

Undergraduate Technological Degree

**CIVIL ENGINEERING
– SUSTAINABLE CONSTRUCTION**

1. Preface

In France, courses in civil engineering concern the whole of the construction sector. Thus it corresponds with the English Language definition « Civil Engineering » which brings together the diverse domains of the Building and Public Works sector, such as industrial construction, individual or group construction, transport infrastructure, urban installations, the environment.

A major sector in the French economy

The following figures reflect the economic importance and dynamic character of this sector in 2011:

- **Production in the Building and Public Works sector:**
 - Turnover: 170 billion Euros (11% of GNP)
- **Companies**
 - 488 000 companies
 - (1 company out of 10 belongs to the Building and Public Works sector)
- **Employees**
 - 1 460 000 employees
 - (1 employee out of 10 works in the Building and Public Works sector)
 - Workmen: 69.6%
 - Employees, technicians, supervisors: 21.1%
 - Engineering executives: 9.3%
- **Professional training**
 - Trainees: 305 000
 - Vocational contracts: 12 720

Source: « Observatoire Prospectif des Métiers et des Qualifications »

New challenges to rise to

Today, transport networks are more complex, constructions more daring, materials more varied, but the mission remains the same: to provide society with the buildings and facilities which are needed, whilst working within the framework of sustainable construction, and respecting future generations.

Environmental factors apply today to all those involved in the construction sector and sustainable construction concerns all building projects. Each of these must be designed to ensure the comfort and health of users, to limit effects on and fit into the environment using natural and local resources as best as possible.

Beyond the usual aging of existing constructions, and as well as the growth in demand for accommodation and infrastructures which are not currently sufficient, new imperatives linked to aspects of sustainable development will lead to a greater need in qualified workers in the Building and Public Works sector. It is particularly necessary to take into account:

- The improvement of thermic and acoustic performance in existing buildings,
- The obligation to remove and treat materials recognised as dangerous to health which are still present in pre-1995 buildings,
- The respect of demands in accessibility,
- The development of new urban transport networks.

Another major factor concerns the health and safety of the workforce. This question is of major importance in the Building and Public Works sector, when the employers' broad and weighty obligations in this matter are taken into consideration, particularly for construction site personnel.

Finally, national standards in sizing and testing of structures have been replaced by Eurocodes. These are or will be obligatory for all projects of justification of stability and solidity of constructions in France and Europe.

2. Course objectives

The DUT diploma in Civil Engineering - Sustainable Construction aims to train senior technicians over four semesters who will possess a high degree of technological skill, as well as being familiar with the non-technological aspects of the profession, such as project management. They may work either in building project ownership (work planning), or building project management (engineering dept.) or in works (construction firms). Their skills cover all construction techniques, from foundations to structures to technical installations, and from the stability of constructions to questions of thermic, acoustic and visual comfort, from choice of materials to the definition of construction techniques, from terracing to road systems, or works of art.

These senior technicians are not expected to do the work of engineers, whose responsibility they often work under, but they must be able to understand the sense and outcome of work.

The course takes place in a university environment, with a scientific and general curriculum covering a wide range of subjects, which allows the students to understand projects within their broader context.

First of all it looks at the founding ideas behind the Building and Public Works sector and is not intended to produce specialists in any particular domain. It allows students to acquire a set of practical skills for all problems common in a works programme, from design of constructions to their building on the site.

Senior technicians trained in this way may be immediately operational within Building and Public Works companies, engineering or method departments, laboratories, administrative organizations or service companies.

According to their professional project and their skills, students in civil engineering may follow a complementary course, particularly a vocational degree.

The course aims to give students the knowledge and skills necessary to reply to the demands of sustainable development and the swift transformation of jobs in the vast domain of construction. It also aims to develop the skills necessary for the senior technician in the workplace, such as improvement in communication, or team coordination or management.

Finally, the programme encourages the senior technician in Civil Engineering - Sustainable Construction to be aware of the human, social, economic and legal factors of health and safety at work, and to take these into account when managing his or her activities and projects, or within the company.

3. Reference system of activities and skills

Whilst remaining non-specialized, the course prepares students for a wide variety of jobs which may be classed into three major sectors according to the context of the activity and targets:

- Building project ownership
- Building project management
- Organization and running of a construction site;

which, according to the most recent national study of *IUT* Technical Faculty graduates' career routes, (2012) correspond respectively to around 10%, 40% and 50% of the types of job occupied by Civil Engineering–Sustainable Construction DUT diploma graduates.

By the end of the course, students will have a good knowledge of what construction is and will be able to identify the major functions, use certain basic management techniques and take into account the major human factors involved in organization.

To this effect, skills in communication and languages will be developed in order to allow the graduate to

find a job and improve his or her position in the best possible conditions.

MAIN JOBS TARGETED (OFFICIAL « ROME » JOB CATEGORY REFERENCES):

CODE ROME	TYPES OF JOBS
F1104	<ul style="list-style-type: none"> • Building and Public Works design
F1201	<ul style="list-style-type: none"> • Running a Building and Public Works project.
F1106	<ul style="list-style-type: none"> • Engineering and studies in the Building and Public Works sector
F1202	<ul style="list-style-type: none"> • Site management.
F1108	<ul style="list-style-type: none"> • Quantity surveying in construction
F1204	<ul style="list-style-type: none"> • Safety in the Building and Public Works sector.

a. Domain of building project ownership

The building project owner is the company which orders the project and for whom the construction work is carried out. This is the project backer who is responsible for financial costs. This domain, towards which more and more of our graduates are turning, is still largely ignored by our students. These are jobs as technical assistant to project owners during the programming and running of new works projects, as well as jobs in maintenance and upkeep of constructions.

MAIN ACTIVITIES AND SKILLS ASSOCIATED

ACTIVITIES	SKILLS
<p>TECHNICAL ASSISTANCE</p>	<ul style="list-style-type: none"> • Checking the feasibility of a project with reference to the existing site and building. • Participating in the establishment of a design brief which includes the demands of environmental performance. • Planning the studies, actions, technical checks at all stages of work (survey of the land, depollution, archaeological digs, sanitary diagnoses, identification of existing buildings). • Establishing reports on works progress and making guarantee claims. • Ensuring work conforms to the project, technical and environmental standards, and establishing adjustments. • Managing expenditure with reference to the budget. • Participating in the setting up of safety and health management. • Participating in works reception (client delivery, use of reserves). • Analysing studies produced by building project supervision teams during invitation to tender.

MAINTENANCE AND UPKEEP

- Organizing, coordinating and checking upkeep and maintenance operations and the viability of infrastructures and constructions (works, networks, buildings, roads, ...) according to the rules of safety and environment and operational imperatives using risk assessment.
 - Ordering technical feasibility studies, consultancies, for the renewal, upkeep and repair of infrastructures and buildings.
 - Selecting suppliers, contractors, comparing offers, negotiating contract conditions and checking that contract work is done, products and materials used, functioning and performance of installations...
 - Coordinating and managing supplier / contractor contracts.
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b. Domain of building project management

Building project management is the set of functions linked to construction engineering during the successive phases of design, studies, carrying out and control of works:

- The range of jobs concerned is very wide: from jobs in engineering or test departments, or laboratory technician, design draughtsman, quantity surveyor, etc., to jobs in test and maintenance engineering.
- These posts require specific skills relative to the running of meetings.

PRINCIPAL ACTIVITIES AND SKILLS ASSOCIATED

ACTIVITIES	SKILLS
FEASIBILITY STUDIES	<ul style="list-style-type: none"> • Helping customers to express their needs, studying the feasibility and cost of a project according to technical, economic and environmental factors. • Using sustainable construction procedure and integrating this with classic construction rules.
PRE-PROJECT STUDIES	<ul style="list-style-type: none"> • Monitoring the conformity of land and subsurface reconnaissance operations (measurements, geotechnical analyses ...) • Taking measurements of probes, drilling, land and subsurface pollution and checking their conformity. • Establishing and formalizing the results of analyses and measurements using reports, accounts, publications. • Establishing and pricing the project portfolio (plans, quantity surveys, estimates) • Carrying out topometric calculations and topographical surveys of terrain.

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- Establishing the tender documents.
 - Including risk management for safety and health of workers and public in the tender documents and construction studies.
 - Assessing the quantity of materials and the total work hours necessary for the work to be done.

TECHNICAL STUDIES AND METHODS

- Determining the demands applied to a construction according to market documents, regulations, the site, natural risks...
- Sizing simple constructions.
- Making working drawings for projects, structures and infrastructures, and their facilities, respecting the norms of representation in place.
- Proposing technical solutions and defining the equipment and materials according to regulations, the site, the cost and performance expected, as well as their environmental impact.
- Defining the means and methods to be implemented, planning the running of worksite operations according to cost, deadline, performance targets, taking into account the company works department's observations and risk prevention linked to co-activity and surroundings.
- Participating in technical monitoring.
- Assessing environmental impact of a construction on its life cycle and comparing different variants.
- Taking into account accessibility and applying rules concerning persons with reduced mobility.

ECONOMIC STUDIES

- Calculating the per unit cost of basic constructions.
- Establishing the total implementation cost of a construction at different placements of a project.
- Preparing provisional and definitive project billing.
- Implementing an analysis which includes economic, environmental, sanitary and legal criteria.

OPERATIONS AND MONITORING OF WORK

- Carrying out the Scheduling, Piloting and Coordination of worksites.
 - Regular monitoring of the conformity of a construction and its facilities to the project and standards in place, through to the end of work.
 - Being responsible for the prevention of health and safety risks for both workers and
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the public.

- Implementing Quality Control Procedures.
- Applying market administrative procedures.
- Implementing adequate worksite nuisance control and managing waste.

MONITORING AND DIAGNOSIS TECHNIQUES

- Establishing or updating diverse infrastructure and networks plans.
- Checking existing constructions and carrying out technical diagnoses (solidity, safety, performance of facilities...), or sanitary diagnoses (asbestos, lead, parasites, gas, air quality...) according to regulations in place.
- Monitoring the conformity of elements of main and secondary structural work according to existing quality, technical standards and environmental criteria.
- Guaranteeing the safety and health of workers and users during monitoring and technical diagnosis operations on constructions.
- Interpreting any damage reported.
- Assisting the engineer in establishing a diagnosis.

c. Domain of worksite organization and management

These jobs cover the tasks which are necessary for the general organization of worksites and the smooth running of the work, particularly as concerns safety:

- Site foreman or assistant foreman.
- Site manager or assistant site manager.
- Quantity surveyor.
- Business manager.
- ...

These posts demand specific skills relative to an aptitude in the management and running of teams.

PRINCIPAL ACTIVITIES AND SKILLS ASSOCIATED

ACTIVITIES

SKILLS

WORK AND WORKSITE MANAGEMENT

- Consulting and choosing suppliers, sub-contractors, service suppliers.
 - Defining the work context, the nature of work to be done, if necessary giving advice on materials and implementation.
 - Replying to invitations to tender, in collaboration with various engineering departments.
 - Estimating the cost of work and establishing a quote with detailed description.
 - Designing and carrying out the installation of the worksite.
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- Adjusting technical, financial and human aspects and updating the work schedule.
 - Forecasting needs in materials, placing orders so as to ensure steady supply of materials.
 - Checking deliveries are conform.
 - Establishing invoices.
 - Watching over the progress of work, analysing and focusing on any difficulties identified, adjusting the placing of personal.
 - Controlling the conformity of application of regulations, procedures and quality instructions.
 - Optimising operating modes, giving out work and instructions.
 - Checking worksite personnel skills, checking authorization for certain regulated operations, identifying purchases needed and capacities of progress of workforce.
 - Preparing for the reception of construction, checking the lifting of reservations.
 - Checking the conformity and quality of constructions.
 - Preparing meetings and worksite visits.
 - Listing supplementary work needed and justifying this to the project owner.
 - Following up graphic documents or technical notes and putting together the Further Work Documents.

**QUALITY
SAFETY
ENVIRONMENT**

- Analysing the risks of professional accidents, risks linked to coactivity on the site, by referring to the work schedule and its updates.
 - Applying the general principals of prevention for the study and preparation of solutions to particular risks on the worksite.
 - Informing the personnel and contract workers of safety measures in place.
 - Waste management.
 - Drafting or completing the Individual Safety and Health Protection Plan.
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4. General course organisation

a. Description of course

The DUT diploma course in Civil Engineering– Sustainable Construction consists of a major, which guarantees the core skills and complementary studies which the student must choose according to his or her Personal and Professional Project (PPP).

This document defines the objectives and contents of the core teaching units, as well as the vocational complementary studies. The complementary studies leading to further studies are the object of a document published separately. Whatever study route is chosen, they are an integral part of the DUT Technology university diploma.

Core skills

The core skills programme is organized into modules of 30 hours of face to face teaching, including assessment, in the form of lectures in front of the whole year (CM), tutorials with 26 students (TD) or workshops with half of this group, 13 students (TP).

The course is structured into 4 semesters over 62 weeks minimum. In each semester, the modules are organized into 3 teaching units (UE) each including 3 to 7 modules, with the exception of semester 4 when the work placement takes up an entire teaching unit. Each teaching unit is capitalizable. A module cannot be part of several teaching units. A teaching unit must begin and finish in the same semester.

The objectives of each module and the skills expected upon finishing are defined at the national level by the present programme. Organization of reaching these goals is left up to the teaching team, within the strict respect of 30 hours per each module and the global planning into lectures, tutorials and workshops within each teaching unit. (see tables p. 11 to 14).

Complementary studies

The student is required to choose 9 complementary modules in semester 4, which will broaden his or her core skills with either vocational goals or further studies in mind, in coherence with the Personal and Professional Project. To this must be added the end of studies project and the work placement which help to construct the student's study route and career path (job or further studies, project ownership or management or works, construction sector or public works sector).

The vocational complementary modules are described in the present programme. They are identified by the letter C in the tables. The work placement in the fourth semester and the end of studies project are an integral part of the vocational preparation process.

Each complementary module lasts 30 hours.

The complementary modules destined to prepare further studies depend on the study route the student decides on within his or her Personal and Professional Project (PPP). These are the object of a separate publication.

Locally, each Civil Engineering department can construct its offer of complementary modules, by adapting 2 modules at the most in semester 4, according to local specific conditions.

Organisation of semesters

The course study route is organized so as to develop the student progressively from young « fresher » high-school leaver to young professional ready to join the workforce.

The first semester is thus designed as a transition semester for all high-school leavers and particularly those from the technology sector. For this reason its length is 17 weeks (instead of 15 weeks for the other semesters), in order to limit the weekly workload. Moreover the course modules of this semester have been designed with realistic and sometimes modest objectives, allowing students to adapt to an environment, a rhythm, a work method and to new subjects.

During this first semester, the « university study methods » module accompanies the student through this transition period and helps him or her to adapt according to their previous study sector.

Modules of a scientific nature in this semester do not participate in the construction of fundamental knowledge necessary to technological skills.

The fourth semester is quite clearly focused on the student's final professionalization. At this point the student will be expected to put knowledge acquired on the course into practice, particularly through his or her work placement and end of study project.

All programme modules (core skills and complementary modules) correspond to 7 major themes:

- Theme 1: Construction
- Theme 2: Management and methods.
- Theme 3: Materials and geotechnical studies.
- Theme 4: Structures and Stability.
- Theme 5: Applied Physics– Comfort – Energy.
- Theme 6: General studies.
- Theme 7: Professionalization.

See the complete list of modules p 23.

SUMMARY OF TEACHING UNITS PER SEMESTER

SEMESTER 1	TU 11	Materials and technology
	TU 12	Professional environment
	TU 13	Sciences and modelling
SEMESTER 2	TU 21	Construction and works
	TU 22	Professional communication
	TU 23	Sciences and structures
SEMESTER 3	TU 31	Facilities and works
	TU 32	Project management
	TU 33	Materials and structures
SEMESTER 4	TU 41	Professional reinforcement
	TU 42	Sustainable construction
	TU 43	End of studies project
	TU 44	Work placement

HOURLY TIMETABLE PER SEMESTER

SEM.	LECTURE	TUTORIAL	WORKSHOP*	Trans-disciplinary teaching	Lecture Tutorial	Tutor-supervised project	Total	Length
S1	114	160	136	54	36	(75)	500	17 weeks
S2	94	154	162	40	20	(75)	470	15 weeks
S3	92	172	146	40	20	(75)	470	15 weeks
S4	26	70	184	34	46	(75)	360	15 weeks
TOTAL	326	556	628	168	122		1800	
TOTAL	1510	290	300	2	100			62 weeks

* Languages, expression-communication modules + modules M1206 and M4101C

b. Summarising table of modules and teaching Units ("UE") per semester

Objectives of semester 1:

- Allow immersion of student in the Public Buildings and Works sector
- Ease the transition towards IUT technology faculty style of teaching
- Broaden knowledge learnt at high school and introduce technological subjects

SEMESTER 1

TEACHING UNIT (TU)	MODULE REFERENCE (M)	MODULE NAME	COEF. /M	TOTAL COEF. /TU	TOTAL HOURS CM	TOTAL HOURS TD	TOTAL HOURS TP	TOTAL HOURS STUDENT /TU
TU 11: MATERIALS AND TECHNOLOGY	M 1101	Graphic language	1,5	10	6	8	16	30
	M 1102	Structural building work	1,5		10	4	16	30
	M 1103	Materials	1,5		14	0	16	30
	M 1104	Granuar materials	1,5		10	4	16	30
	M 1105	Fluids networks	2		8	14	8	30
	M 1106	Basics of Topography	2		2	8	20	30
TOTAL TU 11			10	10	50	38	92	180
TU 12: PROFESSIONAL ENVIRONMENT	M 1201	Basic construction operations	2	10	6	12	12	30
	M 1202	Expression - Communication	2		20	10	30	
	M 1203	Modern Language 1	2		16	14	30	
	M 1204	Tutor-supevised project I	2		(75h of personal work)			
	M 1205	PPP (SI)	1		8	12	20	
	M 1206	Methodology of university study	1		14	16	30	
TOTAL TU 12			10	10	14	78	48	140
TU 13: SCIENCES AND MODELLING	M 1301	Basic structure calculation	1,5	10	8	14	8	30
	M 1302	Constraints in structures	1,5		8	14	8	30
	M 1303	Forces acting on structures	2		10	20	30	
	M 1304	Hydraulics	2		8	14	8	30
	M 1305	Basic mathematics for the technicians	1,5		8	18	4	30
	M 1306	Mathematics	1,5		8	18	4	30

TOTAL TU 13	10	10	50	98	32	180
TOTAL HOURS SEMESTER 1 (17 weeks)	30	30	114	214	172	500

As concerns « Learning Differently », whose objective is teaching innovation, article 15 of the order of 3.8.2005 states that a length of time of around 10 % of the tutored course must be given to independence in the gaining of knowledge in order to help students to progress. This is the subject of the specific module « methodology of university study » in S1, but also of teaching actions dispensed in each of the subjects within the teaching times planned for each module.

Objectives of semester 2 :

- Discover the specialized subjects of the Building and Public Works Sector
- Company awareness

SEMESTER 2

TEACHING UNIT (TU)	MODULE REFERENCE (M)	MODULE NAME	COEF. /M	TOTAL COEF. /TU	TOTAL HOURS CM	TOTAL HOURS TD	TOTAL HOURS TP	TOTAL HOURS STUDENT /TU
TU 21: CONSTRUCTION AND WORKS	M 2101	Acoustic and visual comfort	2	9	8	14	8	30
	M 2102	Binders, concretes and coatings	2		10	4	16	30
	M 2103	Structural and finishing work	1,5		10	4	16	30
	M 2104	Public sector works	1,5		10	4	16	30
	M 2105	Topography applied to a project	2		2	8	20	30
TOTAL TU 21			9	9	40	34	76	150
TU 22: PROFESSIONAL COMMUNICATION	M 2201	Planning works	2	11	6	12	12	30
	M 2202	Expression - Communication	2			20	10	30
	M 2203	Modern language 2	2			20	10	30
	M 2204	Applied Informatics	2			2	30	30
	M 2205	Tutor-supervised project 2	2					(75h of personal work)
	M 2206	PPP (S2)	1				20	20
TOTAL TU 22			11	11	6	72	62	140
TU 23: SCIENCES AND STRUCTURES	M 2301	Displacement in structures	2	10	8	14	8	30
	M 2302	Basics in reinforced concrete	1,5		8	14	8	30
	M 2303	Metallic construction 1	1,5		8	14	8	30
	M 2304	Electricity	1,5		8	14	8	30
	M 2305	Energy studies	1,5		8	14	8	30
	M 2306	Mathematics 2	2		8	18	4	30
TOTAL TU 23			10	10	48	88	44	180
TOTAL HOURS SEMESTER 2 (15 weeks)			30	30	94	194	182	470

As concerns « Learning Differently », whose objective is teaching innovation, article 15 of the order of 3.8.2005 states that a length of time of around 10 % of the tutored course must be given to independence in the gaining of knowledge in order to help students to progress. This is the subject of the specific module «

methodology of university study » in S1, but also of teaching actions dispensed in each of the subjects within the teaching times planned for each module.

Objectives of semester 3:

- Improve technological knowledge
- Finalize one's professional project

SEMESTER 3

TEACHING UNIT (TU)	MODULE REFERENCE (M)	MODULE NAME	COEF. /M	TOTAL COEF. /TU	TOTAL HOURS CM	TOTAL HOURS TD	TOTAL HOURS TP	TOTAL HOURS STUDENT /TU
TU 31: FACILITIES AND WORKS	M 3101	Basics in geotechnical studies	1,5	10	10	8	12	30
	M 3102	Geotechnical studies for the technician	1,5		10	8	12	30
	M 3103	Shells and ventilation	1,5		8	14	8	30
	M 3104	Energy management	1,5		8	14	8	30
	M 3105	Building projects	2		6	8	16	30
	M 3106	Public works projects	2		6	8	16	30
TOTAL TU 31			10	10	48	60	72	180
TU 32: PROJECT MANAGEMENT	M 3201	Preparation of works	1,5	13	6	16	8	30
	M 3202	Worksite management	1,5		6	16	8	30
	M 3203	Expression – Communication 3	1,5		20	10	30	
	M 3204	Modern language 3	2		20	10	30	
	M 3205	PPP 3	1		20	20		
	M 3206	Work Placement	2		(4 weeks minimum)			
	M 3207	Case study	1,5		30	30		
	M 3208	Tutor-supervised project (S3)	2		(75h of personal works)			
TOTAL TU 32			13	13	12	92	66	170
TU 33: MATERIALS AND STRUCTURES	M 3301	Hyperstatic structures	1,5	7	8	14	8	30
	M 3302	Reinforced concrete for technician	2		8	14	8	30
	M 3303	Wood construction	2		8	14	8	30

	M 3304	Mathematics 3	1,5		8	18	8	30
TOTAL TU 33			7	7	32	60	28	120
TOTAL HOURS SEMESTER 3 (15 weeks)			30	30	92	212	166	470

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Objectives of semester 4:

- Perfecting professionalization
- Applying skills acquired
- Improving project dynamics

SEMESTER 4

TEACHING UNIT (TU)	MODULE REFERENCE (M)	MODULE NAME	COEF. /M	TOTAL COEF. /TU	TOTAL HOURS CM	TOTAL HOURS TD	TOTAL HOURS TP	TOTAL HOURS STUDENT /TU
TU 41: FURTHER PROFESSIONAL STUDIES	M 4101C	Company management and legislation	1	6		14	16	30
	M 4102C	Energy systems	1,5		8	14	8	30
	M 4103C	Structure modelling	1,5			12	18	30
	M 4104C	Modern language 4	2		20	10	30	
TOTAL TU 41			6	6	8	60	52	120
TU 42: SUSTAINABLE CONSTRUCTION	M 4201C	Management and project management	1,5	6	6	12	12	30
	M 4202C	Approach of construction projects	1,5			16	14	30
	M 4203C	Construction and project management	1,5		6	8	16	30
	M 4204C	Sustainable construction	1,5		6	8	16	30
TOTAL TU 42			6	6	18	44	58	120
TU 43: END OF STUDIES PROJECT	M 4301C	End of studies project	4	8			100	100
	M 4302	Project communication	2				20	20
	M 4303	Tutor-supervised project	2					(75h of personal work)
TOTAL TU 43			8	8			120	120
TU 44: WORK PLACEMENT	M 4401	Work placement 2	10	10				(6 weeks minimum)
TOTAL TU 44			10	10				
TOTAL HOURS SEMESTER 4 (15 weeks)			30	30	26	104	230	360

The complementary modules are identified by the letter C

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c. Placement – End of Studies Project – Tutor-supervised project

The work placement and the end of studies project contribute to the concretization of professionalization in direct relation with the company. In order to take into account the two important phases of a construction project which are the initial studies and the carrying out of the work (whatever the size of the company), this professionalization is structured into two complementary and inseparable phases:

- The studies phase, which corresponds to « project ownership » and « project management » skills (see p 5), is studied within the framework of the end of studies project in semester 4.
- The works phase, which corresponds to the « organisation and management of worksites » skills (see p 7), is studied during the work placements, which are organized into two distinct parts, one in semester 2 (working placement) and the other in semester 4 (management placement).

The placement

The work placement, which lasts 10 weeks overall, is split into two parts: 4 weeks minimum in semester 2 and 6 weeks minimum in semester 4.

The first part of the placement, in semester 2, intends to immerse the student in the world of Building and Public Works and help him or her to discover the links between what has been taught and practical aspects. A concrete knowledge of construction techniques is learnt via experience on the worksite which is indispensable, whatever the student's career path may be.

The placement therefore takes place in a construction firm in order to allow the student to understand the different aspects of production and implementation and to understand the function of the different professions working on the site.

This first placement is assessed in semester 3.

The second part of the placement, in semester 4, aims to put the student into a management situation in a company or organization which corresponds to his or her professional project. On the worksite he or she will work in association with the site manager or foreman. In an engineering department, work will be associated with the team of engineers. Taking place at the end of the course, this placement allows the student to spend time in an environment which is really favourable to immediate job-finding or further studies on a sandwich course for a vocational degree.

Looking for the placement company or organization is vital as it is a first preparatory exercise in job-seeking skills and is an integral part of the student's Personal and Professional Project (PPP).

The mission given to the trainee is the object of prior consultation between the company or organization and the department in order to measure the feasibility and interest shared by the 3 parties.

During the whole placement, the student is followed up by both a tutor from the department and from the company or organization. The entire placement process, from looking for a company, the definition of the subject or mission, to the twin tutoring (company and IUT faculty), and the oral presentation, is run in a quality-type framework which defines the responsibilities and procedures, as concerns receiving the trainee in the company, and in the work team, as well as follow-up by the tutors.

This procedure replies to a three-fold charter between the student, the course department and the company or organization, materialized by a placement contract in conformity with regulations.

Assessment of placements.

Placement semester 2

The first year placement, which is a placement for becoming familiar with the world of Building and Public Works, is the object of a written report marked by the teaching staff using a table which is common to all placements.

Assessment is part of the semester S3 curriculum. The precise criteria of report writing are defined beforehand and communicated to the student. They are prepared during Communication classes.

Placement semester 4

The goal of the assessment is to check the level which the trainee possesses or has developed in the skills expected of a senior technician.

This assessment has three parts:

- A written report assessed by a teaching tutor,
- An oral presentation assessed by a mixed teacher / professional jury,
- Activity in the company assessed by a professional tutor.

Each of the assessments will check:

- That general placement objectives have been reached,
- That specific objectives determined by tutors have been reached,
- The demonstration of certain qualities and aptitudes by the trainee.

Each assessment is carried out using a specific table. The mark calculated from the assessment of activity in the company is established automatically according to the criteria filled in in the table.

ASSESSMENT OF PLACEMENTS

PLACEMENT	ASSESSMENT	CARRIED OUT BY	COEFFICIENT
SEMESTER 2	Written report	Teaching tutor	2
	Company activity	Professional tutor	2
SEMESTER 4	Written report	Teaching tutor	3
	Oral presentation	Mixed teacher – professional jury	2
	Company activity	Professional tutor	3

End of Study Project (ESP)

This is an important project with an authentic application lasting 100 supervised hours, to which are added 20h of communication and 75h of tutor-supervised activity. It is a complete project in a professional situation in a Building and Public Works department (methods, structures, terrain, etc.) With a focus on professionalization, it should with preference be supervised by a professional from the Building and Public Works sector and a teacher.

Placement- End of Study Project Complementarity

As far as possible, we will try to organize the End of Study Project and the second placement within the same company, in order to form a coherent whole.

Depending on the student's project, constructed during his or her PPP, the study route may be mainly « Worksite » or « Studies », as shown in the table below.

	PLACEMENT 1	PLACEMENT 2	ESP
DURATION	4 weeks minimum	6 weeks minimum	4 weeks
TOTAL DURATION : 14 weeks minimum			
ACTIVITY	Worksite	Worksite	Studies
	Engineering department	Engineering department	

FUNCTION	Worker		
MANAGEMENT	Project engineer	Project engineer	Project engineer
LOCATION	Company	Company	IUT or Company
SUPERVISION	Company	Company	Mixed IUT/Company

The tutor- supervised projects

The tutor- supervised projects and End of Study Project make up a major part of the course in and by the project. This takes place over the whole of the four semesters and in the form of practical work and students' individual assignments as summarized in the table below:

SEM.	TEACHING UNIT	REF. MODULE	NAME MODULE	COEF.	HOURS WORKSHOP	HOURS WITH TUTOR
S1	TU1	M 1204	Tutor-supervised project	1	2	75
S2	TU2	M 2205	Tutor-supervised project	2	2	75
S3	TU3	M 3207	Case Study	2	30	
		M 3208	Tutor-supervised project	3	2	75
S4	TU4	M 4302	Project communication	2	20	
		M 4303	Tutor-supervised project	4	2	75
		M 4301C	End of study project			(4 weeks) 4100

This project activity represents for the student and for the whole of the course a volume of:

- 150h of practical work (global coefficient 8)
- 300h of independent work (global coefficient of activity of tutor-supervised project: 8)

These projects are done in groups (minimum 2 students) and are supervised as far as possible by a mixed team of teachers and professionals of the Building and Public Works sector. This co-supervision encourages coherence between trainers, teachers and Building and Public Works professionals. It participates in the quality of the course and to a certain extent in the further training of teachers. The trans-disciplinarity of projects demands the participation of all members of the department's teaching staff.

In each project module (supervised or tutored), the assessment of skills expected is carried out with the use of a table of criteria which allows the assessment of skills expected individually. It is important to estimate the ambition of a project in order not to place the student in a position as simple subordinate in a process designed and piloted entirely by the tutors.

A splitting into several projects facilitates the gradual incorporation of knowledge and a gradual progression in learning up to the practical application at the end of the course. This constitutes an approach of the practise of the post of senior technician in a professional situation whose objectives for each semester are the following:

- **In semester 1**
Practical application of knowledge and know-how of communication and research techniques (documentary research, study of a technical theme linked to Building and Public Works, study of a construction, proposition of solutions, making of all or part of an object, ...).
- **In semester 2**

Study of methodology of running projects: drawing up a design brief, group work, time and deadline management, written and oral communication...

The development of human relations skills: independence, development of qualities associated with team work (initiative, aptitude in communication ...).

- **In semester 3**
Experimenting with transdisciplinarity on a Building and Public Works case study. Putting into practice of project running methods.
- **In semester 4**
In this semester, the whole of the three project modules forms a separate Teaching Unit.

d. Personal and Professional Project

The overall aim of the PPP is to allow the student to start to design a realistic project, and to construct a study route which is coherent with his or her aspirations and capacities. This individual project is run thanks to the student's own personal ideas and initiatives. Therefore it is founded on the student's important personal investment concerning documentary research, contacts with the Building and Public Works sector and self-knowledge, and also on sharing the tutor's knowledge and supervision on behalf of the teaching staff.

A reflection on joining the job market in the future requires the acquisition of information relative to the professional environment of the Civil Engineering / Sustainable Construction diploma (sectors, companies, jobs...). This information may be sought by students in documents which are accessible but may also be obtained via the professionals involved. This work will be reported and presented in various forms (presentations, reports...). At the end of this PPP, the student must also be capable of dealing with companies. He must know how to present himself, either in writing (curriculum vitae and covering letter) or orally (presentation of the PPP, motivation). The Personal and Professional Project must allow students to be prepared for their obligatory placement periods and especially to be aware of skills and aptitudes which companies expect of them.

Because of its transdisciplinary character, the Personal and Professional Project makes up an essential part of the course structure.

e. Study routes, teaching through technology

A hands-on, realistic course

Training and teaching close to the reality of companies is indispensable.

The acquisition of skills for the future graduate in Civil Engineering - Sustainable Construction focuses on practical experience in the different domains of Building and Public Works. This practical experience can take place thanks to numerous practical activities whose goal is to familiarise the student with an authentic professional culture in a logic of team work.

Sophisticated technical facilities

These practical activities are carried out using specialised technical resources which are one of the strong points of teaching methods here. These technical resources are made up of materials and devices identical to those used in companies and laboratories in the profession. They link partial theoretical teachings to much broader practical teachings in a highly realistic context. They allow many standardized trials to be carried out and thus place the student in a realistic and concrete situation. By allowing the student to learn the acts and behaviour necessary, the major advantage of these technical resources is that they bring a real professionalization to the course.

Teaching based on transdisciplinarity

Skills rely on both knowledge and skills (know-how), attitudes (key qualities) and capacities to be developed (future knowledge), whose acquisition or mastering is necessary to succeed in studies in precise domains.

Therefore an approach via skills implies a change in teaching style. It means that one has to go from transmitting a content (ex. lecture and application of repetitive exercises) conditioned by a logic of discipline towards the development of learning activities which incite students to act in order to acquire knowledge, but also the skills and attitudes which facilitate learning.

If the programme is organized into modules with a homogenous content, the length and number of these modules, as well as the logic of the transdisciplinary approach in any Building and Public Works project implies having a transdisciplinary vision of their implementation.

Each module will not suffice in itself but must be built and taught whilst taking into account the progressive construction of the student's skills. In fact it is hoped to avoid the construction of fragmented knowledge, which is the simple accumulation of knowledge, but to allow the student to perceive the logic, coherence and articulation of all teachings globally in the light of the project.

Thus a method of learning must be favoured which allows the construction of actions focusing on a goal to reach. We may mention:

- Situation-problem learning methods
- learning methods via the project
- learning methods with e-learning
- Training platforms
- Etc.

Teaching which encourages innovation and independence

Progress in techniques demands that during the course students must be capable of learning by themselves.

This is the goal of «Learning Differently», to help the student towards independence. The « learning through a problem » method for example is not the method for learning most and fastest, but the method for learning best and especially learning to learn. It is all about learning to do what we don't know how to do, by doing it.

f. Taking into account of current economic challenges

The Building and Public Works sector is confronted with new and important environmental, sanitary and economic challenges, as well as challenges in the development of professional skills and in economic development.

Sustainable development

In a complex context of energy management– rising energy costs, rarefication of fossil resources, negative impact of CO2 emissions on the environment, etc., - the Building and Public Works sector represents a strategic issue.

The construction sector is one of the most important in our economy in terms of consumption of resources and impact on the environment. Students on this course will be involved in construction throughout all phases, from design to construction itself. Almost all teaching modules take into account the sustainable development aspect (materials, construction technology, works management...). A summarizing module and the end of study project aim to help the student to become capable of detecting key points which will have a determinant environmental impact (energy efficiency, analysis of life cycle, calculation of carbon footprint and of grey energy

of one or several elements), and also to justify constructive choices via a broad multicriteria approach (technique, risk prevention, total cost ...).

Occupational Health and Safety (OHS)

The prevention of risks is a major issue in improving health and safety of workers in the Building and Public Works sector. During a difficult economic period, it may be perceived as a net expense for the company. However, it has now been established that prevention is also a source of economic performance and that it contributes to excellence of operations.

This question especially concerns future graduates of this course who will be intermediate executives in construction responsible for different levels of health and safety of workers. The course prepares students to identify human, social, economic and legal OHS issues within the company and to take them into account in the management of their activities and projects.

Standardization

Quality construction today for the generations of the future implies taking into account the notions of quality, safety and environment. With this goal in mind the very many standards and regulations in the domain of Building and Public Works are published. Without pretending to be exhaustive, students will be systematically brought into contact with the aspect of standards in all design and sizing modules.

Eurocodes in particular, which allow the harmonization of calculation methods which are useable for checking the stability and sizing of different elements which make up the buildings or constructions of civil engineering, whatever the type of construction or material (concrete, metal, mixed steel/concrete, masonry, timber, aluminium structures, calculation rules for geotechnical projects and seismic rules) will be studied in all modules on construction sizing.

Moreover Thermic Regulations, whose aim is to limit energy consumption in new buildings whether they are residential or for any other use (tertiary), will be an essential element of the course in thermics and energy. Finally, the whole of “the state of the art” rules which are imposed on those in civil engineering (Unified Technical Documents, Ministry of Works calculation rules, standards and protocols of laboratory tests, etc....) are presented and used in all the modules concerned.

Each department is strongly encouraged to use the resources proposed to the teaching sector by numerous specialized organisations (Cimbéton, APK, CSTB-Reef, AFNOR-Sagaweb, etc.) in order to facilitate access to standards and regulations.

Business Intelligence

The Building and Public Works sector is going through big changes:

- New technologies
- New materials
- Demands in performance and quality of construction
- Multiplicity of development grant measures in the sector
- ...

Faced with these changes, senior technicians in Building and Public Works must develop technology and regulation monitoring activities and follow research projects and their results (cluster reports, technical information from the « Centre Scientifique et Technique du Bâtiment”),).

Business intelligence is this capacity to anticipate the evolution of markets from all the information which is available. It aims to take advantage of the opportunities opened by the widening of the activity and the globalization of knowledge.

In certain end of study projects the student may need to deal with or produce confidential information.

As a future senior technician, he will have to manage confidentiality relative to his activities: therefore it is his responsibility to make sure this information is respected, as is the case of any employee in relation to his or her employer.

Reports (end of study project presentation document, end of study project papers, oral presentation), may be consulted by others. The normal approach is non-confidentiality. The confidentiality clause (which prohibits public access to the report and final presentation) can only be invoked in the most exceptional cases.

Entrepreneurship

Taking a company over and more broadly the renewal of generations of entrepreneurs is a major challenge for a sector of activity which contains a large percentage of small companies...

Today managing a company in the Building and Public Works sector requires a higher level of training because of the intense demands within the construction sector:

- Commitment to energy efficiency
- Demands in regulations and environment
- Economic and competitor pressure
- Development and judicialization of client relations

Future senior technicians in Building and Public Works must be aware of the issues involved in managing and running a small company and must acquire skills which go beyond mere construction techniques. The Building and Public Works sector offers personal satisfaction through the creation or taking over of a company within a sector which has almost 500,000 companies.

These notions make up one of the objectives of module M4101C, « Company Management and legislation ».

Project management

Unlike Industry, each construction in Building and Public Works is a prototype. In order to take into account the constraints which are variable from one project to another, a real skill in project management is a major advantage.

The senior technician in Building and Public Works must be able to manage the human and technical resources which are part of the project, within the deadlines. Moreover, he or she must take into account the parameters of co-design, coactivity and the need to adapt to challenges specific to Building and Public Works.

The running of a project in Building and Public Works is a group matter. It brings together professionals from many horizons.

The technician must find his or her place amongst these professionals:

- Public and private project owners
- Architects, project managers
- Directors and works engineers
- Suppliers and financial organisations
- Certificating organisations and controllers
- Risk prevention professionals (institutional and Health and Safety coordination)
- ...

5. Description of course modules

a. Objectives of modules

The objective of the modules is the acquisition of professional knowledge and skills and key qualities for the future technician. Each teaching module constitutes a coherent whole.

Each vocational skill corresponds to a level demanded, three of which are recognised:

- **Level 1: minimum: the student has received the information**
The student has received the information and has been made aware of the techniques and problems. His level of knowledge does not allow him to choose a technique nor a solution. However he is knowledgeable enough to get in touch with a specialist. He understands and uses appropriate terminology.
- **Level 2: standard: the student carries out actions under supervision**
The student has received sufficient information and has enough practical know-how to propose a technique or a solution to his superiors and carry it out in the most usual cases. In more complex cases, he is able to communicate with specialists and carry out their recommendations.
- **Level 3: superior: the student is independent**
The student is entirely independent in his tasks; he has a precise knowledge of existing techniques and sufficient practical know-how to analyse, summarize and assess a situation. He is able to gather and apply his skills in most cases.

b. Assessment of modules

All modules, whatever their form, are submitted to assessment. These assessments allow the attribution of a mark from 0 to 20. Assessment modalities are left to the initiative of teaching staff whilst at the same time respecting the following rules:

- In each module, the number of marks resulting from assessment cannot be less than two
- The proportion of practical activities must be highly valued when calculating the different marks.

The teaching unit averages are calculated from the coefficients presented in the tables on pages 11 to 14.

c. Local Adaptation

In order to adapt to the local environment, and following the advice of the *IUT* technical faculty's council, certain modules may be redefined by each *IUT*. This may concern two modules at the most in the last semester among the complementary modules. These modules allow certain aspects of the specialities of Building and Public Works or energy and environment management to be developed according to local skills or needs expressed locally in the professional sector.

Sectors Semesters 1 2 3 4 Modules Code Ref.

Construction

X Graphic Language CONS1 M1101

X

X

Structural work in building

Basics of topography

CONS2

CONS3

M1102

M1106

X Structural work and finishing work CONS4 M2103

X

X

Public works

Topography applied to projects

CONS5

CONS6

M2104

M2105

X Building projects CONS7 M3105

X Public works projects CONS8 M3106

X

X

Construction and project management

Sustainable construction

CONS9

CONS10

M4203C

M4204C