BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS,
FACULTY OF ARCHITECTURE
DEPARTMENT OF BUILDING CONSTRUCTIONS
Central Building II.40.

Building Constructions – Sustainable Building Design
Semester project description

SUBJECT AND INTENTION OF THE PROJECT

Analyze the energy efficiency of the building of your choice using hourly energy balance simulation.

Build a simplified building information model (BIM), then turn it into a building energy model (BEM) by adding supplementary data. Use the BEM for the dynamic building energy simulation. Calibrate and document the calculation results.

A)   BUILDING INFORMATION MODEL

The simplified model of the semester project building should be prepared using either ArchiCAD or Autodesk Revit. It should contain at least the following:
- Envelope structures (roof, external walls, external fenestration, structures with direct ground contact): the BEM should contain minimum one window and one door
- Space zones
- Multiple thermal blocks (optional)
- Internal thermal block boundaries (optional)

B)   ADDITIONAL BUILDING ENERGY MODEL DATA

In addition to model geometry and material properties (which come from the BIM automatically) provide the minimum information necessary to run a successful building energy simulation:
- Hourly weather data
- Operation profiles
- Basic building system (heating, cooling, ventilation, hot water generation, artificial lighting) parameters

C)   DYNAMIC BUILDING ENERGY SIMULATION

Use the educational or public beta version of one of the following software applications to execute the hourly energy balance analysis:
- Energy Evaluation in ArchiCAD 16
- EcoDesigner Star Public Beta For ArchiCAD 16
- Energy Evaluation in ArchiCAD 17 Beta
- Autodesk Revit and Green Building Studio
- Autodesk Vasari
- Autodesk Ecotect

Calibrate results by comparing them to statistical data. Correct the input and repeat the analysis if necessary.

D)   ENERGY PERFORMANCE EVALUATION REPORT

The documentation must contain the following calculation input data:
- Building energy model geometry: external opaque and transparent space boundary areas
- Description of the applied climate file
- Internal space area and volume with assigned operation profiles and building systems

The calculation result documentation <u>must contain</u> the following output data:
- Thermal conductivities (or resistances) of thermal block boundaries
- Annual energy balance of the project: at least in monthly, but preferably in weekly format
- Annual specific energy demands for heating and cooling
- Amounts of the different fuels consumed by the building systems of the project
- Annual total fuel consumption for heating, cooling, hot water generation, ventilation, lighting and auxiliary appliances
- Annual primary energy consumption
- Annual total and/or specific CO_2-equivalent emission (carbon footprint)

In addition to the mandatory content, the result documentation <u>may also contain</u> the following output data, <u>for extra points</u>:
- Thermal blocks with their areas, volumes, assigned operation profiles and building systems
- Internal opaque thermal block boundary areas
- Annual energy balance of each thermal block: at least in monthly, but preferably in weekly format
- Hourly internal temperature graphs of a selected thermal block on a typical summer, fall, winter and spring day
- Design loads (heating and cooling) for each thermal block, with date and hour of occurrence
- Minimum and maximum internal free-float temperatures in unconditioned thermal blocks, with date and hour of occurrence
- 2D thermal bridge analysis result (thermal-vision view, linear thermal conductivity/resistance) of a detail of the project
- The output of the solar study on a window of the project
- Annual cost of operation
- Unmet load hours and/or degree days
- Building energy performance rating

DATELINES

Signature:　　　　　　　　**30rd of April, 2013**
Submission:　　　　　　　**13rd of May, 2013 12:00 h**
Delayed Submission :　　　**24th of May, 2013 12:00 h** (extra process fee applies)

GENERAL NOTES AND REQUIREMENTS

- After the Delayed Submission dateline, no semester projects will be accepted by the department
- The content of the semester project documentation that must be handed in is detailed in chapter *D) ENERGY PERFORMANCE EVALUATION REPORT.* The semester project documentation's file format is either .PDF or .XLS.
- The task has to be completed with at least three consultations certified by the lecturer.

Budapest, 22nd of March, 2013.

　　　　　　　　　　　　　　　　　　on behalf of:

　　　　　　　　　　　　　　　　　　Miklós Svéd
　　　　　　　　　　　　　　　　　　 lecturer

　　　　　　　　　　　　　　　　　　Dr. Zoltán Hunyadi
　　　　　　　　　　　　　　　　　　 assistant