Undergraduate Technological Degree

Materials Science and Engineering

Association des Directeurs d'IUT

Scientific and technological research is continually proposing new materials and new transformation procedures which complement traditional knowledge, allowing them to evolve.

For this reason, by linking Materials Science and Engineering, the course responds to the latest demands in materials: Metals, polymers, glasses, ceramics, composites, multi-materials and agro-materials in the broadest sense (bio-polymers, biocomposites, bio-sourced materials).

Materials are the most basic concern and strategic target of companies, from design to production:

- The moment a product is designed, the demands of product use defines the design brief and conditions the choice of materials.
- At the laboratory, the identification and control of raw materials guarantee the efficiency of the processing procedure,
- In the workshop during manufacturing, the processing procedure must take into account the transformation of material characteristics,
- The conformity of the finished product has to be controlled with reference to the design brief…

To satisfy the demands of industry, it is necessary to be aware of the physical and chemical properties of materials and to manage their behaviour during the implementation process and during their use.

The course must therefore be multi-disciplinary and non-specialised to deal with the diversity of materials.

1. Objectives of the course

The DUT diploma in "Science and Engineering of Materials" develops both scientific and technical aspects of the knowledge of materials: It allows access to the intermediate professions in this sector of activity and to further studies at level 1 or 2.

- The scientific aspect, "Science of Materials", calls upon fundamental notions and focuses on the structure-property relationships of materials.

From a technical aspect, the processing of materials is based upon the major implementation procedures and focuses on materials' behaviour and modification of characteristics, taking into account changes in traditional products and the development of more innovative products.Materials are the origin of most innovations.

The objective of these modules is twofold:

- To acquire the scientific and technical knowledge necessary to understand the behaviour of a material during processing or use;
- To be familiar with the techniques and processes of characterisation and implementation of a material...

The large number of materials available means that the design of parts and the use of materials are permanently changing. This progression is favourable to the appearance of association of materials, of multi-materials and allows a response to often contradictory implementation and stand-by conditions.

2. Reference system of activities and skills

a. Reference system of activities and skills

Materials offer a wide range of job prospects in many sectors of activity: naval construction, aeronautics, packaging, the automobile industry, civil engineering, construction, household appliances, leisure, clothing, shoe manufacture, electrical equipment, electronics...materials are everywhere.

The senior technician in Materials Science and Engineering works in the research and development or engineering department, consultancy, quality control, manufacturing and implementation, as well as in materials analysis and testing laboratories.

Concerning the design of products, he or she is responsible for the functional analysis of parts. He sets up and operates the design brief, using IT equipment. Depending on the function of each part, he decides upon the choice of materials and the implementation process taking into account technical, economic, environmental, process and sustainable development aspects within the design brief. He carries out feasibility studies from prototyping to preproduction. He is responsible for technology watch, research and development of innovative solutions.

Concerning the manufacturing, control and certification of products, he is responsible for the implementation of the production system and participates in the creation of tools.

He identifies and controls the raw materials to guarantee the quality of products.

Concerning laboratory activity, the technician characterises material properties. He establishes a measuring protocol conform to standards and operates the corresponding equipment. He researches documents, uses the « materials » database and contributes to the choice of materials.

The technician shows a spirit of analysis and summary, he communicates and develops a strong team spirit and has a great sense of responsibility. He can use English, and the tools of methodology informatics, design and production as well as laboratory equipment...

The DUT « Materials Science and Engineering» diploma graduate is a general practitioner in materials. His or her scientific, technical and economic training allows him or her to:

- Contribute to the competitiveness of companies at all stages in product life cycle, by optimising scientific, technical and human choices, by integrating quality, maintenance and security.
- Work in a framework of eco-design and innovation to respond to the demands of sustainable development and to master environmental impact.
- Exercise his or her activities in all industrial sectors,
- Collaborate with the different professionals in a company.

BASIC ACTIVITIES AND SKILLS

ACTIVITIES	SKILLS (BEING ABLE TO)
IDENTIFICATION OF A MATERIAL USED IN INDUSTRY	• Applying the rules of labelling of different materials according to standards in force or standard usage. • Defining the different families of materials. • Classifying materials according to various categories. • Describing simple identification methods of materials.

	• Identifying and using technical and safety documents for a material.
??	• Describing material properties. • Carrying out a materials characterisation experiment. • Interpreting the results of a materials characterisation analysis. • Identifying the properties and characteristics of surfaces and interfaces. • Associating the structure of surfaces and interfaces with expected functions. • Matching materials to their properties of use. • Using measuring equipment and carrying out a measurement. • Choosing a measurement technique.
COMMENTED CHOICE OF A MATERIAL FOR A GIVEN APPLICATION.	• Establishing a materials design brief. • Conducting a functional analysis. • Studying the ecological impact of materials. • Identifying the different industrial uses of materials. • Analysing the future development of materials and of processes used. • Studying innovations in materials. • Using IT tools to help with choice of materials. • Choosing a material according to a design brief.
ECO-DESIGN, DESIGN AND SIZING OF A PART	• Creating and reading a drawing and a technical notice. • Using IT drawing tools. • Using simulation software in the framework of design, manufacturing or consultancy. • Carrying out a technical or service functional analysis. • Writing a functional design brief. • Innovating and eco-designing a part taking into consideration conditions of use of the material and the manufacturing constraints. • Researching, analysing and comparing solutions. • Presenting an argument for the choice of solution. • Designing and sizing an assembly. • Identifying and quantifying the physical and chemical constraints of a product. • Making a model, associating a scientific model to a real situation. • Taking into account the rules inherent to materials and manufacturing processes. • Sizing a part and checking its

	performance under mechanical, thermic, chemical, electrical, magnetic and environmental constraints. • Applying the demands of sustainable development.
INDUSTRIALISATION OF PRODUCTS AND TOOLS.	• Creating the documents of manufacturing, design briefs, ranges, procedures, industrialisation design briefs of products and tools. • Defining procedures and processes, means and operational modes. • Studying work posts, user-machine interface. • Creating prototypes or production tools. • Putting new equipment into operation.
CHOICE AND OPERATION OF PROCESSES OF MATERIALS CREATION AND MANUFACTURING OF PRODUCTS.	• Evaluating the different techniques of use of materials. • Choosing and operating the different creation and processing techniques of materials. • Choosing and applying various bulk or surface treatment on materials. • Describing the principal techniques of use of materials. • Creating parts conform to a design brief.
QUALITY CONTROL OF PRODUCTION.	• Testing and ensuring quality of products and processes. • Choosing a device and a measuring chain. Carrying out a test on a part. • Identifying and analysing dysfunction: The FMEA method (Failure Mode Effects Analysis), defining correcting actions and following their implementation. • Operating industrial sensors. • Assessing the pertinence of a test method or a measurement. • Establishing plans of product or process experience. • Participating in quality control within a company.
CONSULTANCY AND TECHNOLOGICAL STUDIES.	• Participating in a consultancy or advice process. • Analysing usage and operating damage. • Instructing and documenting a consultancy portfolio. • Writing a consultancy report. • Identifying means analysis and carrying out analysis. • Establishing a skill group and proposing solutions. • Participating in an inquiry of responsibilities. • Establishing technical and regulatory monitoring.

ANALYSIS OF A LIFE CYCLE ACCORDING TO DEMANDS OF SUSTAINABLE DEVELOPMENT	• Creating and analysing the life cycle of a material. • Understanding the destruction of a material. • Forecasting the end of life of materials. • Choosing and using different recycling methods. • Choosing and using different waste recycling methods.

TRANSDISCIPLINARY ACTIVITIES AND SKILLS

ACTIVITIES	SKILLS (BEING ABLE TO)
PROJECT MANAGEMENT	• Using the methods and tools of running a project. • Knowing how to use research, analysis and summarizing techniques. • Organising and planning your project work, team work. • Carrying out bibliographic research.
EXPRESSION COMMUNICATION	• Communicating a professional or general document. • Making an oral or written presentation of a product, a service, a project or a process. • Developing written and oral communicating skills. • Writing a CV and a letter of motivation, preparing for an interview. • Communicating on the telephone writing emails. • Developing teamwork skills, especially in multinational teams, preparing and participating in meetings.
INFORMATICS AND E-LEARNING	• Using office software, word processing, spreadsheets. • Using networks, internet and message services.
THE PERSONAL AND PROFESSIONAL PROJECT	• Getting to know yourself better • Getting to know jobs in this speciality. • Determining one's Activities with a perspective of professional development and improved skills.
VOCATIONAL TRAINING	• Joining the workplace... • Contributing to the competitiveness of the

	company. • Following the company's targets and investing in its activities. • Running studies and work conform to the Materials Science and Engineering speciality. • Using the whole of one's learning in the framework of the industrial placement. • Developing one's personal and human skills.

b. Operational Index of Careers and Jobs ("ROME")

CODE ROME	TYPES OF JOBS
H1203	• Designing mechanical products
H1204	• Industrial design
H1402	• Management and engineering method and industrialisation
H1404	• Technical operations in method and industrialisation
H2907	• Running a metal production installation
H2903	• Running machining equipment
H1210	• Technical operations in studies, research and development
H1503	• Technical operations in analysis laboratories
H1206	• Management and engineering industrial studies, research and development
H1506	• Technical operations in quality in mechanics and working with metals
H1303	• Technical operations in hygiene and environmental safety
H1502	• Management and engineering in industrial quality
H3202	• Setting up shaping equipment for plastics and rubbers
H2503	• Piloting elementary mechanical production units
H2504	• Team management in the processing industry
H2805	• Piloting in glass production installation
H2502	• Management in production engineering

c. Assessment of learning and reference system of activities and skills

Assessments test the acquisition of knowledge and know-how, and check that the student has learnt all associated skills.

Each vocational skill corresponds to an level demanded, three of these levels are recognised to serve as a guide and help to place the level of the test or assessment:

- **Awareness: the student has received the information**
  This is the minimum level demanded. The student 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.

- **Application: the student carries out actions under supervision**
  This is the standard level demanded. 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.

- **Mastering of the subject: the student is independent**
  This is the highest level demanded. 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.

TABLE OF CORRESPONDENCE OF LEVELS WITH VERBS USED IN THE REFERENCE SYSTEM OF ACTIVITIES AND SKILLS

LEVEL DEMANDED	SKILLS REFERENCE VERBS
KNOWING	Define – Describe - Be curious about – Participate - Know
APPLYING	Apply – Classify – Identify – Use – Make – Implement - Design and Size - Take into account - Put into operation
MASTERING	Interpret – Associate – Match – Choose – Run – Study – Innovate - Develop an Argument - Create a Model – Anticipate - Know how to use – Organise - Master

3. General organisation of the course

a. Course description

The study route leading to the DUT diploma consists of a main subject, which is the core skills of the diploma, and complementary modules. These complementary modules are designed to complete the student's studies according to whether he or she wishes to join the job market or continue onto further studies within higher education.

The complementary modules, whatever the study route, are a major component of the University Technological Diploma.

Those which are designed to help towards further studies are offered to the student who is capable and keen, within the framework of the adaptation of his or her study route via the personal and professional project.

Designed by the IUT technical faculties within the recommendations of the national teaching commissions, they have the same characteristics, in terms of length and coefficients, as the vocational modules.

The course runs over 4 semesters and is organised into teaching units ("UE" in French), themselves divided into modules. There are 67 of these modules which last from 20 to 30 hours. The « tutor-supervised projects» modules have a volume of 60 hours each in S2 and S3 and 180 hours in S4, including 80 hours of unit UE41 and 100 hours of unit UE 42. The work placement makes up a module by itself. These 67 modules are organised into Teaching Units ("UE"). The core skills are made up of 58 modules, the complementary modules, of 9.

The modules are classified according to subject domain (table I), and each module has a corresponding teaching sheet (table IV). The teaching sheets are presented in § 4 (French only).

Much flexibility is accorded to departments for teaching associated with the major materials groupings, via the « materials » and « materials engineering » modules. Taking into account local conditions, the « materials » modules may be treated in either semesters 1, 2 or 3, and the « materials engineering » modules in either modules 2 or 3. This means that the departments can choose the moment to introduce the different materials groupings.

The skills shown in the sheets are the result of the Reference System of activities and skills. When the module does not lead to a professional skill, for example the « Mathematics module», its participation in one or more skills from the Reference System of activities and skills will be mentioned by the expression « This module participates in the … skill ».

Moreover, the percentage devoted to adaptation to the environment, particularly the professional, must not exceed 20 % of the total volume of the course (order of 3 August 2005). The core skills modules thus modified must be clearly identified to allow a reference course to be retained which will ensure the identity of the MSE speciality.

Similarly, roughly 10% of course teaching time must be devoted to non-conventional forms of learning: "hands-on" and "learning differently", etc.

All subjects may involve these teaching innovations and the teaching times concerned will be identified and organised across all subjects as the teaching staff sees appropriate.

The total of 530 course hours in semester 1 can be explained by the presence of many introductory modules in new materials and in adaptation.

MODULES CLASSIFIED ACCORDING TO SUBJECT (TABLE I)

SUBJECT	TITLE TEACHING UNIT (UE)
MATERIALS	• Discovering materials 12 • Metallic Materials 11 • Polymer Materials 11 • Glass and ceramics Materials 21 • Composite Materials 31 • Agro-materials and bio-sourced materials 31 • Experimental Techniques 12 • Characterisation of materials 22 • Materials, innovations and Sustainable Development 41 • Surfaces and interfaces 41
ENGINEERING	• Design and documentation technique 13 • Computer Aided Design 12 • Analysis technique - Technology 22 • Discovering operating techniques 12 • Engineering - Design 22 • Engineering with metals 22 • Engineering with polymers 22 • Engineering with glass and ceramics 22 • Engineering with composites 32 • Engineering with agro-materials, bio-sourced materials 32 • Engineering with assemblies 32 • Model making - Simulation 33 • Quality 23 • Industrial Measurements 22 • Parts testing 32 • Analysis of damage 32
SCIENCES	• Individualised adaptation 13 • Chemistry 11 • Structure of material 11 • Thermodynamics 11 • Chemistry of solutions 21 • Applied Physics 11 • Transfer phenomena 21 • Flow of fluids 21 • Physical properties of materials 31 • Statics in solids 11 • Resistance of Materials 21 • Mathematics 1 13 • Mathematics 2 23
COMMUNICATION	• Expression and communication 1 13 • Expression and communication 2 23 • Expression and communication 3 33 • Expression and communication 4 43 • Language 1 13

	• Language 2 23 • Language 3 33 • Language 4 43
PROFESSIONALIZATION	• Company awareness 43 • Hygiene, Safety, Environment and Sustainable Development 12 • Running a project 23 • Personal and Professional Project 1 13 • Personal and Professional Project 2 23 • Personal and Professional Project 3 33 • Tutor-supervised project 1 22 • Tutor-supervised project 2 32 • Tutor-supervised project 3 41 • Tutor-supervised project 4 42 • Company placement 43

Course Structure

The DUT Diploma is a vocational level III diploma which is part of the university course offer, itself organised into the Degree – Honours Degree – Doctorate study progression route (DHDD).

In this system, the principle of curriculum validation of the student is based on a capitalisation of credits of which a minimum number is required in order to obtain the diploma; the capitalisation of credits is part of the ECTS (European Credit Transfer System) in which a university semester is worth thirty (30) credits.

This principle of capitalisation allows the validation of studies, the validation of experience acquired and also student mobility within the European Union.

Hours given to subjects per Teaching Unit

The course is organised as follows:

- 300 hours of study with all students,
- 530 hours of tutorial (« TD ») with a group of 26 students,
- 670 hours of workshop (« TP ») with a group of students equal to half of a tutorial,
- 280 hours of transdisciplinary study represented by 185 hours of tutorial and 95 hours of workshop in communication, languages and Personal and Professional Project.
- 300 hours of tutor-supervised projects,
- A work placement of 10 weeks minimum.

Nevertheless, certain TP Workshops may only include a reduced group of 8 students, particularly for reasons of particularly expensive or dangerous installations which demand great attention for safety purposes. These are indicated in the sheets concerned (modules M2225, M2226, M2227, M3241, M3242, M3243).

Assessment

Modes of assessment of knowledge and skills are fixed conform to the order of 3 August 2005, amended, in relation to the university technological diploma in European area higher education.

Special case for languages.

It is recommended to measure progress in skills acquired by the student throughout the 4 semesters with a test at the start and at the end of the course.

The level of skills in a language will be validated by the « Certificat de compétence en Langue de l'Enseignement Supérieur (CLES) » or by any other means of level assessment.

Hours given to subjects per Teaching Unit (table II)

SUBJECT TEACHING TIMES

TYPE OF SUBJECT	TOTAL HOURS
CORE SKILLS	• **Modules:** 1250 hours 41 modules of 30 h + 1 module of 20h • **PPP:** 60 hours 3 modules of 20 hours • **Communication:** 100 hours 2 modules of 30 h + 2 modules of 20h • **Languages:** 120 hours 4 modules of 30 hours • 1530 hours
COMPLEMENTARY MODULES	• 9 modules of 30 hours per study route • 270 hours • 1800 hours of which at least 150 hours given to learning differently
TUTOR-SUPERVISED PROJECT	• 2 modules of 60 hours, 1 module of 80 hours and 1 module of 100 hours • 300 hours • 300 hours
IN-COMPANY TRAINING	• 1 module – 10 weeks minimum placement • 10 weeks

Complementary modules

The vocational character of the « DUT » diploma within a wider course offer has led to the design of a modular course which must allow either joining the job market immediately or further studies depending on the student's own professional project.

In the case of further studies, the complementary modules aim at either certification level 2 or level 1. In either case these complementary skills are in the field of greater technological knowledge, reinforcing of professional skills and introduction to science. The complementary modules, whatever the study route, are a major component of the University Technological Diploma.

Those which are designed to help towards further studies are offered to the student who is capable and keen, within the framework of the adaptation of his or her study route via the personal and professional project. Designed by the speciality departments within the recommendations of the national teaching commissions, they have the same characteristics, in terms of length and coefficients, as the vocational modules. The Personal and Professional Project (PPP) allows the student to choose his or her study route. The tutor-supervised projects and the work placement are part of the core subjects.

Vocational Complementary modules

The student must choose one of 3 different study routes, Vocational, Further studies certification level 1 or certification level 2.

Each study route is composed of 9 complementary modules, 6 in semester 3 and 3 in semester 4. In table III, the Vocational complementary modules are the only ones presented in the National Teaching Programme (“Programme Pédagogique National: PPN”).

b. Summary table of modules and Teaching Units (UE) per semester (table III)

SEMESTER 1

TEACHING UNIT (TU)	MODULE REFERENCE (M)	MODULE NAME	COEF. /M	TOTAL COEF. /TU	TOTAL HOURS LECTURE	TOTAL HOURS TUTORIAL	TOTAL HOURS WORKSHOP	TOTAL HOURS STUDENT /TU
TU 11 : MATERIALS AND CONNECTED SCIENCES	M 1101	Metallic Materials	2	11	10	5	15	30
	M 1102	Polymer Materials	2		10	5	15	30
	M 1103	Chemistry	1,5		5	10	15	30
	M 1104	Structure of material	1,5		10	15	5	30
	M 1105	Thermodynamics	1		10	10	10	30
	M 1106	Applied physics	1,5		5	10	15	30
	M 1107	Solid statics	1,5		10	10	10	30
TOTAL TU 11			11	11	60	65	85	210
TU 12 : BASICS OF MATERIALS ENGINEERING	M 1208	Discovering materials	2	9	10	15	5	30
	M 1209	Discovering implementation techniques	2		5		25	30
	M 1210	Experimental techniques	2		5	5	20	30
	M 1211	CAD	2				30	30
	M 1212	Hygiene, Safety, Environment, Sustainable Development	1		10	15	5	30
TOTAL TU 12			9	9	30	35	85	150
TU 13 : FUNDAMENTAL LANGUAGES	M 1313	Expression and communication 1	2	10		10	20	30
	M 1314	Language 1	2			20	10	30
	M 1315	PPP 1	1,5			15	5	20
	M 1316	Design and technical documentation	1,5			30		30
	M 1317	Mathematics 1	1,5		5	25		30
	M 1318	Individual Adaptation	1,5			20	10	30
TOTAL TU 13			10	10	5	120	45	170
TOTAL HOURS SEMESTER 1			30	30	95	220	215	530

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 : SCIENCE APPLIED TO MATERIALS	M 2119	Glass and ceramic materials	2	8	10	5	15	30
	M 2120	Solutions Chemistry	1,5		10	5	15	30
	M 2121	Flow of fluids	1,5		5	10	15	30
	M 2122	Transfer phenomena	1,5		5	10	15	30
	M 2123	Resistance of Materials	1,5		5	10	15	30
TOTAL TU 21			8	8	35	40	75	150
TU 22 : ENGINEERING OF MATERIALS	M 2224	Engineering – Eco-design	1,5	12	5	10	15	30
	M 2225	Engineering with metals	1,5		5	10	15	30
	M 2226	Engineering with polymers	1,5		5	10	15	30
	M 2227	Engineering with glass and ceramics	1,5		5	10	15	30
	M 2228	Characterisation of materials	1,5		5	5	20	30
	M 2229	Technical analysis – Technology	1,5			30		30
	M 2230	Industrial measurement	1,5		5	15	10	30
	M 2231	Tutor-supervised project 1	1,5					(60h)
TOTAL TU 22			12	12	30	90	90	210
TU 23: FURTHER FUNDAMENTAL LANGUAGE STUDIES	M 2332	Expression and communication 2	2	10		20	10	30
	M 2333	Language 2	2			20	10	30
	M 2334	PPP 2	1,5			10	10	20
	M 2335	Quality	1,5		10	10	10	30
	M 2336	Mathematics 2	1,5		5	15	10	30
	M 2337	Running a project	1,5		5	10	15	30
TOTAL TU 23			10	10	20	85	65	170
TOTAL HOURS SEMESTER 2			30	30	85	215	230	530

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 : SCIENCES OF MATERIALS	M 3138	Composite materials	2	6	10	5	15	30
	M 3139	Agro-materials, bio-sourced materials	2		10	5	15	30
	M 3140	Physical properties of materials	2		5	10	15	30
TOTAL TU 31			6	6	25	30	45	90
TU 32 : DEVELOPMENT OF MATERIALS ENGINEERING	M 32241	Engineering with composites	1,5	9	5	10	15	30
	M 3242	Engineering with agro-materials, bio-sourced materials	1,5		5	10	15	30
	M 3243	Engineering with assemblies	1,5		5	10	15	30
	M 3244	Testing of parts	1,5		10	5	15	30
	M 2345	Damage analysis	1,5		10	10	10	30
	M 2346	Tutor-supervised project 2	1,5					(60h)
TOTAL TU 32			9	9	35	45	70	150
TU 33 : CONSOLIDATION OF FUNDAMENTAL LANGUAGES	M 3347	Expression and communication 3	1,5	6		20		20
	M 3348	Language 3	2			20	10	30
	M 3349	PPP 3	1			10	10	20
	M 3350	Model design – Simulation	1,5			5	25	30
TOTAL TU 33			6	6		55	45	100
TU 34 : COMPLEMENTARY TRAINING	M 3451C	Job-seeking	1,5	9	5	10	15	30
	M 3452C	Automatization	1,5		5	10	15	30
	M 3453C	Signal treatment	1,5		5	10	15	30
	M 3454C	Innovation and smart economics	1,5		5	10	15	30
	M 3455C	Methods of industrialisation	1,5		5	10	15	30
	M 3456C	Production management	1,5		5	10	15	30
TOTAL TU 43			9	9	30	60	90	180
TOTAL HOURS SEMESTER 3			30	30	90	180	250	520

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 : FINAL IMPROVEMENT MODULES	M 4157	Materials, innovations and Sustainable Development	2	10	10	20		30
	M 4158	Surfaces and interfaces	1,5		5	10	15	30
	M 4159C	Management of resources	1,5		5	10	15	30
	M 4160C	Life in the company	1,5		5	10	15	30
	M 4161C	Marketing techniques	1,5		5	10	15	30
	M 4162	Tutor-supervised project 3	2					(80h)
TOTAL TU 41			**10**	**10**	**30**	**60**	**60**	**150**
TU 42 : PERFECTING OF FUNDAMENTAL LANGUAGES	M 4263	Expression and communication 4	1,5	8		20		20
	M 4264	Language 4	2			20	10	30
	M 4265	Company studies	1,5			20		20
	M 4266	Tutor-supervised project 4	3					(100h)
TOTAL TU 42			**8**	**8**		**60**	**10**	**70**
TU 43: VOCATIONAL TRAINING	M 4367	Company Placement	12	12				
TOTAL TU 43			**12**	**12**				
TOTAL HOURS SEMESTER 4			**30**	**30**	**30**	**120**	**70**	**220**
TOTAL SEMESTERS 1 + 2 + 3 + 4			**120**	**120**	**300**	**735**	**765**	**1800**

Article 15 of the order of 3 August 2005 states that "10% of teaching hours on the course" can be given over to « Learning Differently », it may be exempted in each subject and be the object of specific modules.

d. Work placement - Tutor-supervised projects

Work Placement

The work placement, which lasts 10 weeks minimum in S4, finishes the vocational aspects of the DUT diploma course. It allows for an important vocational investment related to the technical, technological and human skills expected of the graduate.

The search for a placement company by the student is essential in that it also prepares the student for future job hunting.

The whole of the placement process, from looking for a company or organisation to the oral presentation, is carried out within a quality-type framework which defines responsibilities and procedures. This process responds to a three-sided charter between the student, the course department and the company or organisation, made official by a placement contract which is conform to regulations. The trainee's project is the object of consultation between the company or organisation and the department in order to measure the feasibility and interest shared by the 3 partners. During the placement period, the student is jointly followed by a tutor from the teaching staff and by a tutor from the company.

The assessment is carried out jointly by both tutors and focuses on work carried out in the company or organisation. The written report and the oral presentation will be assessed by a mixed jury made up of "company" and "faculty". The assessment is based on a table of criteria which allow an assessment of skills expected individually, taken from the Graduate Activities and Skills reference.

Tutor-supervised project

The tutor-supervised project is a first approach towards professionalization, it should add a professional dimension to academic knowledge acquired, which favours the involvement of professionals in the student project teams at various stages of the progress of the project.

It is the moment for skills learnt during the course to be put into practice. The activity of the tutor-supervised project, which demands 300h of work for the student over the whole of the course constitutes an approach to the practise of the senior technician's job within a company. Its goal is to develop professional skills for the future graduate, such as the implementation of knowledge and know-how (documentary research, proposition of solutions, creation of all or part of a product or service…), experience of trans-disciplinary work, and the development of skills in human relations. Independence, the development of teamwork qualities (initiative, aptitude in communication…) will be focused on during the activities of the tutor-supervised project. The tutor-supervised project is divided into two parts to facilitate the aggregation of knowledge and progress in learning, leading to a realistic application which will demand the use of project managing skills.

The tutor-supervised project in the second semester (S2) will focus on communication skills and the use of document research techniques.

In the third semester, activities will focus particularly on the use of project methodology, which will be applied during S3 and S4.

The tools of functional analysis and project management will be favoured in S3 and implementation in S4.

The subject of the project can be decided on by the tutor of the project or by the company or the student himself. At the end of his or her studies, the student disposes of the tools necessary for the running of a project during the company placement.

e. Personal and Professional project

The Personal and Professional Project is an essential element in the structure of the DUT diploma course. The Personal and Professional Project (PPP) is a foundation task which allows the student to form a precise idea of the jobs in Materials Engineering and of the personal skills which these demand.

The notions of career and skills must be developed in particular, beyond questions of qualification and salary. Its goal is to allow the student an overview of his or her current and future professional aspirations, his personal aspirations, his strong and weak points, so he can draw up a study route which is coherent with the targeted job sector.

Finally, the PPP aims to teach career route methodology skills which may be used throughout a career. The student is expected to be the main instigator of the process: the PPP insists on the necessity of a genuine commitment.

All teachers participate, whatever their speciality, in order to provide the student with the techniques, methods and tools necessary to both teach him or her the solutions to problems in career route-finding, job finding and training throughout his or her career, and to carry out his or her choices.

These tools, procedures and methods rely on the educative approach in career-finding and its developments: the student must create his or her project from experiences built, experienced, accumulated and confronted with others. Techniques for job-finding and changing career or any other form of vocational teaching of students may be used at this point in the course.

f. Study routes, Teaching through Technology

The technological character of the course in the IUT technical faculty must be underlined by the choice of study route and teaching method used. The accent will be placed on the use of methodology, informatics, design and production tools as well as that of laboratory materials.

Methods used must include technological subjects as much as possible, focusing very much on new technologies without neglecting other aspects of learning.

Teaching through Technology must allow students to develop their independence with the goal of helping them to be able to adapt to conditions in their future work place.

All modules, even the most scientific ones, have a technological goal and will focus as much as possible on examples from the world of industry in both illustrations given and tools used.

This course, which uses a project for teaching, aims to provide the student with the technical skills and independence necessary, and to prepare him or her for further training throughout their career.

The course takes into account teaching methods such as « Learning to Learn », « Learning Differently », « Hands-on Learning », the module of individual adaptation and the teaching of practical work and projects, all of which contribute to access to higher education, taking into account and supporting the technological “baccalaureates”.

The module of « individual adaptation» at the beginning of the course will allow skills learnt to be broadened, while taking into account the study route of each student and favouring the learning of independence.

« Learning Differently »,
While traditional teaching, and in particular that associated with the tutor-supervised projects, encourages student autonomy in techniques, learning differently will teach him how to learn by himself. Techniques are forever changing; the technician must therefore be able to update his knowledge.

Teaching the student how to learn by himself does not mean just leaving the student alone with the information. Much importance will be given to tutoring and innovative teaching methods. All subjects are likely to include forms of learning other than the traditional lectures, tutorials and workshops.

180 hours are given to this form of studying, organised by the teaching staff across the timetable and subjects. These sessions must be clearly identified.

These studies must allow the student to improve knowledge learned during the various sessions of the teaching modules; they are closely linked to his or her personal work and demand that the student play an active role in the course. « Learning Differently » teaching may be done using self-assessment, using access to course modules accessible via computer networks.

« Learning to Learn »,

The « Learning to Learn », teaching method is integrated into all modules; it can be adapted to skills targeted and to the teaching programme and remains at the teachers' discretion.

g. Taking into account of current economic challenges

The course is directly linked to the world of industry and must therefore take into account the real economic challenges of today's economy. A scientific and technological course only makes sense if it replies to today's needs and tomorrow's challenges.

Six major themes will be developed during the DUT diploma course at a national level. These themes are the object of a progression throughout the modules of the 4 semesters, leading to an important focus on Sustainable Development (from S1 to S4), and Company Studies in S4.

All modules concerning Materials and Engineering, linked to the notions of Sustainable Development, are spread across the 4 semesters and represent more than 300 hours. These modules look at the problems of choice of materials, notions of eco-design (carbon balance and life cycle analysis), operation and recycling.

The presentation of Health and Safety at work is looked at in S1 ("HSEDD" – 30 hours), Economic Intelligence is looked at in the presentation of projects and in S3 (Innovation and Economic Intelligence – 30 hours). Standardization is looked at throughout the semesters (from the module on design and technical documents in S1 to the modules on quality or running a project in S2 and control in S3). Each of these modules lasts 30 hours. Finally Company Studies has its module in S4.

This all comes to more than 300 hours of the core subjects of the course. These teachings may be developed via projects or complementary studies. These teachings and approaches may also be looked at in the different phases of the tutor-supervised projects.