

What and Why

Diploma: civil engineer in architecture

A particular education to approach technology and structure was developed for the Architect-Engineer. By the intuitive approach, this gives them an advantage to understand and conceptualise building or structure. Further, they also take part in the program of Construction Engineer. Inversely, the first license Constructor student must take part in initiation courses to structure and technology for architect.

Architecture Candidature:

By means of "course" of initiation to structural and technological design with practical works, the following objectives that are targeted are to:

- become familiar with the theoretical concept that lies behind structural understanding and theory of the resistance of materials.
- become familiar with "a way of" taking a structural or technological problem in an integrated way to the project conception
- give the minimum knowledge, in a global approach, to be able to find answers to specific questions

Architecture License:

During the last three years, students approach specialised aspects (technological, structural, and architectural) and receive solid knowledge. A part of this courses is imposed and the rest follows the chosen orientation.

How

Interstitial workshops of architectural structure or technology:

"*interstice*" in French means : a space between two other things or moments. It means that such workshops are performed between two other sorts of work, in addition to a workshop of architectural project. It represents a complement that gives access to theoretical notions necessary to complete a task.

Candidature initiation courses were first interstitial workshops.

The 4th year architecture major imposed workshop is accompanied by "interstitial" workshops on specialised aspects: structure, indoor and outdoor climate, technology aspects. Some seminars complete the required knowledge, and the projects must integrate these considerations in global conception and detailing.

"course" of initiation to structural and technological design with practical works:

originally a collection of simple experiences given with light theoretical support during an "interstitial" workshop. This candidate teaching evolves toward a more structured new type of lesson in which theory is also transmitted by means of experience. Emphasis is made on the use of

model. Sensible experiences permit to understand the consequences of structural or technological rules or choices.

Two courses are available:

- FSAR 1382: Theory and technology I (1st year architecture):
brief history of structural design and experiments on the different states of tension of materials by means of foam and wood basic structure with theoretical intervention of the teacher and synthesis exercises on the global conception of a timber tower with scale models and pre-calculations
- FSAR 1482: Theory and technology II (2nd year architecture and 3rd year construction):
 - analysis of existent structures from great structural buildings with calculations by hand and computer and realisation of a structural model.
 - conception of an exposition room with a timber footbridge, including detailing of joints, walls, and structure.A more conventional lesson is given in parallel on the "structural and technological aspects"

In Louvain-la-Neuve, technology and architectural structure are taught in four ways:

- Intersticiels workshops on structure or technology
- "course" of initiation to structural and technological design with practical works
- "intersticiels" workshops on structure and/or technology (within architectural projects)
- course of technology and/or orientated workshop

The fourth way may seem to be a more conventional course. Let's begin with our original ways to teach these subjects.

" Intersticiels" workshops of architectural structure or technology:

In the beginning, structure was only taught with the more conventional way of lessons in which all possibilities of structure or technology were reviewed. But there were lack in the sensible way to approach such problems (in architectural project, for example).

"intersticiels" workshops were then developed. "Intersiciel" come from the French word "interstice", which means a sort of space between two other things or moments. This means such workshops where perform between two other sorts of work, in addition to a workshop of architectural project. This was a complement to give access by a sensible way to theoretical notions that were necessary to complete their work.

These "intersticiels" workshops were a collection of simple experiences in association with light theoretical support. Sensible experiences could permit to understand the consequences of structural or technological rules, to be integrated in their project.

Along the time, these suite of experiences became more structured and could become a complete new sort of lesson in which theory was transmitted as a personal journey in the knowledge by the way of experience.

PART II: conception of an exposition room with a timber footbridge, including all detailing of joints and wall, and structural preoccupation.

A more conventional lesson is given in parallel on the "structural and technological aspects"

These parts of the program is prescribed to all student.

"Intersticiels" workshops in structure and/or technology (within architectural projects):

For the ARCH22 student (4th year architecture), the major workshop in architecture is since a little accompanied by "intersticiel" workshops on specialised aspects such as: structure, indoor and outdoor climate, technology aspects. Some seminaries are given to deal with the minimum knowledge, and projects must integrate all these considerations in the global conception and detailing.

This part of the program is prescribe to all student

Orientation Structure and Technology

From the 4th year, students must choose between 4 orientations: climate, Struct&techno, urbanism, formal conception.

If Struct & Techno is chosen, students in the two last years will encounter more workshops and lessons related to structure & technology. They must achieve an end-of-studies-work that deals more particularly with technological or structural aspects.

Who

The structure of the personnel staff is divided into cells:

- Structure and technology
- Climate
- Theory and history of architecture and the city
- Urbanism

Specialised courses are given by professors of the staff of these cells, or by external intervening specialists in a particular domain. Members of the cells have normally been researchers, and have a thorough knowledge in these domains. As for the workshops, it is preferred that they are delivered by a teacher who has a professional practical in architecture.

For interstitial workshop, the teacher must gather the two aspects, which can be problematic. Nearly all intervenants are part-time workers for the university. This situation is not exactly corresponding to what is attempted from an academic member, and is unfortunately therefore not encouraged.

When and to What extent

Candidature

1st year: Theory and technology I [FSAR 1382]: 8 UA
2nd year: Theory and technology II [FSAR 1482]: 11 UA

1 UA (unité d'apprentissage, i.e. Unit of Learning) =

4 hours in lessons or supervised workshops

8 hours personal work including 4 hours in lesson or workshop

The concept of UA has made its apparition with the reform of the

candidature years. This reform [CANDI 2000] insists on personal learning and ability of working within a group.

Prescribe in license

Lessons prescribe to all students: distributed on 3 years: 202,5 h

Interstitial associated with the major 4th year conception workshop of 60h [AMCO 2525]:

intersticiel structure and technology [AMCO 2384]: 30h

intersticiel climate [AMCO 2364]: 15h

Optional in license

Optional lesson following chosen orientation attached to architecture: 127,5 h

Optional lesson following chosen orientation attached to constructor engineer: 157,5 h

4th year [license]: workshop following orientation [AMCO 2526/7/8/9]: 120 h

End of study work in the chosen orientation

- seminars 120 h

- personal work ≈ half year

One year ≈ 2 x 450 h of lesson of workshop

Candidature

Contents are fixed but must evolve towards a compromise between direct and sensible approach and the ultimate state method now in rules for calculations.

Technical subjects must continually be update.

Practical works are guided by a "protocol". This protocol describes the experiences to deal with, or the approach to adopt, to analyse a problem or project. Some of these evolve to accentuate some aspect of the theory, or to organise more efficiently the work of the students.

These protocols will be next finalised and take part in the educational project of l'Isle d'Abeau (France).

Some of the results of the student work will be re-used as pedagogical examples.

License

In general, contents are also fixed.

New courses appear in accordance with the demand of the profession or new developments: great project management, wood architecture and timber structure conception, restoration techniques,

To be pertinent, the content of the intervention during the interstitial workshop must be adapted to the project that is dealt with. This means: competence must be available in the teacher's mind. It also means that teacher must be a practitioner.

Virtual reforms

ARCHITECTURAL STRUCTURE AND TECHNOLOGY TEACHING IN



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- give the minimum knowledge, in an global approach, and/or learn to find response to specialised ask

Architecture License :

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HOW

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brief history of structural design + a group of experiences on the differents states of stress in the matter by means of foam and wood basic structure with theoretical intervention of the teacher + synthesis exercise on the global conception of a timber tower with scale model and pre-calculations

- FSAR 1482: Theory and technology II [2nd year architecture and 3rd year construction]:

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 Final work in the chosen orientation
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SECOND YEAR ANALYSIS WORKSHOP

3. Calcul du poids de la neige sur la structure.

Il est évident que plus la structure formera un angle se rapprochant de l'horizontale, plus la neige s'accumulera sur celle-ci. Il y a donc lieu étant donnée la forme de la structure étudiée de tenir compte de cette neige. Pour ce faire dans la même optique que celle de l'étude du vent, nous avons séparé la surface de recouvrement exposée à la neige en deux parties comme sur le dessin ci-dessous.

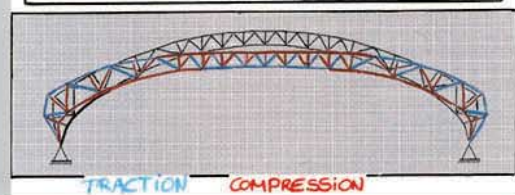


Cette subdivision nous permet de considérer une accumulation équivalente de la neige sur l'ensemble de la partie B' (contenant 14 nœuds). L'accumulation de la neige sur la partie A' (contenant 2 nœuds) est ignorée étant donné l'angle d'inclinaison important sur cette structure.

- a) **Calculs préliminaires.**
 - Surface de B' : $S_B = 11,42 \text{ m} \times 47,5 \text{ m} = 542,45 \text{ m}^2$
 b) **Poids de la neige sur la partie B'**
 La charge de la neige étant de $0,4 \text{ kN/m}^2$
 $0,4 \times 542,45 \text{ m}^2 = 216,98 \text{ kN}$

ANALYSIS BY MODEL AND CALCULATIONS

DÉFORMÉE SOUS L'ACTION DE CHARGES PONCTUELLES APPLIQUÉES AUX NŒUDS. LES BARRES EN COMPRESSION ET EN TRACTION SONT ÉGALEMENT REPRÉSENTÉES.



EXISTING BUILDING ANALYSIS

