ZU_8z5c18

5. Pedagogical development and research: Development of new courses, teaching materials, teaching methods, examination types or other types of pedagogical development. Didactic and pedagogical research. Cooperation with external collaboration partners.

Lecture Notes:

Johra, H. (2019). Thermophysical Properties of Building Materials: Lecture Notes. Department of Civil Engineering, Aalborg University. DCE Lecture notes No. 76

Johra, H. (2019). Simple Data Pre-processing of the Laser Flash Analysis Results from the LFA 447 Apparatus. Department of Civil Engineering, Aalborg University. DCE Lecture notes No. 72

Johra, H. (2019). Description of the Laser Flash Analysis Method for Thermal Diffusivity Measurement with the LFA 447. Department of Civil Engineering, Aalborg University. DCE Lecture notes No. 73

Johra, H. (2020). Assembling temperature sensors: thermocouples and resistance temperature detectors RTD (Pt100). Department of Civil Engineering, Aalborg University. DCE Lecture notes No. 78

Johra, H. (2021). Basic Troubleshooting for Experimental Equipment. (1 ed.) Department of the Built Environment, Aalborg

University. DCE Lecture notes No. 77

Johra, H. (2019). Guide to Manually Refill the Liquid Nitrogen Tank of the LFA 447 Apparatus. Department of Civil Engineering, Aalborg University. DCE Lecture notes No. 74

Johra, H. (2019). Description of the Guarded Hot Plate Method for Thermal Conductivity Measurement with the EP500. Department of Civil Engineering, Aalborg University. DCE Lecture notes No. 75

Johra, H. (2019). Cleaning Procedure for the Guarded Hot Plate Apparatus EP500. Department of Civil Engineering, Aalborg University. DCE Technical Reports No. 265

Johra, H. (2020). Coating Translucent and Semitransparent Material Samples for Laser Flash Analysis. Department of the Built Environment, Aalborg University. BUILD Report Vol. 2020 No. 22 <https://sbi.dk/Pages/Coating-Translucent-and-Semitransparent-Material-Samples-for-Laser-Flash-Analysis.aspx>

Johra, H. (2022). Overview of the Coefficient of Performance (COP) for conventional vapour-compression heat pumps in buildings. Department of the Built Environment, Aalborg University. DCE Lecture notes No. 79

6. References on your teaching skills from superiors or colleagues. Teaching evaluations and any teaching awards received.

Type your answer here...

7. Personal reflections and initiatives: Here you may state any personal deliberations as regards teaching and supervision, any wishes and plans for further pedagogical development, plans for following up on student feedback/evaluations, etc. Personal reflections on your own pedagogical practice, including objectives, methods and implementation. This should include an analysis and a reasoned description of your pedagogical activities in relation to your pedagogical understanding and student learning. Thoughts on the teaching method at Aalborg University (which is largely based on group-organised project work and problem-based learning)

Type your answer here...

8. Any other information or comments.

Type your answer here...