

### Preparation for DELF B2 certification

**Code: GCV 03 101/GCV 03 201**

**Teacher: Aymen Degachi**

**Grade: Full-time faculty member**

**University: IIT**

**Email:**

**aymen.degachi@iit.ens.tn**

**Total module duration**

**63+63 h**

Contact hours	Out of class activities
21h CI + 14h Projet	28h
21h CI + 14h Projet	28h

**The equivalent credits**

**2+2 ECTS**

**Semester 1+2**

### 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

#### 1.1: Course Description

This course is a preparation for the DELF level B2 certification. Indeed, it is a training on a refinement of the different skills required for the DELF B2 exam. These skills revolve around oral and written comprehension as well as oral and written production. In this sense, in each session our work consists in elaborating staggered exercises in two parts: an oral and a written activity. In addition, we encourage students to practice the different DELF B2 exams. This is done through various applications that allow students to learn, revise and deepen their knowledge of French lexical, grammatical and civilizational aspects by tackling many topical themes.

#### Objectives

##### ➤ **Global objective :**

To develop students' communicative skills and improve their self-confidence when speaking in public and to be able to discuss, debate and present a personal point of view in any communication situation; both written and oral.

##### ➤ **Specific Objectives :**

At the end of this course the student will be able to:


- Direct the listening of an audio support, pick up the most relevant details and understand authentic audio documents.
- Locate the information necessary for the comprehension of an informative text relating to various fields.
- Take a position in front of a well determined problematic and produce an argumentative essay related to several themes.
- Locate the main idea of an article and present orally a personal opinion on the subject in question.

#### 1.2:Prerequisites

The students can easily build a brainstorming network of ideas on the different topics proposed in the sessions. They are also able to produce and present short fragments orally to the class. They are also able to write a short paragraph in a given time frame in relation to defined themes.

## 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	<b>The keys to talk about our plural identity</b>	14 H	<p>In this work unit we evoke the theme of the new links between the individual and his environment in order to have the ability to :</p> <ul style="list-style-type: none"> <li>- Better talk about new social models, relationships between family members.</li> <li>- Identify the notions of cause and consequence</li> <li>- Elaborate an argumentative discourse</li> <li>- Master the keys to the newsletter / informative text / argumentative essay / general idea</li> </ul>
<b>Chapter 2</b>	<b>Keys to Talk about Civil Rights</b>	14 H	<p>In this course, we will discuss the struggle of men and women for their rights and social benefits in order to be able to :</p> <ul style="list-style-type: none"> <li>- Talk about freedom of choice / civil rights and equality / solidarity</li> <li>- Work on the modes of the indicative, the infinitive and the subjunctive + the goal</li> <li>- Make a plan to organize ideas: informative and argumentative text</li> <li>- Master the keys to the interview / the argumentative text / the professional letter / the point of view</li> </ul>
<b>Chapter 3</b>	<b>The keys to talk about the professional world</b>	14 H	<p>In this section we focus on professions, trades and working conditions with the objective of knowing :</p> <ul style="list-style-type: none"> <li>- Giving an opinion</li> </ul>

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				<ul style="list-style-type: none"> <li>- Structuring a statement</li> <li>- Using opposition and concession</li> <li>- Elaborate the introduction and conclusion of an argumentative text               <ul style="list-style-type: none"> <li>- To master the keys of the argumentation / letter of application and complaint</li> </ul> </li> </ul>
<b>Chapter 4</b>	<b>Keys to Talk about Citizenship</b>	14 H		<p>In this module we highlight the theme of citizenship, the rights and duties of citizens to learn to :</p> <ul style="list-style-type: none"> <li>- Address administrative and political issues in France</li> <li>- Talking about the symbols of the state</li> <li>- Using the hypothesis</li> <li>- Maintain a moderate tone in a formal letter.</li> <li>- Mastering the keys to discourse/opinion debate</li> </ul>
<b>Chapter 5</b>	<b>The keys to talk about future world</b>	14 H		<p>In this unity we focus on solutions for a better world, for sustainable development and for the environment in order to be able to :</p> <ul style="list-style-type: none"> <li>- Confirm or contradict the interlocutor</li> <li>- Ask for more information</li> <li>- Using time indicators</li> <li>- Using reported speech</li> <li>- Using non-verbal communication in interaction               <ul style="list-style-type: none"> <li>- Mastering the expression of agreement, reserve, disagreement and uncertainty</li> </ul> </li> </ul>

## 2. METHODOLOGY:

The DELF B2 certification preparation course is composed of two parts:

- Integrated courses (communication of fundamental information introduced by using multiple examples)
- Applications and exercises

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### 3. EVALUATION:

Type	Covering which Chapter (s)	The weighting factors
Mid-term	1-2-3	30%
Final exam	1-2-3-4-5	70%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- BRETONNIER Marie, GODARD Emmanuel, LIRIA Philippe, MISTICHELLI Marion et SIGÉ Jean-Paul, Les clés du nouveau DELF B2, Editions Maison des Langues, Paris, 2007, Réimpression Juillet 2014.
- COLLINI Virginie, JAMET Marie-Christine, Préparation à l'examen du DELF B2, Hachette Français Langue Étrangère, Paris, 2008, Impression Mai 2013.
- <https://www.bonjourdefrance.com/>
- <https://www.partajondelfdalf.com/>

# Accounting for the engineer

Code: GCV 03 102

**Teacher: Amel Trabelsi Elloumi**

Grade: full-time faculty member

University: International Institute of Technology

Email:

[Dep.PCP@iit.ens.tn](mailto:Dep.PCP@iit.ens.tn)

**Total module duration**

42 h

Contact hours	Out of class activities
21h CI	21h

The equivalent credits  
2 ECTS

**Semester 1**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course consists of an introduction to business management.

### Objectives

Its objectives are to:

- Present in a practical and logical way the fundamental notions and analyses of management science,
- Allow the student to get to know the company and the nature of its relationship with the environment,
- Introduce the student to the fundamental principles of management, the main functions of the company,
- To prepare the student for the different management specialties (Production Management, Procurement, Finance, Marketing, Human Resources Management),
- To guide the student in the choice of conceptual tools and means allowing him/her to intervene effectively in the search for solutions to his/her professional and personal problems.

### 1.2: Prerequisites

This course is an introduction to management and the student is not supposed to have previous knowledge as it's an initiation.

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	The company : generalities	4.5	- Define the company - Understand the financial, economic and social role of the company.
<b>Chapter 2</b>	The business environment	4.5	- Define the company's environment - Understand the company's relationship with its environment.
<b>Chapter 3</b>	The company and the manager	6	-Define management functions and the role of the manager
<b>Chapter 4</b>	The management process	6	- Define the business process - Understand the four functions of management: planning, organizing, directing and controlling.

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	*
Project (h)	*
Visits (h)	*

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All chapters	30%
Practical work		
Mid-Term		
Oral test	Chapter 1,2,3	20%
Final exam	All chapters	50%

### 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

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## Research Methodology

**Code: GCV 03 103**

**Teacher: Manel Dammak**

**Grade: Full-time Teacher**

**University: IIT**

**Email:**

**Manel.dammak@iit.ens.tn**

**Total module duration**

**42 h**

Contact hours	Out of class activities
21	21

**The equivalent credits**

**2 ECTS**

**Semester2**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

The engineering profession requires both the development of scientific research skills and the ability to write and present reports. Also, during the engineering journey, student have to validate two mandatory internship and a graduation project in which they will be evaluated partially on its methodology of redaction and scientific research.

### Objectives

In this course, the student is tutored to:

- uses office environment to write correctly a report, using pertinent reference
- adopt predefined writing templates
- carry out literature research
- elaborate a specification and plan to achieve all objectives
- critically assess data and draw conclusions

### 1.2: Prerequisites

Basic knowledge on digital environment

Basic knowledge on office environment

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
Chapter 1	Methodology of redaction	9	Mastering the office environment Mastering how to respect a writing specification
Chapter 2	Methodology of scientific research	12	Mastering the research processes (Data collection – analysis – presentation of data and interpretation – discussion)

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	9
Practical work (h)	6
Project (h)	6
Visits (h)	-

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### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	Chapter 2	25%
Practical work	Chapter1	20%
Mid-term		
Oral test		
Final exam	All	55%

### 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

<https://pix.fr>
<https://support.microsoft.com>
<https://www.ibm.com/services/learning/fr/>

# Math for Engineer I

Code: GCV 03 104

Teacher: Raouia Neji

Grade: Full-time faculty member

University: International Institute of technology of Sfax (IIT)

Email:

[raouia.neji@iit.ens.tn](mailto:raouia.neji@iit.ens.tn)

Total module duration

42 h

Contact hours	Out of class activities
21h	14h

The equivalent credits

1 ECTS

Semester 1

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

Reducing a matrix consists in looking for a similar matrix, the simplest possible in the best case, a diagonal matrix. It is then a diagonalization if not a triangular matrix, then a trigonalization.

This course then consists of learning how to study the differential equation and transform it into an exact equation using integration factors.

It then focuses on a first-order partial differential equation that involves only the first derivatives of the unknown function of  $n$  variables.

Finally, non-linear first-order partial differential equations occupy the last part of this course.

### Objectives

The objectives of this course are to:

- Diagonalize a matrix and calculate its  $n$ th powers.
- Calculate the limits of a multivariate function.
- Calculate the partial derivatives of a multivariate function and determine the critical points of this function.
- Be able to determine whether a critical point of a multivariate function is a maximum or a minimum.
- Determine the gradient and the Jacobian of a multivariate function.
- Calculate the double and triple integrals of a function and apply this notion to calculate the volume, the center of gravity...
- Know the special Eulerian functions (Gamma and Beta)

### 1.2: Prerequisites

Mathematical Fundamentals

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
Chapter 1	Matrix reduction	9h	Understand and apply the following notions: Transposed from a matrix Matrix multiplication Determinants Rank and trace of a matrix Gauss Inversion Triangulation of a matrix Solving a system of linear equations Eigenvalues and eigenvectors Diagonalization Basic change

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			Passage matrix
<b>Chapter 2</b>	Two-variable function	6h	Understand and apply the following notions Homogeneous functions First partial derivatives Partial elasticity Partial derivatives seconds Hessian Matrix Schwarz Theorem
<b>Chapter 3</b>	Special functions (Gamma and Beta)	6h	Understand and apply the following notions: The Gamma function and properties The Beta function and properties Relationship between Gamma and Beta Formula of the complements Stirling formula

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	*****
Project (h)	*****
Visits (h)	*****

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work		
Mid-term	*****	30%
Oral test	*****	*****
Final exam	All	70%

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#### 4. RECOMMENDED BIBLIOGRAPHY:

- Fluid Mechanics: Frank White, Ed. Mc Graw Hill
- Fundamentals of Fluid Mechanics: Bruce R. Munson, Donald F. Young, Theodore H. Okiishi. Ed. Wiley
- Practical work notes: A. Lejeune. AEES Course center. University of Liège.
- Fluid mechanics, elements of a first course; P. CHASSAING; Cépadués Editions

# Mechanics of Continuous Media

Code: GCV 03 105

Teacher: Atef Daoud

Grade: Professor

University: National Engineering School of Sfax ENIS

Email:

Atef.daoud@enis.tn

Total module duration

77 h

Contact hours	Out of class activities
42h CI	35h

The equivalent credits  
3 ECTS

Semester 1



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course consists of the following parts:

- Math reminder: Vector calculation elements, the operators
- Stress Field in MC: studies of stress tensors at one point
- Displacement field
- Deformation field in a MC: studies of deformation tensors at one point
- Generalized Hooke's law: constraints-deformations relationship
- Plane stress and plane deformation: Airy function
- Elasto-static equations
- Deformation energy
- The Theorem of Virtual Works
- Solving linear elasticity problems

### Objectives

The objectives of this course are to:

- Acquire the basics of the mechanics of continuous media, state of stresses, state of deformations, displacement fields, linear elasticity law, resolution methods, elasticity limit criteria in order to pursue advanced mechanics (plasticity, mechanics of porous media, etc...) and the finite element method.

### 1.2: Prerequisites

Linear Algebra

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Math Reminders	4h	-Master the elements of vectorial calculation, the operators
<b>Chapter 2</b>	Stress Field in MC	4h	-To know the studies of the stress tensors at one point -Mastering Mohr's representation
<b>Chapter 3</b>	Displacement field	4h	-Calculate the displacement field -Mastering deformation compatibilities
<b>Chapter 4</b>	Deformation Field in a MC	4h	-To know the studies of the tensors of the deformations at a point

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<b>Chapter 5</b>	Generalized Hooke's Law	4h	-To know how to represent the law of behavior and analyze the stress-strain relationship in elementary cases.
<b>Chapter 6</b>	Plane stress and plane deformation	4h	-Solve planar problems in elasticity
<b>Chapter 7</b>	Elasto-static equations	4h	-Know how to implement yield strength criteria.
<b>Chapter 8</b>	Deformation energy	4h	-To know the theorems related to the calculation of elastic deformation energies, minimum theorems, kinematic and static approaches.
<b>Chapter 9</b>	Virtual Work Theory	4h	-To know the theorem of virtual works
<b>Chapter 10</b>	Solving linear elasticity problems	6h	-Know how to express the boundary conditions of a simple linear elasticity problem. -To know how to implement a method of resolution.

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	42h
Practical work (h)	*****
Project (h)	*****
Visits (h)	*****

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work	*****	*****
Mid-term		30%
Oral test	*****	*****
Final exam	All	70%

#### 4. RECOMMENDED BIBLIOGRAPHY:

- MECHANICS OF CONTINUOUS MEDIA, Samuel Forest, Michel Amestoy, Gilles Damamme, Serge Kruch, Vincent Maurel, Matthieu Mazière, Année 2009–2010
- Continuous Media Mechanics Course, Mondher NEIFAR Higher Institute of Education and Continuing Training, Janvier 2009
- MECHANICS OF CONTINUOUS MEDIA, Hatem ZENZRI, 2012
- J.OBALA, Continuous Media Mechanics Exercises and Problems, MASSON Edition, Paris, (1981).
- G. DUVAULT, MECHANICS OF CONTINUOUS MEDIA, MASSON Edition, Paris

# Fluid Mechanics

Code: GCV 03 106

Teacher : Sleh Bouraoui

Grade: Master technologist

University: Higher Institute of Technological Studies of Sfax (ISET)

Email:

bouraouisleh@gmail.com

Total module duration

42 h

Contact hours	Out of class activities
21h CI+7h TP	21h

The equivalent credits  
2 ECTS

Semester 1

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

The content of this course allows students to acquire the basic notions of fluid mechanics and to apply them to real life cases:

This course includes:

- The first part is an introduction to fluid mechanics in which we classify perfect fluids, real fluids, incompressible fluids and compressible fluids and define the main properties that will be used later.
- The second part is devoted to the study of fluids at rest. The fundamental laws and theorems in fluid statics are stated. The notion of pressure, Pascal's theorem, Archimedes' principle and the fundamental relationship of hydrostatics are explained.
- The third part deals with the fundamental equations that govern perfect fluid dynamics
- The fourth part contains the equations and theorems relating to the dynamics of incompressible viscous fluids (Viscous Fluid Flow).
- The last part explains a simplified method for calculating pressure losses. It is indispensable for the dimensioning of various hydraulic installations (problems of pumping, turbines, hydraulic and thermal machines in which a fluid is conveyed, etc.).

### Objectives

The objectives of this course are to:

- Discover a first definition of a continuous medium, Understand the notion of pressure and incompressible fluid, Understand the notion of viscosity.
- Understand the notions of statistics and fluid kinematics.
- Be able to calculate pressure losses
- Sizing of various hydraulic installations
- Solve problems of pumping, turbines, hydraulic machines.

### 1.2: Prerequisites

General Physics, Chemistry, Mathematical Analysis

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Fluid Properties	6	-Know the classes of perfect fluids, real fluids, incompressible fluids and compressible fluids -Define the main properties of these fluids -Know the notions of viscosity
<b>Chapter 2</b>	Fluid statistics	6	-Master the fundamental laws of fluid statics. -To know the notion of pressure, Pascal's theorem, Archimedes' principle and the fundamental

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			relationship of hydrostatics.
<b>Chapter 3</b>	Perfect Fluid Dynamics	5	-Study the fundamental equations of perfect fluid flow
<b>Chapter 4</b>	Dynamics of incompressible viscous fluids	5	-Study the equations and theorems relating to the dynamics of incompressible viscous fluids
<b>Chapter 5</b>	Linear and local pressure drops	6	-Master the simplified method of calculating losses

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	7h
Project (h)	*****
Visits (h)	*****

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work		25%
Mid-Term	*****	20%
Oral test	*****	*****
Final exam	All	55%

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### 4. RECOMMENDED BIBLIOGRAPHY:

- Fluid Mechanics: Frank White, Ed. Mc Graw Hill
- Fundamentals of Fluid Mechanics: Bruce R. Munson, Donald F. Young, Theodore H. Okiishi. Ed. Wiley
- Notes de travaux pratiques: A. Lejeune. Centrale des cours de l'AEES. Université de Liège.
- Mécanique des fluides, éléments d'un premier parcours; P. CHASSAING; Cépadués Editions

# Geographic Information System (GIS)

**Code: GCV 03 107**

**Teacher: Imen HENTATI**

**Grade: Master assistant**

**University: Faculty of Science of Gafsa**

**Email:**

**imenhentati@yahoo.fr**

**Total module duration**

**42 h**

Contact hours	Out of class activities
14h CI + 14h TP	21h

**The equivalent credits**  
**2 ECTS**

**Semester 1**



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

The GIS technology has all the functionality of the database manager that can be applied in a geo-referenced environment for analysis and visualization. These features distinguish GIS from other analysis systems and offer many application perspectives.

This course reviews the presentation of Geographic Information Systems, Real World Modeling, Geographic Data Acquisition Processes and Techniques, and the various spatial analysis operations in GIS.

### Objectives

The student must be able to:

- Structure an S.I.G. project;
- Present, georeference and structure spatialized data;
- Gather data from various sources and of varied nature;
- Manage information including a graphic or geometric part and a descriptive part (attribute data or attributes);
- Create information by spatial analysis processes;
- Carry out spatial queries and cross-layers;
- Solve spatial problems and propose relevant solutions: GIS is a Decision Support Tool.

### 1.2: Prerequisites

Geology, Topography and Computer Science.

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Presentation of Geographic Information Systems	5	- Define a GIS - Become familiar with the components and functions of a GIS - Know the GIS Application Area
<b>Chapter 2</b>	Real world modeling	8	- represent the real world in a computerized system (Cartographic Modeling and Entity-Relationship Conceptual Modeling)
<b>Chapter 3</b>	Acquisition and structuring of spatial data	8	- Master the processes and computer hardware (peripherals) necessary for the acquisition of graphic data and their integration into a GIS.

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<b>Chapter 4</b>	Spatial analysis	8	- Master the spatial analysis operations in GIS, either in vector or/and raster mode.
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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	14h
Project (h)	*****
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work	Chapitre 3	25%
Mid-term	Chapitre 1 & 2	20%
Oral test	*****	*****
Final exam	Chapitre 1, 2, 3 et 4	55%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- **Gomasca M.A** (2009). Basics of Geomatics: Elements of Geographical Information Systems. Springer Science+Business Media B.V. DOI 10.1007/978-1-4020-9014-1\_9, 481-559.
- **Collet C.** (1992). Geographic information systems in image mode, Presses Polytechniques et Universitaire Romandes, Lausanne.

# Computer science

Code: GCV 03 108

**Teacher : Elleuch Mohamed**

**Grade: Technologist**

**University: Higher Institute of Technological Studies of Sfax**

**Email:**

Elleuch\_med@yahoo.fr

**Total module duration**

**56 h**

Contact hours	Out of class activities
14h CI + 14h TP	28h

**The equivalent credits**

**2 ECTS**

**Semester 1**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course is designed to support learners' general increase in digital knowledge and skills. It aims to improve digital content creation and problem solving. It is subdivided into two parts: the first part concerns spreadsheets (layout, calculation, graphics, ...) and the second part concerns programming with Python.

### Objectives

- Master, understand and apply the initial knowledge of the environment and methods (Formatting, calculation and simple graphics)
- Manipulate, Automate and control calculations with spreadsheets
- Getting familiar with Python: getting to know its environment, its structures as well as its modules and functions.

### 1.2: Prerequisites

The computer training course requires, as a prerequisite, a basic mastery of one's computer workstation and internet communication tools, in order to familiarize oneself with the pedagogical documents and participate in the proposed activities.

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapitre 1</b>	Environment and Methods (Simple formatting, calculation and graphics)	5h	<p>Master and apply the initial knowledge of the environment: Open and save a document. Know the interface of workbooks, spreadsheets, row and column names. Know and use the different display modes. Customize the tabs and the ribbon. Split the window. Freeze the panes. Show the Developer tab.</p> <p>Master and apply the Basic Operations on a workbook: define the printing area in a workbook, print and layout, change the width of a column, the height of a row. Delete and insert cells. Save a document under another name.</p> <p>Master and apply special paste: paste values, transpose, paste by performing an operation.</p> <p>Perform simple calculations: know how to enter a formula in a cell. Perform division, addition or multiplication; Identify calculation priorities. Enter a time. Insert a sum</p>

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			<p>Use and apply basic formulas: simple formulas (MAX, SI, SUM.SI, NB.SI...); conditional formulas (nested SI, SI, OR, AND); determine the impact of deleting a row or column on a formula.</p> <p>Master the basic formatting: presentation of cells (color, font style, bold, alignment). Basic number formatting (percentage, thousands separator, accounting).</p> <p>Know the usual formatting: cell framing, number formatting, indentation, use of styles. Brush tool.</p> <p>Manipulate and Create a simple graph: create and move a graph in a sheet; distinguish the main types of graphs (curve graphs, pie charts, bar graphs, ring graphs).</p> <p>Practice sorting and searching data: search, replace or select data (either on the data or on its formatting...); use automatic filters; use the automatic sorting function (in ascending/descending order); use the instant fill function.</p>
<b>Chapitre 2</b>	Automate calculations with spreadsheets	8h	<p>Master calculation methods: know and use absolute and relative references in a formula; copy or move a formula; use text in a formula; understand the main calculation errors (#NAME?, #DIV/0!, #####...)</p> <p>Apply and use advanced functions: mathematical functions (ROUND - ENT...); advanced search functions (INDEX, EQUIV...); text functions (LEFT, RIGHT, STXT, EXACT...); REPLACE and REPLACEB functions; date functions (TODAY, DAY, MONTH, DAYSEM...) and time functions; count the occurrences of a table (NB. SI); generate random numbers (ALEA); sort values (RANK); simple search functions (SEARCH, SEARCH); CONCATEN function</p> <p>Master advanced formatting: conditional formatting, merge cells, center on several columns. Insert a smartArt or an image. Use workbook themes; change workbook margins and orientation; manage page breaks; insert a background.</p> <p>Develop and Improve the layout of a graph: formatting with graph styles; enlarging and reducing the size of a graph; managing titles and legends; modifying data series in a graph; printing a graph.</p> <p>Working with large data: moving and selecting quickly,</p>

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			moving and duplicating a spreadsheet, working in a workgroup. Automate tasks in Excel: record and execute macros. Read a pivot table: recognize a pivot table; analyze data in a pivot table; filter data in a table.
<b>Chapitre 3</b>	Python environment	3 h	Knowing the Python work environment (Installation and notation) Basic syntax knowledge and Python instruction execution Knowing Types and Variables in Python Define the main operations and methods available for the str type.
<b>Chapitre 4</b>	Python structures	4h	Understanding and mastering : - Simple structures - Control structures - Iterative structures
<b>Chapitre 5</b>	Python modules and functions	4h	Understanding and mastering : - The modules - Native functions - Functions (declaration, definition, parameter passing, use, ...) - Recursivity - - Complexity
<b>Chapitre 6</b>	Scientific computing	4h	Understanding and mastering : - Library (Numpy and Scipy) - Graphic (Matplotlib) - - Files

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	8h
Practical work (h)	14h
Project (h)	6h
Visits (h)	*****

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### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	Chapitre 1 & 2	20%
Practical work	All	25%
Mid-Term	*****	*****
Oral test	*****	*****
Final exam	Chapitre 3, 4, 5 & 6	55%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

<https://pix.fr>
<https://support.microsoft.com>
<https://www.ibm.com/services/learning/fr/>

# Resistance of materials

Code: GCV 03 109

Teacher: Mounir Ben Jdidia

Grade: Professor

University: National School of Engineers of Sfax ENIS

Email:

mounir.benjdida@enis.rnu.tn

Total module duration

98 h

Contact hours	Out of class activities
35h CI + 14h TP	42h

The equivalent credits

3 ECTS

Semester 1



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course includes:

- Generalities on beams: geometrical characteristics of the straight sections of a beam and beam theory
- Simple and compound stresses: study of compression tension, study of pure bending in a straight section, study of deflected bending in a straight section, study of simple bending, study of compound bending, study of shear, study of beam torsion, elastic deformation energy in each type of stress.
- Internal potential theory: work of external forces and deformation energy, internal potential as a function of external forces, Relationship between forces and displacements and Clapeyron's theorem, Maxwell Betti's reciprocity theorem, Castigliano's theorem, Menabréa's theorem, Theorem of virtual works, Application to the calculation of displacements: Castigliano's theorem, Theorem of virtual works, Vêrétchaguine's theorem, Application to the resolution of hyperstatic structures: Menabréa's theorem.

### Objectives

The objectives of the course are:

- To acquire the basic notions on the theory of beams and the geometrical characteristics of the straight sections of a beam.
- To study the internal stresses and deformations of the beams.
- To master simple and compound stresses and energy concepts.

### 1.2: Prerequisites

Math, Solid Mechanics

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	General information on beams	7	Master the geometrical characteristics of the straight sections of a beam Master Beam Theory
<b>Chapter 2</b>	Simple compound and solicitations	15	Study and understand the compression tension Study and understand pure bending in a straight section Study and understand the deflected bending in a straight section Study and understand the simple bending Study and understand the compound bending

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			Study and understand the shear Study and understand the torsion of beams Study and understand the energy of elastic deformation in each type of stressing
<b>Chapter 3</b>	Internal Potential Theory	13 h	Understand the work of external forces and deformation energy Master internal potential as a function of external forces Analyze relationship between forces and displacements and Clapeyron's theorem Master Maxwell Betti's Reciprocity Theorem Master Castigliano's Theorem Master Menabréa Theorem Master The Theorem of Virtual Works Apply the calculation of displacements: Castigliano's theorem, virtual work theorem, Vêrétchaguine's theorem. Apply the resolution of hyperstatic structures: Menabréa theorem

### Contents of the practical work (14h)

- Study of the geometrical characteristics of the sections
- Simple tension-compression study
- Simple bending study
- deformation of a beam in flexion
- Deformed beam in bending
- Torsion study of beams

### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	35h
Practical work (h)	14
Project (h)	
Visits (h)	

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### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		25%
Mid-term		20%
Oral test		
Final exam	All	55%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- - Course on Resistance of Basic Materials (N. Bourahla)
- - Strength of materials - Introduction to structural calculations (J. Bastien)
- - Resistance of materials Volume 1, O.P.U Collection the course of civil Engineering, 06-1990 (Zedira H and LAhbari N)

# Building materials

Code: GCV 03 110

**Teacher: Abdelmonem MASMOUDI**

Grade: PHD, aggregated in Civil Engineering

University: ENIS

Email:

Abdelmonem.masmoudi@enis.tn

Total module duration

70h

Contact hours	Out of class activities
28h CI + 14h TP	35h

The equivalent credits

3 ECTS

Semester 1

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

- Materials: physical (thermal, water, acoustic, electrical) and mechanical (tensile, compression, bending, creep and relaxation tests) properties.
- The aggregates: origin, quality, field of use, properties, geometrical characteristics (granularity, shape of the aggregates, surface of the aggregates), physico-chemical characteristics (density, water content, porosity, cleanliness of the aggregates: sand equivalent test, Methylene Blue test), mechanical characteristics (wear resistance: Micro Deval test, shock resistance: Los Angeles test).
- Mineral binders: hydraulic and airborne (lime, cement and plaster.), manufacturing process, Classification and standardization and field of use.
- Mortars: Characteristics of mortars (adherence, compressive strength, porosity, compactness, inalterability of mortars), Dosing of mortars (Mortar yield, Water dosage), Mortar tests (Setting test, Mortar consistency test, Shrinkage and swelling test, Tensile and compression test), Fields of use.
- Admixtures: roles, classification of admixtures (plasticizers, water reducers - plasticizers, superplasticizers, setting and hardening gas pedals, setting retarders, air entraining agents, mass water repellents).
- Ceramic products: manufacturing, products marketed in Tunisia, controls to be carried out.
- Hydraulic products: properties of fresh and hardened concrete; functions of concrete; formulation; implementation; fields of use; special concretes.
- Bituminous concretes: black products (asphalt, tars, bitumens) manufacturing and fields of use, emulsions, hydrocarbon asphalts (formulation and characterization tests), surface coatings.

### Objectives

- Acquire knowledge of the most commonly used building materials in the field of civil engineering in terms of their manufacture, properties, classification and field of use
- Acquire skills in the classification, identification and characterization of products used in civil engineering.

### 1.2: Prerequisites

Physics, chemistry, mathematics

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
Chapter 1	Material Properties	2	-Master the physical, chemical and mechanical properties of materials used in civil engineering.

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<b>Chapter 2</b>	Aggregates	4	-To know the quarry aggregates, aggregates for pavements, their properties and mechanical characteristics. -Control of the tests in the lab (preparation for the sessions of Practical work)
<b>Chapter 3</b>	Binders	3	-Know the different types of binders and the roles of binders in construction -Mastering the Standardization Classification marking designation of cements and special cements
<b>Chapter 4</b>	The mortars	3	-Connaitre les caractéristiques des mortiers -Maîtriser le dosage des mortiers et les essais et l'utilisation des mortiers
<b>Chapter 5</b>	The adjuvants	3	-To know the different families of adjuvants -Mastering the use, dosage and field of application of adjuvants
<b>Chapter 6</b>	The ceramic products	3	-To know the different types of ceramic products marketed in Tunisia -Mastering the applications and controls to be carried out on ceramic products
<b>Chapter 7</b>	Hydraulic concretes	6	-To know the 2 states of fresh and hardened concrete -Mastering Manufacturing - implementation mixing and vibration -Control the shrinkage, expansion, creep and compressive strength equivalence of cylinder cubes.
<b>Chapter 8</b>	Bituminous concretes	4	-To know the black products (asphalt, bitumen, tars, bitumen emulsions...) -To master the use of black products -Mastering characterization tests on hydrocarbon asphalt mixes (Marchal, PCG, Duriez, rutting...) -Control of surface dressings and their applications

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	28h
Practical work (h)	14h
Project (h)	
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work	2-4-7-8	25%
Mid-term	1-2-3-4-5	20%
Oral test		
Final exam	All	55%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- [1] H. RENAUD: *Building constructor* Edition Foucher 1985.
- [2] G.DREUX - J.FIESTA: *New Concrete Guide* Edition Eyrolles 1992
- [3] R.DUPAIN - R.LANCHON – JC.SAINT-ARROMAN: *GRANULATS, soils, cements and concretes:* Edition CASTEILLA 1995.
- [4] M.NOVERRAZ: *Building technology* Edition Eyrolles 1997.
- [5] Sika Catalogue : *Product Catalogue* 2004.
- [6] Factory Sfax ceramic: *Product Catalogue* 2000.
- [7] Tunisian Waterproofness: *Product Catalogue* 2002.
- [8] SUD BETON : *Catalogue pour BPE et produits préfabriqués en béton* 2002.
- [9] CIOK : *Catalogue des ciments d'Oum El Kelil* 2005.
- [10] ARTICERAM : *Product Catalogue* 2005.
- [11] STIBOIS : *Catalogue des grands ateliers du nord* 2005.
- [12] SOTACIB : *Catalogue Société Tuniso-Algérienne de Ciment Blanc* 2005.

- [13] M. BERNARD : *Cours de chimie minérale* Edition Dunod 1994.
- [14] A.CROS et G. ARRIBET : *Initiation à la chimie moderne*, Edition Belin 1969.
- [15] F.DE LARRARD : *Structures granulaires et formulation des bétons, études et recherches des laboratoires des ponts et chaussées*. LCPC avril 2000.
- [16] Techniques de l'ingénieur Tome C4
- [17] R.LANCHON : *Cours de laboratoire 1 et 2, Granulats, bétons, sols, brevets de techniciens et baccalauréats F* Edition Casteilla 1995.
- [18] J.BARON JP.OLIVIER : *les bétons, bases et données pour leur formulation, association technique de l'industrie des liants hydrauliques* Edition Eyrolles 1996.
- [19] J.BOAST : *Les matières plastiques* Edition Lavoisier 1985.
- [20] J.LE COARER : *Chimie le minimum vital* Presses universitaires de Grenoble 1994.
- [21] S.ZUCKERMAN : *Beyond the Ivory Tower* Toplinger, publications 1970.
- [22] A.JOURNAUX : *Collection de sciences naturelles, terminale D* BORDAS 1974.
- [23] CH.DESIRE : *Collection de géographie* HAIER 1958
- [24] E.OLIVIER : *Technologie des matériaux de construction* Edition 1977.
- [25] E.ABSI : *Annales de l'institut technique du bâtiment et des travaux publics* 1979.
- [26] J.NEJI, H.SMAOUI, W.GANDOUIZ : *Les bétons de sables en technique routière, actes du colloque MS<sup>2</sup>, LGC de l'ENIT* 2004.
- [27] R.MENSI : *Recueil d'essais sur les matériaux de construction, manuel de laboratoire* Polycopié de l'ENIT 2000.
- [28] M.BEN OUEZDOU, L.BRAHIM, T.ACHOUR : *Nouvelle approche de formulation des bétons hydrauliques*. Annales de l'équipement volume XV-N°01 1<sup>er</sup> semestre 2005.
- [29] A.MASMOUDI, *Cours avec exercice de matériaux de construction*. Edition centre de publication universitaire 2005
- [30] Normes tunisiennes NT 21.\*\*
  - 1. NT 21.03 (1984) ENR\* : *Essais pour déterminer les propriétés des granulats* Réf EN 932.2 (1999)
  - 2. NT 21.05 (2002) ENR : *Granulats : mesures des masses volumiques, coefficient d'absorption et teneur en eau des sables* Réf NFP 18-555 (1990)
  - 3. NT 21.08 (2003) ENR : *détermination de la résistance à l'usure (micro Deval)* Réf EN 1097-1 (1996)
  - 4. NT 21.09 (2002) ENR : *Essais pour béton durci, partie 4 : Résistance en compression* Réf EN 12390-4 (2000)
  - 5. NT 21.15 (1984) ENR : *Entrevous en béton de granulats courants pour plancher en béton à poutrelles préfabriquées avec dalle de compression coulée en œuvre* Réf NFP 14.305 (1976)
  - 6. NT 21.19 (2003) ENR : *Essais pour déterminer les caractéristiques géométriques des granulats, partie 3 : Détermination de la forme des granulats, du coefficient d'aplatissement* Réf EN 933-3 (1997)
  - 7. NT 21.21 ENR : *Granulats, Essais Los Angeles* Réf NFP 18-573 (1990)



8. NT 21.25 (2001) ENR : *Granulats, détermination de la propreté superficielle* Réf NT P18-591 (1990)
9. NT 21.29 (2001) ENR : *Equivalent de sable* Réf NFP 18-598 (1991)
10. NT 21.60 (1996) ENR : *Hourdis en terre cuite pour planchers en béton armé* Réf NFP 13-401 (1944)
11. NT 21.85 (1990) ENR : *Bordures et caniveaux préfabriqués en béton* Réf NFP 98-302 (1982)
12. NT 21.87 (1990) ENR : *Pavées en béton* Réf NFP 98-303 (1980)
13. NT 21.91 (1989) ENR : *Carrelages, carreaux de mosaïque de marbre* Réf NFP 61-302 (1970)
14. NT 21.111 (1990) ENR : *Essais du béton, partie 2 : confection et conservation des éprouvettes* Réf ISO 2736/2 (1986)
15. NT 21.113 HOM\*: *Détermination de la résistance à la compression des éprouvettes* Réf ISO 4012 (1978)
16. NT 21.115 HOM : *Détermination de la résistance à la traction des éprouvettes* Réf ISO 4108 (1980)
17. NT 21.116 (1990) HOM : *Béton frais, détermination de la consistance, essai d'affaissement* Réf ISO 4109 (1980)
18. NT 21.120 (1990) HOM : *Béton durci, détermination de la masse volumique* Réf ISO 6275 (1982)
19. NT 21.123 (1990) HOM : *Béton, détermination de la résistance à la flexion des éprouvettes* Réf ISO 4013 (1978)
20. NT 21.127 (1990) HOM : *Granulats pour béton, détermination de la masse volumique en vrac* Réf ISO 6782 (1982)
21. NT 21.177 (2002) ENR : *Adjuvants pour béton, mortier et coulis, méthodes d'essais, partie 1 : béton et mortier de référence pour essais* Réf EN 480-1(1997)
22. NT 21.178 (2002) ENR : *Adjuvants pour béton, mortier et coulis, méthodes d'essais, partie 2 : détermination du temps de prise*
23. NT21.192 (2002) ENR : *Essais pour déterminer les caractéristiques des granulats, partie 1 : détermination de la granularité, analyse granulométrique par tamisage*
24. NT21.193 (2002) ENR : *Essais pour déterminer les caractéristiques mécaniques et physiques des granulats, partie 6 : Détermination de la masse volumique réelle et du coefficient d'absorption d'eau* Réf EN 1097-6 (2000)
25. NT21.207 (2002) ENR : *Essais pour déterminer les caractéristiques mécaniques et physiques des granulats, partie 9 : qualification des fines, essai au bleu de méthylène* Réf EN 933-9(1988)
26. NT21.234 (2003) ENR : *Bitumes et liants bitumineux, détermination de la pénétrabilité à l'aiguille* Réf EN 1426 (1994)
27. NT 21.235 (2003) ENR : *Bitumes et liants bitumineux, détermination de la température de ramollissement, méthode bille et annaux* Réf EN 1427 (1999)

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1. NT 47.01 (1992) HOM : *Ciment, composition spécifications et critères de conformité* Réf ENV 197/1(1992)
2. NT 47.02 (1983) HOM : *Liants hydrauliques, chaux hydrauliques artificielles (CHA)* Réf NFP 15-312(1969)
3. NT 47.03 (1995) HOM : *Liants hydrauliques, chaux hydrauliques naturelles (CHN)*
4. NT 47.13 (1983) HOM : *Liants hydrauliques, techniques des essais, essai de retrait et de gonflement* Réf NFP 15-433 (1963)
5. NT 47.15 (1991) HOM : *Méthodes d'essais des ciments, analyse chimique des ciments*
6. NT 47.16 (1983) HOM : *Liants hydrauliques, vérification de la qualité des livraisons, emballage, marquage* Réf NFP 15 -300 (1981)
7. NT 47.17 (1991) HOM : *Méthodes d'essais des ciments, détermination de la finesse* Réf EN 196/6 (1989)
8. NT 47.22 ENR : *Gypse et plâtre pour enduits intérieurs à application manuelle ou mécanique de dureté normale ou de très haute dureté , classification, désignation, spécification* Réf NF B 12-301 (1987)
9. NT 47.23 (1988) ENR : *Plâtres à mouler pour Staff* Réf NF B 12-302 (1982)
10. NT 47.25 ENR : *Ciment Portland à moyenne résistance aux sulfates, spécifications*
11. NT 47.26 ENR : *Ciment Portland à haute résistance aux sulfates, spécifications*
12. NT 47.30 (1991) HOM: *Méthodes d'essais des ciments. Détermination des résistances mécaniques* Réf EN 196/1 (1987)

# Geology of the engineer

Code: GCV 03 111

**Teacher: Monia Bouchaala**

**Grade: Assistant Technologist**

**University: ISET Sfax**

**Email:**

**Monia.ingenieur@gmail.com**

**Total module duration**

**42h**

Contact hours	Out of class activities
21h CI + 7h TP	14h

**The equivalent credits**

**2 ECTS**

**Semester 1**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

The course starts with the study of the general aspects of the earth such as its internal composition, structure and characteristics. Next, the study of geological hazards related to civil engineering, the use of rocks in civil engineering, the study of rocks and minerals is studied. Then, we study together the geological structures, namely folds and faults.

We finish by practical works which concern the map and the topographic profile, as well as the map and the geological section.

### Objectives

The objectives of the course are

- To understand the importance of geology in civil engineering
- To be able to differentiate between the main types of minerals and rocks.
- Understand how geological phenomena affect the performance of structures and infrastructures

### 1.2: Prerequisites

Notions de physique et de chimie

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	General Introduction	1.5h	Understanding the importance of geology in civil engineering
<b>Chapter 2</b>	History of the earth	1.5h	To have an idea about the geological times
<b>Chapter 3</b>	Structure of the earth	3h	To know the internal structure of the earth and the characteristics of the globe
<b>Chapter 4</b>	The Rocks	3h	Differentiate between the different types of rocks
<b>Chapter 5</b>	Minerals	3h	Differentiate between the different types of minerals
<b>Chapter 6</b>	Use of rocks in civil engineering	3h	Understand the use of different types of rocks in civil engineering

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<b>Chapter 7</b>	The floors	3h	Knowing the different types of soils and their characteristics
<b>Chapter 8</b>	Elements of tectonics	3h	Understand how tectonic phenomena affect buildings and structures.

**TP:** - Identification of minerals and rocks (2h)  
 - Map and topographic profile (3h)  
 - Map and geological section (2h)

### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	7h
Project (h)	*****
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	4,6 & 8	20%
Practical work	*****	25%
Mid-term	*****	*****
Oral test	*****	*****
Final exam	3, 4,6 et 8	55%

### 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- 1-ANTOINE P., FABRE D.: Geology applied to civil engineering, Masson ed.
- 2-BARTON, LIEN, LUDE engineering classification of rock masses for the design of tunnel support. Rock Mech.
- 3-Bour Ivan: Crystallography and Mineralogy Course
- 4- CAMBEFORT H: Geotechnical engineering and soil reconnaissance, Eyrolles ed. 3e ed.
- 5-FILLIAT G. (coordinateur) : The Practice of soils and foundations, Editions du Moniteur,

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6- GRAÏNE-TAZEROUT Khadija: GEOLOGY Course. (Review 2017/2018-Dpt Geology-FSTGAT/USTHB)

7-Houti Farid : GEOLOGY COURSE

8- JELLOUL BRAHIM: GEOLOGY COURSE FOR ENGINEERS.

9- LETOURNEUR J., MICHEL R.: Civil Engineering Geology, coll. U, Armand Colin Ed.

10- <https://formation-continue.enpc.fr/nos-formations-courtes/11-genie-civil/215-geotechnique>

11-[https://www.pairform.fr/doc/17/138/467/web/co/6\\_4\\_1.html](https://www.pairform.fr/doc/17/138/467/web/co/6_4_1.html)

12-<https://junior.universalis.fr/encyclopedie/plis-et-failles-geologie/>

# Environmental Engineering

Code: GCV 03 112

**Teacher: Monem KALLEL**

Grade: Professor

University: National School of Engineers of Sfax ENIS

**Email:**

monemkallel@gmail.com

Total module duration

**28**

Contact hours	Out of class activities
14h CI	14h

The equivalent credits

**1 ECTS**

**Semester 1**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

- The first part of this course focuses on the notion of air pollution with the study of the greenhouse effect, global warming, the ozone hole and acid rain.
- The second part is interested in the notion of water pollution by focusing on the water cycle (drinking water treatment plant, distribution network, sewerage network and treatment plant).
- The third part allows the students to present their projects on themes of their choice (1. ecological house, 2. storage tank drinking and waste water network treatment plant and dam, 3. earthquake-proof construction, 4. clinker and recycled materials, 5. cement and building materials).

### Objectives

The objectives of the course are

- To acquire the basic notions on the environment: the natural conditions necessary for a healthy life and the identification of the disturbances that can be generated and can lead to the degradation and pollution of natural resources and the quality of life.
- To master the regulations in force.
- To know the impact of civil engineering projects on the environment,
- To know the various wastes in the field of civil engineering, the recovery and recycling of these wastes.
- To know the importance of the environment.
- To participate as a citizen to preserve it and as a GC engineer to participate actively in projects of depollution, recycling of materials, construction of HQE buildings, installation of technical landfill CET and WWTP.

### 1.2: Prerequisites

- General notions on the environment
- General knowledge in the field of geology and biology
- Chemistry
- Building materials
- Construction techniques

### 1.3: Learning Outcomes

Chapter	Entitled	Duration	Targeted Competences
<b>Chapter 1</b>	General information	2	General introduction on the environment, sustainable development and knowing the different components of the environment
<b>Chapter 2</b>	Pollution and environmental degradation	2	To know the different forms of pollution, the causes, the consequences of the different forms of pollution as well as solutions for fight against pollution.
<b>Chapter 3</b>	Environmental institutions in Tunisia	2	To know the different Tunisian environmental institutions as well as the Missions of each institution.



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<b>Chapter 4</b>	Environmental impact study	2	Understand environmental impact assessment, To know its objectives, its content and to know the different projects submitted to the EIA
<b>Chapter 5</b>	Structures that protect the environment: WWTP (wastewater treatment plant) and CET (technical landfill center)	2	Have an idea about WWTP and CET, To know how the WWTP and the CET work and the techniques for carrying out a CET (technical landfill center).
<b>Chapter 6</b>	Classification, recycling and valorization of waste in the field of civil engineering	2	To know the Classification of waste in the field of construction and public works as well as Recycling and Valorization: Examples
<b>Chapter 7</b>	High ENVIRONMENTAL QUALITY SUSTAINABLE building	2	To know the HQE approach, the HQE building, and how to apply an HQE approach during the execution phase and the operation phase of the building


### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14
Practical work (h)	
Project (h)	
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All chapters	30%
Practical work		
Mid-term		
Oral test		

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Final exam		All chapters	70%

### 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Government Decree No. 2018-447 of May 18, 2018, setting limit values and alert thresholds for ambient air quality.
- Order of the Minister of Local Affairs and the Environment and the Minister of Industry and Small and Medium Enterprises of March 26, 2018, setting the limit values for effluent discharges into the receiving environment.
- Decree No. 2005 - 1991 Of July 11, 2005, relating to the environmental impact study and setting the categories of units subject to the environmental impact study and the categories of units subject to the specifications.
- Law No. 96-41 of June 10, 1996, on waste and the control of its management and disposal (1)
- EARTH PLANET SUMMIT United Nations Conference on Environment and Development Rio de Janeiro, Brazil 3-14 June 1992
- Guide for the High Environmental Quality (HQE) of buildings in the Alpes-Maritimes 2012 vintage
- PhD thesis of Mrs. ZMEMLA Raja: study of the long-term behavior of Tunisian phosphogypsum stored on slag heaps and valorized in road technology.

# Architecture, town planning and urban development

Code: GCV 03 113

**Teachers: Fathi Cherif & Boudabous Hager**

Grade: Engineer of urbanistics projects

Grade: urban architect

University: IIT

Total module duration

49 h

Contact hours	Out of class activities
28h CI	21h

The equivalent credits

2 ECTS

Semester 1

## Architecture and urban planning

### 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

#### 1.1: Course Description

This course consists of the following parts:

#### Part 1: Architecture

Representation of the elements of a building for residential use

Living space: bedrooms, living room, living room, shower room, bathroom, kitchen

Traffic area: corridors, stairs, elevators

Floor plan

Location map

Distribution plan: plan view of a building

Façades: main facade, side facades

Cuts: simple cut, broken cut

Representation of the elements of a multi-storey residential, administrative or commercial building.

Representation of engineering structures: Girder bridges, Slab bridges, Steel bridges

#### Part 2: Town Planning & Development

Architecture and sustainable development

Functionality of human life in a city

"Diagnosis": Approaches to the space and layout

Development Procedures

Habitat and territory: land use and urbanization coefficients

Urban Transportation

Urban Project - Programming

Morphology of urban spaces and zoning: Administrative zone; Commercial zone;

Business or industrial zone; Agricultural zone; Cultural and leisure zone, green zones ...

Types of Subdivision and Subdivision Projects

Roads and features in a subdivision project

Servicing and drainage networks in a subdivision project

Presentation of the Tunisian Urban Planning Code

## Objectives

The objectives of this course are to:

- To master the reading and understanding of architectural plans related to a building or engineering project.
- To train students to think both theoretically and operationally in urban planning and development, taking into account environmental issues.
- To acquire basic knowledge for territorial planning and development
- To apply the restrictions of the urban planning code when creating an urban or civil engineering project
- To be able to create subdivisions in the different zoning areas of the city
- To control the mobility component in the city via urban transport: creation of urban transport networks, stations and parking lots
- To know the characteristics of the urban roads in the different areas of the city
- To draw the networks of servicing of the subdivisions

## 1.2: Prerequisites

Civilizations in Tunisia; traditions, cultures and way of life in the Tunisian style

## 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Representation of the elements of a construction for residential use	2 h	Master the representation of the elements of a construction: Bays; staircases; furnishings, lighting, sanitary equipment; elevators; heating equipment air conditioning
<b>Chapter 2</b>	Floor plan Location map	2h	Master the reading and understanding of the layout and location plans of a real estate project.
<b>Chapter 3</b>	Distribution plan of a construction Facades Cups	4h	Master the reading and understanding of the distribution plans of the different levels Basement; ground floor; mezzanine and garden level; floors; terrace floor of a real estate project. Master the reading and understanding of simple and broken cuts Mastering the layout of a staircase
<b>Chapter 4</b>	Representation of engineering structures :	4h	Master the reading and understanding of plans for: apron; abutments; headers. Master the reading and comprehension of a longitudinal section of an OA and a cross section of an OA.

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<b>Chapter 5</b>	Architecture and sustainable development	3h	Know the contemporary architecture and the old styles of constructions through the history of the region in Tunisia. Life Cycle Assessment Sustainable development
<b>Chapter 6</b>	Functionality of human life in a city	3h	Know the functionalities of the citizen's life in his city: work; transportation; residence; administration; education of young people; culture and place of worship and leisure; health; energy; waste.
<b>Chapter 7</b>	Approaches to space and planning procedures	2h	Establish a Diagnosis of the existing situation Define Space Requirements Know the layout procedures
<b>Chapter 8</b>	Morphology of urban spaces	3h	Know the different zones in a city and list the specificities of each zone and establish the links between them.
<b>Chapter 9</b>	Types of Subdivision and Subdivision Projects	3h	Create subdivisions in the different zoning areas of the city Create the necessary roads in a subdivision project Servicing a subdivision project
<b>Chapter 10</b>	Town planning code in Tunisia	2h	Know the restrictions and requirements of the urban planning code

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	28h
Practical work (h)	
Project (h)	
Visits (h)	6h

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-term	Chapter 1, 2, 3,4 & 5	30%
Oral test		
Final exam	All	70%

## 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Technical drawing and plan reading: building and structural work Book of Henri Renaud
- Technical drawing and reading of building plan pdf April 2020
- Town planning code in Tunisia.
- Dictionary of urban planning and development online at Puf.com
- Dictionary of urban planning and development, Pierre Merlin, Françoise Choay, Puf.
- Town planning. By Pierre Merlin. Année : 2010; Pages : 128 Editor : University Presses of France
- Technologies and French urban engineering - The dialogue of the territories with the city's industrialists Patrick Braouezec, (Prefacier) Antoine Frérot, (Prefacier) Gérard Wolf, (Postfacier)
- Urban planning and development: Theories and debates : Book of Juliette Maulat and Sabine Bognon

# Topography

Code: GCV 03 114

**Teacher : ELLOUZE Ali**

Grade: Master assistant

University: National School of Engineers of Sfax ENIS

Email:

[ali.ellouze@enis.tn](mailto:ali.ellouze@enis.tn)

Total module duration

63 h

Contact hours	Out of class activities
21h CI + 14h TP	28h

The equivalent credits

3 ECTS

Semester 1



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

- General: Shape and Dimensions of the Earth, Applications of Topography
- Geometric Levelling: General Levelling of Tunisia (N.G.T), Principle of Geometric Levelling, Geometric Levelling Processes, Errors and Faults
- Measuring angles and distances: Horizontal Angles and Orientation, Vertical Angles, Direct Distance Measurements, Indirect Distance Measurements, Calculating Reduction, Errors and Mistakes
- Topographic survey methods: Planimetric framework, Polygonation, Triangulation, Intersection, Intersection, Crossover, Trilateration
- Reading of maps and profiles: Contour line, Altitude of a point, Elementary shapes of the ground, Plan view, longitudinal profile and Cross profile.

### Objectives

The student must be able to:

- Understand any document drawn up by a topographer.
- Be able to communicate with a topographer.
- Know how to operate a topographer.
- Monitor the proper execution of a survey.
- Receive any work completed.
- Handling of topographic equipment (level and total station) in order to establish simple surveys.

### 1.2: Prerequisites

Mathematics : ( Trigonometry, Integration and Geometry)

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	General	4 h	To know the shape and dimensions of the earth Know the applications of topography
<b>Chapter 2</b>	Geometric levelling	5 h	To know the general levelling of Tunisia (N.G.T) To master the principle of geometric levelling. To master the processes of geometric levelling. Interpret the Errors and Faults.
<b>Chapter 3</b>	Measurement of angles and distances	4 h	Measure horizontal angles and orientation Measuring vertical angles Mastering direct distance measurements Controlling indirect measures of distance Do the Discount Calculation Interpreting Errors and Mistakes

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<b>Chapter 4</b>	Topographic Survey Methods	4 h	Mastering the Planimetric Canvas Mastering Polygonation Mastering Triangulation Mastering the Intersection Controlling cross-referencing Mastering Trilateration
<b>Chapter 5</b>	Reading maps and profiles	4 h	Read the contour line Determine the altitude of a point Read and understand the elementary forms of the terrain Read and understand the drawing in plan Read and understand the profile at length Read and understand the profile across

### Contents of the practical work

Execution of a geometric levelling by pathway and radiation.

Measurement of angles and distances (Total station)

Execution of a detailed survey by combined measurements of angles and distances with a total station

### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	14
Project (h)	
Visits (h)	

The “Out of class activities” consists of:

Activity 1 (7h)	Projet (VRD)
Activity 2 (7h)	Projet (BAT)
Activity 3 (h)	
Activity 4 (h)	

### 3. EVALUATION :

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Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work	2, 3 & 4	25%
Mid-term	1, 2 & 3	20%
Oral test		
Final exam	3, 4 & 5	55%

#### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Ernest P. LAUZON et Roger DUQUETTE : « General topometry” second edition : Les Editions de l'Ecole Polytechnique de Montréal (E.E.P.M.)
- Ernest P. LAUZON et Roger DUQUETTE : ” General topometry” troisième édition : Les Editions de l'Ecole Polytechnique de Montréal (E.E.P.M.)
- Lucien LAPOINTE et Gilles MEYER : ‘Topography Applied to Public Works, Buildings and Urban Surveys”: Fourth Edition 1997 EYROLLES
- Michel Brabant : “Master the topography of the observations on the plan” First edition : 2001 EYROLLES
- Michel Brabant, “Master the topography of the observations on the plan” second edition: 2003. EYROLLES
- S. MILLES : modern topography and topometry tome 1 and 2 : 1999 EYROLLES
- - Topography and General Topometry Course: School and Observatory of Earth Sciences (EOST)

### Preparation for DELF B2 certification

**Code: GCV 03 101/GCV 03 201**

**Teacher: Aymen Degachi**

**Grade: Full-time faculty member**

**University: IIT**

**Email:**

**aymen.degachi@iit.ens.tn**

**Total module duration**

**63+63 h**

Contact hours	Out of class activities
21h CI + 14h Projet	28h
21h CI + 14h Projet	28h

**The equivalent credits**

**2+2 ECTS**

**Semester 1+2**

### 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

#### 1.1: Course Description

This course is a preparation for the DELF level B2 certification. Indeed, it is a training on a refinement of the different skills required for the DELF B2 exam. These skills revolve around oral and written comprehension as well as oral and written production. In this sense, in each session our work consists in elaborating staggered exercises in two parts: an oral and a written activity. In addition, we encourage students to practice the different DELF B2 exams. This is done through various applications that allow students to learn, revise and deepen their knowledge of French lexical, grammatical and civilizational aspects by tackling many topical themes.

#### Objectives

##### ➤ **Global objective :**

To develop students' communicative skills and improve their self-confidence when speaking in public and to be able to discuss, debate and present a personal point of view in any communication situation; both written and oral.

##### ➤ **Specific Objectives :**

At the end of this course the student will be able to:

- Direct the listening of an audio support, pick up the most relevant details and understand authentic audio documents.
- Locate the information necessary for the comprehension of an informative text relating to various fields.
- Take a position in front of a well determined problematic and produce an argumentative essay related to several themes.
- Locate the main idea of an article and present orally a personal opinion on the subject in question.

#### 1.2:Prerequisites

The students can easily build a brainstorming network of ideas on the different topics proposed in the sessions. They are also able to produce and present short fragments orally to the class. They are also able to write a short paragraph in a given time frame in relation to defined themes.

## 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	<b>The keys to talk about our plural identity</b>	14 H	<p>In this work unit we evoke the theme of the new links between the individual and his environment in order to have the ability to :</p> <ul style="list-style-type: none"> <li>- Better talk about new social models, relationships between family members.</li> <li>- Identify the notions of cause and consequence</li> <li>- Elaborate an argumentative discourse</li> <li>- Master the keys to the newsletter / informative text / argumentative essay / general idea</li> </ul>
<b>Chapter 2</b>	<b>Keys to Talk about Civil Rights</b>	14 H	<p>In this course, we will discuss the struggle of men and women for their rights and social benefits in order to be able to :</p> <ul style="list-style-type: none"> <li>- Talk about freedom of choice / civil rights and equality / solidarity</li> <li>- Work on the modes of the indicative, the infinitive and the subjunctive + the goal</li> <li>- Make a plan to organize ideas: informative and argumentative text</li> <li>- Master the keys to the interview / the argumentative text / the professional letter / the point of view</li> </ul>
<b>Chapter 3</b>	<b>The keys to talk about the professional world</b>	14 H	<p>In this section we focus on professions, trades and working conditions with the objective of knowing :</p> <ul style="list-style-type: none"> <li>- Giving an opinion</li> </ul>

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			<ul style="list-style-type: none"> <li>- Structuring a statement</li> <li>- Using opposition and concession</li> <li>- Elaborate the introduction and conclusion of an argumentative text</li> <li>- To master the keys of the argumentation / letter of application and complaint</li> </ul>
<b>Chapter 4</b>	<b>Keys to Talk about Citizenship</b>	14 H	<p>In this module we highlight the theme of citizenship, the rights and duties of citizens to learn to :</p> <ul style="list-style-type: none"> <li>- Address administrative and political issues in France</li> <li>- Talking about the symbols of the state</li> <li>- Using the hypothesis</li> <li>- Maintain a moderate tone in a formal letter.</li> <li>- Mastering the keys to discourse/opinion debate</li> </ul>
<b>Chapter 5</b>	<b>The keys to talk about future world</b>	14 H	<p>In this unity we focus on solutions for a better world, for sustainable development and for the environment in order to be able to :</p> <ul style="list-style-type: none"> <li>- Confirm or contradict the interlocutor</li> <li>- Ask for more information</li> <li>- Using time indicators</li> <li>- Using reported speech</li> <li>- Using non-verbal communication in interaction</li> <li>- Mastering the expression of agreement, reserve, disagreement and uncertainty</li> </ul>

## 2. METHODOLOGY:

The DELF B2 certification preparation course is composed of two parts:

- Integrated courses (communication of fundamental information introduced by using multiple examples)
- Applications and exercises

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### 3. EVALUATION:

Type	Covering which Chapter (s)	The weighting factors
Mid-term	1-2-3	30%
Final exam	1-2-3-4-5	70%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- BRETONNIER Marie, GODARD Emmanuel, LIRIA Philippe, MISTICHELLI Marion et SIGÉ Jean-Paul, Les clés du nouveau DELF B2, Editions Maison des Langues, Paris, 2007, Réimpression Juillet 2014.
- COLLINI Virginie, JAMET Marie-Christine, Préparation à l'examen du DELF B2, Hachette Français Langue Étrangère, Paris, 2008, Impression Mai 2013.
- <https://www.bonjourdefrance.com/>
- <https://www.partajondelfdalf.com/>



# Economy for Engineer

**Code : GCV 03 202**

**Teacher: Amel Trabelsi Elloumi**

**Grade: Full-time faculty member**

**University: International Institute of Technology**

**Email:**

**Dep.PCP@iit.ens.tn**

**Total module duration**

**42 h**

<b>Contact hours</b>	<b>Out of class activities</b>
<b>21h CI</b>	<b>21h</b>

**The equivalent credits  
2 ECTS**

**Semester 2**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

The aim of this course is to enable the student to acquire the essential tools to a good understanding of the training and evolution of exchange institutions, and of price formation. The analysis of these phenomena will be based on the study of the behavior of decision-making centers (business, consumer and other institutions) that affect the distribution of resources in an economy. The course also aims to familiarize the student with scientific methodology in economics as well as to abstract reasoning for a better understanding in economic realities. This course will cover the general foundations of the economy and the two main levels of economic analysis: microeconomics and macroeconomics.

### Objectives

Overall objectives: Introduce the student to basic concepts in economics, explain and analyze, ranging from individual behavior (microeconomics) to general behavior (macroeconomics), the main mechanisms of economic life.

Learning outcomes: At the end of this course, the student must be able to:

- know the fundamentals of microeconomic analysis and to study the behavior of individual economic agents (consumers and companies) in markets where products are traded.
- Master the tools of microeconomic analysis will allow the student to learn how to assess the health of a company.
- Be familiar with the tools and aggregates used to measure economic activity.
- Interpret and analyze the main macroeconomic imbalances.
- Analyze current problems and economic realities.

### 1.2: Prerequisites

Mathematics

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
Chapter 1	Introduction to Economic Analysis	5h	<ul style="list-style-type: none"> <li>❖ To differentiate between economic and non-economic goods and classify economic goods and needs</li> <li>❖ To analyze economic activity (organization and relations between actors)</li> <li>❖ To know the tasks of the economist, the methods used and the different levels of economic analysis.</li> </ul>
Chapter 2	The economy and main schools of economic thought: foundations and contributions	4h	<ul style="list-style-type: none"> <li>❖ To know the main currents of economic thought and their main contributions,</li> </ul>

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			<ul style="list-style-type: none"> <li>❖ Understand why and how an economic issue can be addressed in a different way with different economists</li> <li>❖ To know the basis on which the main economic systems are built.</li> </ul>
<b>Chapter 3</b>	<b>Analysis of consumer behavior</b>	4h	<ul style="list-style-type: none"> <li>❖ To describe how and why individuals choose one good over another;</li> <li>❖ To show that the combination of preferences and budget constraints determine consumer choices</li> <li>❖ To determine which combination of goods to choose to maximize consumer utility.</li> </ul>
<b>Chapter 4</b>	<b>Analysis of consumer behavior</b>	4h	<ul style="list-style-type: none"> <li>❖ To introduce producer behavior, the production function, productivity and cost theory and introduce the relationship between costs, prices and profits</li> </ul>
<b>Chapter 5</b>	<b>Economic circuit</b>	4h	<ul style="list-style-type: none"> <li>❖ To know the decision-making and economic agents and the interactions underlying economic activities.</li> <li>❖ To determine the national accounts (financial and non-financial) used to record and summarize the economic activities carried out by economic agents.</li> </ul>

## 2. METHODOLOGY:

The method adapted in this course is:

- Economic activity
- Organization of economic activity
- Methods and levels of analysis in economics

The teaching includes:

- Lectures (communication of basic information using examples and applications)

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- Tutorial sessions (exercises)
- Homework

The contact hours consist of:

Integrated Course (h)	15
Practical work (h)	6
Project (h)	
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work	*	10%
Mid-Term	*	20%
Oral test		
Final exam	*	70%

### 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

#### Course manual:

Course notes in General Economics  
 Workbook Exercises

#### Reference manuals :

- Mankiw G.N. (1998), *Principes de l'Economie*, Economica.
- Parkin M. et BADE R. (2002), *Introduction à la macroéconomie moderne*, Collection ERPJ.
- Samuelson P. A. et Nordhaus W. D. (2000), *L'Economie*, Economica.
- Bosserelle E. (2017), *Les Fondamentaux - Economie Générale*, Scolaire / Universitaire (broché)

# Math for Engineer II

Code: GCV 03 203

Teacher: Raouia Neji

Grade: Full-time faculty member

University: International Institute of Technology of Sfax (IIT)

Email:

[raouia.neji@iit.ens.tn](mailto:raouia.neji@iit.ens.tn)

Total module duration

42 h

Contact hours	Out of class activities
21h	21h

The equivalent credits

2 ECTS

Semester 2

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course consists of learning how to solve one- and two-variable differential equations with constant coefficients with or without a second member.

This course also includes the distribution being the most suitable theory for many physical systems, convolution and Fourier Transform being very powerful tools thanks to distributions.

This course will focus on the application of mathematical tools to represent physical phenomena that classical functions are unable to transcribe.

### Objectives

The objectives of this course are to:

- To be able to solve a differential equation with one and two variables
- Be able to compute Fourier transforms of non-periodic functions.
- To have understood the notion of the convolution product.
- Understand the notions of Laplace transforms and inverse Laplace transforms.
- Be able to solve a differential equation using Laplace transforms.
- Know how to decompose a periodic signal into a Fourier sum.

### 1.2: Prerequisites

Mathematical Fundamentals

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Solving differential equations of order 1 to 4	6h	-Solving one-variable and constant coefficient differential equations with or without a second member -Solving bivariate and constant coefficient differential equations with or without a second member
<b>Chapter 2</b>	Fourier Transform	7h	Understand and master the following concepts: General Sufficient condition of existence Properties Convolution Inversion Floor and Parseval Formulas
<b>Chapter 3</b>	Laplace Transformation	7h	Understand and master the following concepts: General Properties Convolution Practical methods for calculating the image and an original Application: Using the Laplace transform to solve a differential equation

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<b>Chapter 4</b>	Optimisation	5h	Understand and master the following concepts: Extremum Critical point Optimization under stress
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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	*****
Project (h)	*****
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work	*****	*****
Mid-term	1, 2,3	30%
Oral test	*****	*****
Final exam	All	70%

# Computer Aided Drafting (DAO)

Code: GCV 03 204

Teacher: Ilhem Borcheni

Grade: Full-time faculty member and head of the Civil Engineering department

University: International Institute of Technology (IIT)

Email:

Ilhem.borcheni@iit.ens.tn

Total module duration

56 h

Contact hours	Out of class activities
28h TP	28h

The equivalent credits  
2 ECTS

Semester 2



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

- The presentation of AUTOCAD, AUTOCAD Design Center
- The DWT Drawing (template file);
- The multi-document environment;
- The coordinate system;
- The operation of AUTOCAD;
- The various commands and associated contextual menus
- Building design: facades, plans, sections, details
- Reinforced concrete design: formwork, reinforcements, footings, columns and beams in B. A, floors with pre-slabs, wall in B.A.

### Objectives

- Acquire the principles of representation of plans in Civil Engineering and master the use of the commands of the AUTOCAD software;
- Represent and read plans
- Realize a 2D drawing project, from the initial parameterization to the printing on A0 plotter.
- To master adequately the 3D functionalities of the AUTOCAD software on architectural and formwork plans.
- The student will be able to develop his or her own vision in space and refine his or her understanding of volumes, and the use of various drawing instruments, particularly the computer and various software programs.

### 1.2: Prerequisites

Basic computer skills.

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
TP1	Presentation of the AUTOCAD software	4h	Master AUTOCAD commands and tools Master the parameterization Master the management (of data, files and their properties, of the screen environment: windowing, display, toolbar, precision in the drawing ;
TP2	Building design: facades, plans, sections, details	6h	Master the Drawing of architectural plans of a building Master plan scoring systems
TP 3	Presentation of facades, sections and details	6h	Present facades, sections and details of an architectural plan
TP 4	Drawing plans in Reinforced Concrete	6h	Develop the formwork plan, reinforcements, footings, columns-beams in B.A., floors with pre-slabs, sail in B.A., staircase,

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<b>TP 5</b>	3D Drawings	6h	Master Perspective, Master location in space. Understand and read Façades as a main facade
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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	*****
Practical work (h)	28h
Project (h)	*****
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work	All	100%
Mid-Term	*****	*****
Oral test	*****	*****
Final exam	*****	*****

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Dessin technique, Saint-Laurent, GIESECKE, Frederick E. Éditions du renouveau pédagogique Inc., 1982.
- Exercices de dessins de pièces et d'assemblages mécaniques avec le logiciel SolidWorks, Jean-Louis Berthéol, François Mendes,
- La CAO accessible à tous avec SolidWorks : de la création à la réalisation tome1 Pascal Rétif,
- Guide du dessinateur industriel, Chevalier A, Edition Hachette Technique,

# General and urban hydraulics

**Code: GCV 03 205**

**Teacher : Mohamed KTARI**

**Grade: Master Assistant**

**University: National School of Engineers of Sfax ENIS**

**Email:**

**Medktari55@gmail.com**

**Total module duration**

**56 h**

Contact hours	Out of class activities
28h CI	28h

**The equivalent credits**

**2 ECTS**

**Semester 2**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course consists of the following parts:

- Analysis and description of the water needs of an agglomeration
- Search for a water point capable of meeting these needs
- Design and dimensioning of networks: supply, distribution and evacuation to a natural outlet after treatment if necessary.

### Objectives

The objectives of this course are to:

- To know how to estimate the needs of an agglomeration in order to design a suitable network.
- Choose the type of flow and type of networks according to the circumstances and needs.
- Search for and optimize the source that can meet the needs.
- Dimension and calculate the flow networks under load (under pressure).
- Dimension and calculate free surface flow networks

### 1.2: Prerequisites

- Underground hydraulics (flow in the ground)
- Fluid Mechanics

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Water needs to be met	6h	Know how to estimate the needs of an agglomeration in order to design a suitable network.
<b>Chapter 2</b>	General Characteristics of Water and Sewerage Facilities	6h	Choose the type of flow and type of networks according to the circumstances and needs.
<b>Chapter 3</b>	Capture	6h	Search and optimize the source that can meet the needs
<b>Chapter 4</b>	Flow under load	5h	Dimension and calculate the flow networks under load (under pressure)
<b>Chapter 5</b>	Free surface flow	5h	Dimension and calculate free surface flow networks

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	28h
Practical work (h)	*****
Project (h)	*****
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work	*****	*****
Mid-Term	1, 2, 3	30%
Oral test	*****	*****
Final exam	3, 4 , 5	70%

### 4. RECOMMENDED BIBLIOGRAPHY:

- Hydraulique souterrain
- Mécanique des fluides
- Hydraulique générale et hydraulique urbaines

# Operational Research

**Code: GCV 03 206**

**Teacher: Omar AYADI**

**Grade: Associate Professor**

**University: IIT**

**Email:**

[Omar.ayadi@yahoo.fr](mailto:Omar.ayadi@yahoo.fr)

**Total module duration**

**35 h**

Contact hours	Out of class activities
21h CI	14h

**The equivalent credits**

**2 ECTS**

**Semester 2**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course consists of applying scientific methods and tools to problems involving the operations of a system so as to find optimum solutions in parity with the overall objectives and constraints. The types of problems that may be addressed by operation research methods are firstly described. The structure of a linear program is then presented to model mathematically the operation research problems. The graphical and simplex methods are then studied as basics resolution methods.

### Objectives

The purpose of this module is to investigate modeling and solving techniques of optimization problems. Based on several examples, and following an analogy approach between the considered methods, the student is expected to learn how to identify a linear operational research problem, develop corresponding model (linear program), solve it with one of the studied methods and analyze the obtained solutions.

### 1.2: Prerequisites

Basic mathematical knowledge are recommended

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Linear modelling	6H	- To Know the type of operation research problems and application area of operation research methods - To distinguish the different component of operation research problem: decision variables, parameters, objectives and constraints - To develop the canonic and standard formulations of linear programs
<b>Chapter 2</b>	Graphical resolution method	6H	- To solve problems using graphical method
<b>Chapter 3</b>	Simplex algorithm	12H	- To know the different steps of Simplex method and the analogy with graphical method
<b>Chapter 4</b>	Duality and post-optimality analysis	6H	-To solve dual problem and make post-optimality analysis

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### 2. METHODOLOGY:

The contact hours consist of presenting different aspects related to operation research: problem modeling, methods and analysis. The theoretical aspects are accompanied by cases study. A part of these cases is requested to be made as self-study activities.

Integrated Course (h)	21h
Practical work (h)	
Project (h)	
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-Term	Chapter 1, 2	30%
Oral test		
Final exam	Chapter 3, 4	70%

### 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Introduction à la recherche opérationnelle et à la gestion de production (2005) Kacem Saï. Centre de Publication Universitaire, Tunisie
- Introduction à l'optimisation différentiable (2006) Michel Bierlaire. Presses Polytechniques et universitaires romandes



# Numerical analysis

Code: GCV 03 207

Teacher: Khalil Ayadi

Grade: Mster Assistant

University: ISGIS

Email:

khalilayadi@yahoo.fr

Total module duration

42 h

Contact hours	Out of class activities
14 CI+14h TP	14h

The equivalent credits  
2 ECTS

Semester 2

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course includes:

- Direct methods for the resolution of linear systems (Gauss elimination method, Cholesky method, LU decomposition method: Crout method, QR factorization method)
- Iterative Methods (Classical Iterative Methods, Gradient Methods, Eigenvalue and Eigenvector Calculation)
- Interpolation and Approximation (Lagrange Interpolation, Newton Interpolation Polynomial, Approximation in the sense of discrete least squares)
- Numerical integration (Composite method, Interpolation type quadrature formulation, Classical integration formula, Gauss formulas)
- Numerical resolution of differential equations (Numerical approximation of 1st order differential equations, Finite difference method: heat equation, Study of one-step methods)
- Computer work: Applications on Matlab

### Objectives

The objectives of this course are to:

- Master the resolution of a linear system
- Be able to apply iterative methods to approach a solution (convergence)
- Master the use of linear interpolation methods and know non-linear interpolation.
- Be able to apply the method of least squares
- Mastering the numerical calculation of an integral
- Be able to apply the finite difference method

### 1.2: Prerequisites

Math for Engineer I, Math for Engineer II

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Direct methods for the resolution of linear systems	8h	-Solving a linear system using Cholesky and Crout methods
<b>Chapter 2</b>	Iterative methods	3h	-Apply iterative methods for the calculation of eigenvalues and eigenvectors
<b>Chapter 3</b>	Linear and non-linear interpolation and Least Squares Approximation	6h	-Apply linear and non-linear interpolation methods -Apply the method of least squares

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<b>Chapter 4</b>	Digital integration	6h	-Master Numerically calculating an integral
<b>Chapter 5</b>	Numerical resolution of differential equations	5h	- Master Numerically solve the differential equations of order 1 - Apply the finite difference method for the discretization of the heat equation

Practical work: Computer work: Applications on Matlab in all chapters

### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	14h
Project (h)	*****
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work	All	25%
Mid-term	1, 2,3	20%
Oral test	*****	*****
Final exam	All	55%

### 4. RECOMMENDED BIBLIOGRAPHY:

- P. Lascaux, R. Théodor. Numerical Matrix Analysis Applied to the Art of Engineering, Tomes 1 and 2 Masson 1986.
- M. Crouzeix, AL Mignot: Numerical analysis of differential equations, collec. Math. Appli. For mastery. Masson, 1984.
- O.G. CiarletIntroduction and Numerical Matrix Analysis and Optimization, Dunod.

# Calculation of Structures I

**Code: GCV 03 209**

**Teacher: Mounir Ben Jdidia**

**Grade: Professor**

**University: National School of Engineers of Sfax ENIS**

**Email:**

**mounir.benjdidia@enis.rnu.tn**

**Total module duration**

**84h**

Contact hours	Out of class activities
42h CI	42h

**The equivalent credits**

**3 ECTS**

**Semester 2**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course consists of the following parts:

- Deformation of isostatic and hyper-static beams: Navier Bresse formulas, Wilson Maney formulas
- Study of continuous beams: Claperon method; Focal methods
- Energy Theorem: Bertrant Font-Violant unitary charge theorem; virtual work theorem; Mawell-Betti reciprocity theorem; Castigliano's theorem; Menabrea's theorem.
- Force and cut-off method: Study of continuous beams; Study of frames
- Studies of lattice systems
- Simple bending of compressed bars
- Buckling with bending of compressed bars

### Objectives

The objectives of this course are to:

- Master the Navier Bresse formulas in the study of deformation of isostatic and hyperstatic beams.
- Master the Claperon method and the foci methods in the study of continuous beams.
- Study the continuous beams
- Study frames and gantries
- Controlling deformations of lattice systems
- Master the calculation of displacements and rotations of a hyperstatic structure by applying the virtual work theorem.
- Calculate the simple buckling of compressed bars
- Calculate the buckling with bending of the compressed bars

### 1.2: Prerequisites

Math, Material Resistance

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Deformation of isostatic and hyper-static beams	6 h	Master the Navier Bresse formulas in the study of deformation of isostatic and hyperstatic beams. Master Wilson Maney's formulas in the deformation study of isostatic and hyperstatic beams
<b>Chapter 2</b>	Study of continuous beams	6h	Master the Claperon method and the foci method in the study of continuous beams.

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<b>Chapter 3</b>	energy theorems	9h	Apply Castigliano's theorem to calculate the displacement under a point load; Apply Mhor's theorem to compute displacement under distributed loads; - Apply Mhor's theorem to compute displacement under point loads Apply Mawell-Betti's reciprocity theorem ; Apply the Bertrant unit load theorem for the calculation of displacements and rotations; Master the calculation of displacements and rotations of a hyperstatic structure by applying the virtual work theorem. Apply the Menabrea therome for the calculation of hyperstatic reactions.
<b>Chapter 4</b>	Method of forces and cuts	9h	Study the continuous beams Study frames and gantries
<b>Chapter 5</b>	Study of lattice systems	6h	Master the calculation of internal stresses in the elements of an isostatic or hyperstatic lattice internally
<b>Chapter 6</b>	Simple bending of compressed bars	3h	Master the calculation of the simple buckling of compressed bars
<b>Chapter 7</b>	Buckling with bending of compressed bars	3h	Calculate the simple buckling of compressed bars


## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	42h
Practical work (h)	
Project (h)	
Visits (h)	

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-term	Chapter 1, 2 & 3	30%

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	Oral test			
	Final exam	All	70%	

#### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Albiges M. Résistance des matériaux appliquée, tome1, Editions Eyrolles, Paris, 1969.
- Decelle A. F., and Legendre D., Mécanique appliquée au génie civil, Editions Eyrolles, Paris, 1983.
- Dreyfuss E., Leçons sur la Résistance des matériaux, Editions Eyrolles, Paris, 1966.
- Maquoi R., Mécanique des structures –première partie- Notes de cours destinées aux étudiants de 3ème Bachelier Génie Civil, Université de Liège –Faculté des sciences appliquées, 2008.
- Megson T. H., Structural and stress analysis, British library cataloguing in publication data, 1996.
- Nash W. A., Theory and problems of strength of materials. 4th Ed. McGraw-Hill, New York, 1998.
- Philippe B., Mécanique des Structures, ENPC, 2008
- Calcul pratique des structures auteurs : w.a. jalil édition : eyrolles

# Reinforced concrete I

Code: GCV 03 210

**Teacher: Mounir Ben Jdidia**

**Grade: Professor**

**University: National School of Engineers of Sfax « ENIS »**

**Email:**

**mounir.benjdidia@enis.rnu.tn**

**Total module duration**

**84 h**

Contact hours	Out of class activities
42h CI	42

**The equivalent credits**

**3 ECTS**

**Semester 2**



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course includes:

- Introduction and generalities (properties and behaviors of concrete and steel)
- Safety concept - Combinations of actions (ELU and ELS)
- Association Steel - Concrete (Adhesion and anchoring, and coating)
- Lowering of loads
- Single Traction - Tie rods
- The Simple Compression «Poles » (reinforcement and stability of a post)
- Single Bending

### Objectives

The notions to be studied in this course will allow students to appreciate:

- The working principle of reinforced concrete
- Load combinations at different limit states
- Anchoring steel in concrete
- The descent of loads in simple isostatic structures
- Calculation of reinforced concrete elements subjected to simple tension "tie rods".
- The calculation of reinforced concrete elements subjected to simple compression "columns".
- A section (rectangular or T-shaped) of a reinforced concrete part subjected to simple bending at the different limit states (ELU and ELS)

### 1.2: Prerequisites

Materials; RDM; Building design

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Introduction and generalities	6h	-Mastering the calculation of steel and concrete properties -Understanding the behaviour of concrete and steel
<b>Chapter 2</b>	Concept of safety - Combinations of actions	3h	-Mastering and calculating ELU and ELS combinations
<b>Chapter 3</b>	Steel - Concrete Association (Adhesion)	3h	-Master the calculation of straight and curved anchors -Define the coating
<b>Chapter 4</b>	Lowering of loads	12h	-Master the calculation of the load descent on a beam and on a column
<b>Chapter 5</b>	Single Traction - Tie rods	12h	-Mastering the calculation of tie rods in BA

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<b>Chapter 6</b>	The Simple Compression " Posts	3h	-Master the calculation of reinforcement and stability of a column
<b>Chapter 7</b>	Single Bending	12h	-Mastering the calculation of reinforcement of a rectangular section with the ELU Mastering the calculation of reinforcement of a T-section in the ELU Able to Justify the T-section in ELS

### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	42h
Practical work (h)	*****
Project (h)	*****
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work	*****	*****
Mid-Term	1,2,3	30%
Oral test	*****	*****
Final exam	All	70%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Cours de Résistance des matériaux de base (N. Bourahla)
- Résistance des matériaux – Introduction aux calcul des structures (J. Bastien)
- Résistance des matériaux Tome 1, O.P.U Collection le cours de génie civil, 06-1990 (Zedira H et LAhbari N)

# Soil Mechanics I

Code: GCV 03 211

Teacher: Moncef ZAIRI

Grade: Professor

University: National School of Engineers of Sfax ENIS

Email:

moncef.zairi@enis.rnu.tn

Total module duration

70 h

Contact hours	Out of class activities
28h CI +14h TP	28 h

The equivalent credits

3 ECTS

Semester 2

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

Soil mechanics studies the behaviour of superficial geological formations under the action of construction works (settlements, landslides...). Soils are classified according to parameters related to their composition (granulometry, porosity...) or their behaviour (plasticity, cohesion, permeability...). It is the knowledge of these parameters that will allow to predict the behaviour of soils and to adapt civil engineering works accordingly.

### Objectives

This course in Soil Mechanics (Part 1) allows student-engineers to:

- Identify the physical parameters of a soil
- Calculate underground flows
- Determine the water parameters of a soil
- Define the state of stresses in the natural soil or following loading
- Understand the consolidation process and calculate the oedometric compaction.

### 1.2: Prerequisites

Engineering Geology, MMC

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Soil Identification and Classification	7h	Identify the physical parameters of a soil
<b>Chapter 2</b>	Drainage in soils	8h	Calculate underground flows
<b>Chapter 3</b>	Soil constraints	7h	Determine the water parameters of a soil Define the state of stresses in the natural soil or after loading
<b>Chapter 4</b>	Settlement and consolidation	8h	Understand the consolidation process and calculate the oedometric compaction.

## 2. METHODOLOGY:

The contact hours consist of:

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Integrated Course (h)	28h
Practical work (h)	14h
Project (h)	
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		30%
Mid-Term		
Oral test		
Final exam	All	70%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Notes de cours (Moncef Zairi)
- La pratique des sols et fondations Georges Filliat, Editions du Moniteur, Paris 1981, 1392 pp.
- Cours pratique de mécanique des sols. 1 Plasticité et calcul des tassements, Costet et Sanglerat, Bordas, Paris 1981, 284 pp.
- Cours pratique de mécanique des sols. 2 calcul des ouvrages, Costet et Sanglerat, Bordas, Paris 1983, 447 pp.
- Eléments de mécanique des sols, Schlosser, Presses de l'Ecole Nationale des Ponts et Chaussées, 1984, 151pp.
- Soils in construction, Schroeder, John Wiley and Sons, NY, 1984.
- Canadian Foundation Engineering Manual, the Canadian Geotechnical Society, 1978, 345 pp.
- Mécanique des sols, Cordarey, Tec Doc, Paris 1994, 380 pp.
- Geotechnical Instrumentation for Monitoring Field Performance, dunnicliff et Green, John Wiley and Sons, 1988, 577pp.

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### Sustainable development

Code: GCV 03 212

**Teacher:**
**Grade:**
**University:**
**E-mail:**
**Total module duration**
**28h**

Contact hours	Out of class activities
14. CI	14

**The equivalent credits**
**1 ECTS**
**Module Responsible**

.....

**Semester 2**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This module presents the history, definition and importance of sustainable development by highlighting its 3 main pillars: an economic pillar, an environmental pillar and a social pillar.

It shows that the implementation of sustainable development consists in ensuring that all stakeholders (citizens, associations, companies, governments, etc.), adapt their behaviors, actions, policies, programs, laws and regulations, according to a global vision to simultaneously achieve environmental balance and subsequently achieve the reasons for the creation of Agenda 21.

This course studies the definition and the various types of pollution, waste and environmental impact, in particular with regard to water (its importance in our life, its multiple uses and the impact of wastewater)

The environmental policy is established which sets out the objectives and principles relating to the management of the effects and environmental aspects by preparing an exhaustive material balance of the sources of pollution, discharges and wastes. Then we measure the associated impacts and identify among these sources of pollution those that we can control in our processes. Finally, the building sector and the entire construction industry are particularly concerned by sustainable development, which presents itself as a major issue for this sector, and is gradually becoming a requirement of the owners and an increasingly regulatory obligation. more restrictive, particularly in terms of High Energy Performance and renewable energies. This leads this module to the verification of the requirements of the ISO 14001 standard as well as the legal and regulatory requirements.

### Objectives

The objectives of this course are to:

Understand sustainable development

Know the environmental impact


Ensure sustainable development and respect for the environment in the construction industry

### 1.2: Prerequisites

Environmental Engineering, Building Materials

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning outcomes
<b>Chapter 1</b>	Introduction and nomenclature of sustainable development	5h	Understand sustainable development
<b>Chapter 2</b>	Environmental aspects and impacts	5h	Know the environmental impact

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<b>Chapter 3</b>	The construction sector facing sustainable development	4h	Ensure sustainable development and respect for the environment in the construction industry	

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14
Practical work (h)	
Project (h)	
Visits (h)	

## 3. EVALUATION:

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-term	Chapter1,2	30%
Oral test		
Final exam	All	70%



# Concrete technology

**Code: GCV 03 213**

**Teacher: Ali Ellouze**

**Grade: Master assistant**

**University: National School of Engineers of Sfax ENIS**

**Email:**

**ali.ellouze@enis.tn**

**Total module duration**

**28 h**

Contact hours	Out of class activities
21h CI	21h

**The equivalent credits**

**2 ECTS**

**Semester 1**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description and Objectives

- Types and components of hydraulic concrete, the main formulation methods and technological solutions in terms of mixing, placing, additions and admixtures: Ordinary concrete BO, Self-compacting concrete BAP, High performance concrete BHP, Fiber reinforced concrete, Lightweight concrete BL.
- Exposure classes: situation of standard NF EN 206-1 in the normative and regulatory context.
- The main formulation methods, performances and specifications of BB bituminous concretes.

### Objectives

- Control the proportions of a mixture with specific properties at a lower cost.
- Mastering the NF EN 206-1 standard in the normative and regulatory context
- Mastering the main methods of hydraulic concrete formulation, technological solutions in terms of mixing, placing, additions, additions and admixtures : Ordinary concrete BO, Self-compacting concrete BAP, High performance concrete BHP, Fiber reinforced concrete, Lightweight concrete BL.
- Master the main formulation methods, performance and specifications of BB asphalt concrete.

### 1.2: Prerequisites

Building materials

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapitre 1</b>	Constituents of hydraulic concrete	3h	Control the proportions of a mixture with specific properties at a lower cost.
<b>Chapitre 2</b>	Exhibition classes	2h	know to locate the standard NF EN 206-1 in the normative and regulatory context
<b>Chapitre 3</b>	Ordinary Beton : BO	6 h	the main formulation methods
<b>Chapitre 4</b>	Self-Compacting Beton : SCB	2h	Mastering the specificities, advantages and formulation of Self-Placing Concrete : SPC
<b>Chapitre 5</b>	High Performance concrete: HPC	2 h	Mastering the specificities, advantages and formulation of High Performance Concrete: HPC
<b>Chapitre 6</b>	Fiber reinforced concrete	2 h	Mastering the specificities, advantages and formulation of Fiber Reinforced Concrete
<b>Chapitre 7</b>	Lightweight concrete Lc	2 h	Mastering the specificities, advantages and formulation of Lightweight Concrete LC
<b>Chapitre 8</b>	Asphalt concrete: AC	2 h	Performance and specifications Formulation

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	
Project (h)	
Visits (h)	

The “Out of class activities” consists of:

Activity 1 (h)	7
Activity 2 (h)	
Activity 3 (h)	
Activity 4 (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	In which week ?	The weighting factors
Project			
Practical work			
Mid-term	1, 2 & 3	8 / 15	
Oral test	3, 4, 5, 6, 7 & 8	3 - 15	
Final exam	All	Exam	

### 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- New concrete guide: Georges Dreux and Jean Festa, Eyrolles.
- Concretes, bases and data for their formulations: under the direction of Jacques Baron and Jean Pierre Olivier, Eyrolles.
- Standard NT 21.195(2002): Concrete - Part 1: Specification, Performance, Production and Conformity
- Standard NT 47.01(2002): Cement - Composition, Specifications and Compliance Criteria
- Standard NT 21.30(2003): Aggregates-Definitions, Compliance, Specifications
- Standard NF EN 206-1: EXPOSURE CLASSES, according to the ACTIONS due to the environment

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# Survey and implementation

**Code: GCV 03 214**

**Teacher : ELLOUZE Ali**

**Grade: Master Assistant**

**University: National School of Engineering of Sfax ENIS**

**Email:**

**ali.ellouze@enis.tn**

**Total module duration**

**35 h**

<b>Contact hours</b>	<b>Out of class activities</b>
<b>14h CI + 7h Projet</b>	<b>14h</b>

**The equivalent credits**

**1 ECTS**

**Semester 2**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

- Documents necessary for the establishment of the site: site plan, ground plan, foundation plan and topographical plan
- Implementation method: markings on chairs, total station
- Implementation of KM projects: implementation of Buildings, Roads, OAs and OHs

### Objectives

The student must be able to:

- Provide the necessary documents for the establishment of the implantation
- Mastering the methods of construction implementation
- To materialize on the ground the layout, the axis or the limits of a construction by drawing the plans at real scale.

### 1.2: Prerequisites

Mathematics and Topography

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Necessary documents for the establishment of the implantation	3h	Mastering the site plan Mastering the ground plan Mastering the foundation plan Mastering the topographic plan
<b>Chapter 2</b>	Implementation execution method	6h	Know the markings on the chairs Mastering the total station survey
<b>Chapter 3</b>	Implementation of constructions in CE	12 h	Mastering the implementation of Buildings Mastering the implementation of Roads Mastering the implementation of AOs and OHs

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## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	*****
Project (h)	7h
Visits (h)	*****

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	1, 2 & 3	30%
Practical work	*****	*****
Mid-term	*****	*****
Oral test	*****	*****
Final exam	1, 2 & 3	70%

## 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Ernest P. LAUZON et Roger DUQUETTE : « General topometry". Second edition : Les Editions de l'Ecole Polytechnique de Montréal (E.E.P.M.)
- Ernest P. LAUZON et Roger DUQUETTE : General topometry"third edition : Les Editions de l'Ecole Polytechnique de Montréal (E.E.P.M.)
- Lucien LAPOINTE et Gilles MEYER : "Topography applied to public works, buildings and urban surveying" : Fourth edition 1997 EYROLLES
- Michel Brabant : Mastering the topography of the observations at the first edition level : 2001 EYROLLES
- Michel Brabant, Mastering the topography of the observations on the second edition plan: 2003. EYROLLES
- S. MILLES : modern topography and topometry tome 1 and 2 : 1999 EYROLLES
- Topography and General Topometry Course: School and Observatory of Earth Sciences (SOES)

# Building processes

**Code: GCV 03 215**

**Teacher: Mohamed KTARI**

**Grade: Master Assistant**

**University: National Engineering School of Sfax ENIS**

**Email:**

**Medktari55@gmail.com**

**Total module duration**

**70 h**

Contact hours	Out of class activities
36h CI +6h Projet	28h

**The equivalent credits**

**3 ECTS**

**Semester 2**



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course has two main parts:

- The processes of construction of the structures which present the different types of realization, equipment and machinery required according to the different types of construction, soils, materials, loads and possible natural exposures and the construction site.
- The processes of construction of the buildings which present the various types of realization, equipment and machines necessary according to the various types of construction, grounds, materials, loads and possible natural risks and of the construction site.

### Objectives

The objectives of this course are to:

- To know the particularities of engineering structures.
- Know the various types of each structure (bridges, roads, dams, tunnels,...) as well as the construction processes associated with each and the construction materials.
- Know and master the construction processes of a building from the earthwork level up to repair and maintenance.

### 1.2: Prerequisites

All specialty courses: Soil Mechanics, Structure, Reinforced Concrete, Prestressed Concrete, Hydraulics, Roads, Material Resistance, Steel Construction,...

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	<b>Structures of art</b>		
<b>Chapter 1.1</b>	<b>Introduction</b>	5h	Know the particularities of engineering structures
<b>Chapter 1.2</b>	<b>Bridges</b>	4h	Know the various types of bridges and know the construction processes and materials appropriate for bridges.
<b>Chapter 1.3</b>	<b>The Roads</b>	4h	Know the various types of roads and to know the processes of realization as well as the equipment of safety and of the good functioning adequate to the roads.
<b>Chapter 1.4</b>	<b>Dams</b>	4h	Know the various types of dams and know the construction processes as well as the safety equipment and construction materials adapted to dams.

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<b>Chapter 1.5</b>	<b>Les Tunnels</b>	4h	Know the different digging and armouring processes and the equipment to be used.
<b>Chapter 2</b>	<b>Building</b>		
<b>Chapter 2.1</b>	<b>Terrassement</b>	4h	Know the method of preparing a construction site (felling, demolition, grading, excavation, ...)
<b>Chapter 2.2</b>	<b>Stabilisation</b>	4h	Define the processes for consolidation, armouring, reinforcement and drawdown of the sheet
<b>Chapter 2.3</b>	<b>Fondations</b>	4h	To know the various types of foundations (simple, deep ...) and to know the processes of realization as well as the necessary equipment.
<b>Chapter 2.4</b>	<b>Constructions</b>	5h	Know the various types of construction and know the appropriate construction materials and processes according to circumstances
<b>Chapter 2.5</b>	<b>Réparations et entretiens d'ouvrages existants et classés</b>	4h	Understand the process of injection, underpinning and the reinforcement method

### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	36h
Practical work (h)	*****
Project (h)	*****
Visits (h)	6h

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All chapters	25%
Practical work	*****	*****
Mid-Term	All chapters	20%

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Oral test	*****	*****
Final exam	All chapters	55%

-

# **Title of the Module**

## **Business English Certificate**

### **B1//B2**

**Code:** GCV 04 101

GCV 04 201

**Teacher: Nada BEN MAHFOUDH FOURATI**

**Grade: Full-time faculty member**

**University: International Institute of Technology**

**Email:**

**Nada.benmahfoudh@iit.ens.tn**

**Total module duration**

**63h \* 2**

Contact hours	Out of class activities
21h CI + 14h Project	28h
21h CI + 14h Project	28h

**The equivalent credits**

**2\*2 ECTS**

**Semester 3 + 4**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course focuses on familiarizing students with the level and content of the BUSINESS ENGLISH CERTIFICATE abbreviated as BEC. It prepares students to communicate in a good way whether in a written way or orally in the context of work. Each lesson is organized so that it develops and enhances all skills and sub-skills necessary to learn the English language adequately and to be familiarized with international tests.

According to the European framework, the BEC PRELIMINARY is B1.

### Objectives

The student will be able to:

- ✓ use English in an International context of business.
- ✓ To help students revise the necessary skills to learn business English and to sit for the exam
- ✓ To learn time management
- ✓ To encourage students to speak
- ✓ To enhance students to write correctly and up to the point.

### 1.2: Prerequisites

The student should be a good A2 in order to follow these lectures.

When the student is B1 in General English, he excels and gets the gist of these tasks and training

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	<ul style="list-style-type: none"> <li>- Getting to know each other</li> <li>- Introduction to the main axes of the course</li> <li>- Job Application</li> <li>- Employment</li> </ul>	15	<ul style="list-style-type: none"> <li>- To know the benefits and the utility of learning business English</li> <li>- To understand the context in which business English is used</li> <li>- To differentiate and use formal and informal language</li> <li>- To establish the link between learning English and being prepared for the professional career</li> </ul>
<b>Chapter 2</b>	<ul style="list-style-type: none"> <li>- Travel /Business Accommodation/ Organizing a conference</li> </ul>	15	<ul style="list-style-type: none"> <li>- To learn the vocabulary related to accommodation</li> <li>- To discover another context of business English in which you should necessarily use a foreign language</li> </ul>
<b>Chapter 3</b>	<ul style="list-style-type: none"> <li>- Money</li> <li>- Graphs and Charts</li> </ul>	15	<ul style="list-style-type: none"> <li>- To understand that business English can be part of their engineering knowledge</li> <li>- To learn the comparative, the</li> </ul>

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			superlative, contrasting words, adverbs ... that describe a movement in a graph
<b>Chapter 4</b>	- Exams	25	<ul style="list-style-type: none"> <li>- To understand the format of the exam</li> <li>- To learn that time management is an important skill to succeed in this certificate</li> <li>- To raise the student's awareness that the exam covers the four skills</li> </ul>

The content and order of lessons are subject to change.

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	
Project (h)	14h
Visits (h)	

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-Term	*	15%
Oral test	*	15%
Final exam	*	70%

## 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

These references are not ordered.

- English for Business
- Pass Cambridge BEC Preliminary

# Entrepreneurial culture

**Code : GCV 04 102**

**Teacher: Amel Trabelsi Elloumi**

**Grade: Ph.d in Economics**

Full-time faculty member

In charge of the preparation for the professional career department

**University: International Institute of Technology**

**Email:**

**Dep.PCP@iit.ens.tn**

**Total module duration**

**27 h**

Contact hours	Out of class activities
21h CI	21h

**The equivalent credits**

**2 ECTS**

**Module responsable**

**Amel Trabelsi Elloumi**

**Semester 3**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

- To carry out their Innovation & Entrepreneurship Project, student engineers must analyze the market, find an innovative concept, develop the product, federate a team, carry out an operating plan and comply with regulatory constraints. So many missions that fit perfectly with what a company expects of a young engineer.
- These Innovation & Entrepreneurship projects often come from companies seeking to develop new products, to respond to innovation and development issues related to their sectors.

### Objectives

The development of the entrepreneurial culture requires an awareness and promotion effort:

- knowing entrepreneurship
- imagining and becoming an entrepreneur
- building a project and making it reliable
- Discovering the process to implement
- Finding an innovative idea to create a project
- creating a competitive business model

### 1.2: Prerequisites

- Having an idea about the socio-economic environment
- The fundamentals of management
- Entrepreneurship processes
- Some functions (of the company)

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Entrepreneurship sensitization	7h	- To Learn about entrepreneurship. - To become familiar with the characteristics of the entrepreneurship environment. - To Extend the spectrum of entrepreneurial knowledge.
<b>Chapter 2</b>	The forms of entrepreneurship	7h	- To Know the main forms of entrepreneurship. - To Understand the specificity of the different forms.
<b>Chapter 3</b>	Business model	7h	- To master the research methods of an innovative or creative idea - To Know the different forms of business Model - To extend the skills of students to prepare their Business Model



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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	
Project (h)	
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All chapters	30%
Practical work		
Mid-Term		
Oral test	Chapter 1,2	20%
Final exam	All chapters	50%

# END OF YEAR PROJECT

**Code: GCV 04 103**

**Teacher: Achraf Ammar**

**Grade: Internship coordinator**

**University: IIT**

**Email:**

**Avhraf.ammar@iit.ens.tn**

**Total module duration**

**42 h**

Contact hours	Out of class activities
7h CI + 14h Project	21h

**The equivalent credits**

**2 ECTS**

**Semester 3**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

After having validated a first year of the engineering cycle and also carried out a first internship, the student engineer will be able to achieve scientific projects with more efficiency. This course is a real preparation for the graduation project and will help students who have a project idea to start developing them.

### 1.2: Objectives

In this course, the student is tutored to:

- Master report redaction
- Carry out literature research with more accuracy.
- Do advanced research on a specific topic
- Develop an action plan to meet a predefined objective
- To realize real projects

### 1.3: Prerequisites

Validate Internships and Graduation project course

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Preparing research topic	6	Detect research themes related to personal skills Do an advanced search in a chosen theme Detect innovation and advancement opportunities in a Chosen theme
Chapter 2	Developing action plan	10.5	Apply a scientific research process to identify a concrete action plan.
Chapter 3	Reporting results	4.5	Synthesis correctly results Develop the critical perception Identify perspectives and new opportunities

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	7h
Practical work (h)	-
Project (h)	14h
Visits (h)	-

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### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	1	25%
Practical work		
Mid-term		
Oral test	2	20%
Final exam	1-2-3	55%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

<https://pix.fr>

# Armed Concrete II

Code: GCV 04 104

Teacher: Mohamed Hadj Taieb

Grade: Higher Education Assistant

University: National School of Engineers of Sfax ENIS

Email:

mohamedhtaieb@yahoo.com

Total module duration

77 h

Contact hours	Out of class activities
28h CI +14h TP	35h

The equivalent credits

3 ECTS

Semester 3

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course includes:

- The Forfitaire method
- The caquot method
- The stop pattern of the bars
- Compound bending
- Slab floor slab cladding
- Calculation of the sails
- Calculation of soles

### Objectives

The concepts to be studied in this course will allow students to:

- Apply the theoretical and regulatory laws of mechanics to the field of reinforced concrete in the dimensioning of reinforced concrete framing elements in limit states (sections subjected to compound bending, continuous beams, slab floors, walls, columns, footings).
- To produce formwork and reinforcement drawings of the dimensioned elements and bar distribution purlins.

### 1.2: Prerequisites

Materials; RDM; Building design; Reinforced concrete I

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Sharp Effort	12h	- Calculate the resistance of the cores: common sections - Master Distribution of the transverse reinforcement by the Caquot method - Study the supports - Understand Section table rib junction T
<b>Chapter 2</b>	Compound bending	12h	- Calculate the limit state reinforcement (fully tensioned, partially compressed/stretched and fully compressed sections) - Master SLE Justification
<b>Chapter 3</b>	The Torsion	6h	- understand Pure torsional resistance - Master Concrete justification - Calculate Longitudinal and transverse reinforcements
<b>Chapter 4</b>	Continuous reinforced concrete beams	12h	- Calculate the solicitations by: the Forfitaire method and the Caquot method minus. - Reinforcements of continuous beams and stop bars

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	42h
Practical work (h)	14
Project (h)	
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work	All	25%
Mid-term	1,2	20%
Oral test		
Final exam	All	55%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Jean Perchat& Jean Roux, Reinforced concrete course BAEL 91 Eyrolles 1993
- Jean-Pierre Mougin : Reinforced concrete course BAEL 91 Eyrolles 1992
- Victor Davidovici : reinforced concrete form, Moniteur Edition, Paris 1995.

# Structural Design II

Code: GCV 04 105

**Teachers: Mounir Ben Jdidia – Lotfi Hammami**

**Grade: Professors**

**University: National School of Engineers of Sfax ENIS**

Email:

[mounir.benjdida@enis.rnu.tn](mailto:mounir.benjdida@enis.rnu.tn)

[lotfi.hammami@enis.rnu.tn](mailto:lotfi.hammami@enis.rnu.tn)

Total module duration

56 h

Contact hours	Out of class activities
28h CI	28 h

The equivalent credits  
2 ECTS

Semester 1



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course presents:

- Line of influence: a description and enumeration of the various types of lines of influence with the appropriate calculation method for an isostatic or hyperstatic system for a rolling load.
- The Rotation Method: the study and application of the equations of equilibrium of the bars to determine the relationships between displacements and rotations with the moments at the ends of the bars.
- The method of displacements: the Variational Formulation of a beam (in Tension-Compression, Torsion, Bending), the determination of the Displacement Field in a bar, the Displacement Vector, Stress Vector, Load Vector and Deformation Vector; the Elasticity Matrix, the Elementary Stiffness Matrix of each bar as well as the overall stiffness of the structure: assembly of the established elementary matrices.

### Objectives

The objectives of this course are

- To master the calculation of influence lines.
- Acquire the rotation method for the resolution of hyperstatic systems. To be able to determine the internal forces for a fixed or movable node bar structure.
- To teach students the displacement method for the calculation of bars structures. To be able to determine displacements and to deduce the internal forces for a fixed or movable node bar structure.

### 1.2: Prerequisites

Calculation of structures I

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Line of influence	8 h	Master the calculation of the lines of influence for an isostatic or hyperstatic system for a rolling load. - Line of influence of internal efforts - line of influence of a reaction or moment - line of influence of a displacement or a rotation
<b>Chapter 2</b>	Rotation method	8h	Master the application of the equations of equilibrium of the bars for the determination of the relations between displacements and rotations with the moments at the ends of the bars. Master the rotation method for the determination of forces in hyperstatic structures.
<b>Chapter 3</b>	Displacement method	12h	To know the Variation Formulation of a beam in Tension-Compression, Torsion, Bending

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			Determine the Displacement Field in a bar and writing the displacement vector Determine of the Stress Vector and Strain Vector in a bar; elasticity matrix Be able to write the Elementary Stiffness Matrix for each bar and base change Be able to write the load vector Determine of the overall rigidity of the structure: assembly of the established elementary matrices Master the resolution of the established linear system and calculate displacements Deduct the support reactions and internal efforts in each bar
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## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	42h
Practical work (h)	
Project (h)	
Visits (h)	

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
DS	Chapter 1, 2 et 3	30%
Oral test		
Final exam	All	70%

## 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Albiges M. Applied material resistance, tome1, Editions Eyrolles, Paris, 1969.
- Decelle A. F., et Legendre D., Mechanics applied to civil engineering, Editions Eyrolles, Paris, 1983.

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- Dreyfuss E., Lessons on Material Resistance, Editions Eyrolles, Paris, 1966.
- Maquoi R., Structural mechanics - first part - Lecture notes for 3rd Bachelor of Civil Engineering students, University of Liège – Faculty of Applied Sciences, 2008.
- Megson T. H., Structural and stress analysis, British library cataloguing in publication data, 1996.
- Nash W. A., Theory and problems of strength of materials. 4th Ed. McGraw-Hill, New York, 1998.
- Philippe B., Structural Mechanics, ENPC, 2008
- Practical calculation of author structures: w.a. jalil edition : eyrolles

# Plates and shells

Code: GCV 04 106

**Teacher: Slim KAMMOUN**

**Grade: Master Assistant**

**University: IIT**

**Email:**

**Slim.kammoun@gmail.com**

**Total module duration**

**56 h**

Contact hours	Out of class activities
21h C + 7h TP	28h

**The equivalent credits**  
**2 ECTS**

**Semester 3**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This module presents the modeling and calculation of thin structures treated as two-dimensional media of the plate and shell type. The calculation is done for elastic and static structures.

Isotropic structures will be the most analyzed but orthotropic and reinforced structures will be discussed.

Problems related to plates (rectangular and circular) and shells (cylindrical, conical, spherical) are solved analytically.

Modeling and calculation of plates and shells will be based on Love-Kirchhoff's hypotheses (1st order linear model) adopted for thin structures.

### Objectives

The objectives of this course are

- Understand Kirchhoff's hypotheses and know how to determine the fields of displacements, deformations and stresses as well as internal forces, the Lagrange equation and boundary conditions.
- Apply the formulas seen in CH1 to solve circular, annular and rectangular plate problems
- Understand Love's hypotheses and know how to determine Displacement, deformation and stress fields as well as Internal stresses, Boundary conditions and Solving problems of thin shells (cylindrical, spherical, conical...).

### 1.2: Prerequisites

Knowledge acquired from the course: Mechanics of Continuous Environments

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	General equations of elastic bending of thin plates	7h	-Understand Kirchhoff's assumptions. -To know how to determine : <ul style="list-style-type: none"> <li>• Displacement, deformation and stress fields</li> <li>• Domestic efforts</li> <li>• The Lagrange equation</li> <li>• Boundary conditions</li> </ul>
<b>Chapter 2</b>	Thin circular and annular plates	7h	Apply the formulas seen in CH1 to solve circular and annular plate problems
<b>Chapter 3</b>	Rectangular thin plates	7h	Apply the formulas seen in CH1 to solve rectangular plate problems
<b>Chapter 4</b>	The membrane theory of thin shells	7h	-Understand Love's assumptions. -To know how to determine : <ul style="list-style-type: none"> <li>• Displacement, strain and stress fields</li> <li>• Domestic efforts</li> <li>• Boundary conditions</li> <li>• Solving problems with thin shells (cylindrical, spherical, conical...)</li> </ul>

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	7h
Project (h)	
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-Term	1	30%
Oral test		
Final exam	All chapters	70%

### 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

A. C. Ugural (2009). Stresses in beams, plates, and shells. CRC Press Taylor & Francis Group.

J. Courbon (1980). Plaques minces élastiques. Editions Eyrolles

S. S.P. Timoshenko & S. Woinowsky-Krieger (1959). Plates and Shells. McGraw-Hill Inc., US.

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# Pathologies, Diagnosis and rehabilitation of structures 1

**Code: GCV 04 107**

**Teacher: Amin Ben Said**

**Grade: Expert Engineer**

**Email:**

**amin.sfax.bensaid@gmail.com**

**Total module duration**

**42h**

<b>Contact hours</b>	<b>Out of class activities</b>
<b>14h CI + 7h Projet</b>	<b>21h</b>

**The equivalent credits**

**2 ECTS**

**Semester 3**

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## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This module has three main parts.

The first part deals with the presentation of the pathologies of pavements and reinforced concrete structures; the different pathologies that can affect concrete; the methods of auscultation; the maintenance and repair scenarios; the classification of engineering structures according to the IQOA method.

During this time, the students will be divided into small groups, each of which will choose a targeted presentation topic related to one of the themes of this module. The topic and the presentation plan will have to be validated by the expert.

The second part is devoted to the presentations given by the students whose targeted topics relate to one of the themes of this module and will be validated by the teacher.

The third part is dedicated to a visual inspection visit of a reinforced concrete structure. This part deals with the detection of disorders and the filling of the report according to the IQOA method.

### Objectives

This course aims to:

- Acquire from the student the basic elements that allow him to identify the degradations and the sources of pathologies.

- Evaluate the state of a work, establish and justify the follow-up to be given and carry out corrective actions.

### 1.2: Prerequisites

Construction processes,

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
Chapter 1	Pathologies of pavements	7h	<ul style="list-style-type: none"> <li>- Knowing the disorders and understanding of the degradation process</li> <li>- Learning to identify the origins of disorders</li> <li>- Knowledge and understanding of the different auscultation methods</li> </ul>
Chapter 2	Pathologies of works in reinforced concrete	7h	
Chapter 3	Classification of engineering structures according to the IQOA method	7h	<ul style="list-style-type: none"> <li>- Understanding of maintenance or repair solutions repair</li> <li>- Mastery of the classification procedures</li> <li>- Mastery of the principles of IQOA classification</li> <li>- Filling of verbal processes</li> </ul>



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## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	10h
Project (h)	7h
Visits - Practical work (h)	4h

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All chapters	20%
Practical work	chapter n°3	25%
Mid-term	*****	*****
Oral test	*****	*****
Final exam	All chapters	55%

## 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- CATALOG OF DEGRADATIONS OF ROAD SURFACES - LCPC
- STRUCTURAL PATHOLOGIES - CEREMA
- CATALOGS OF ORDERS - SETRA

# Acoustics applied to the building

Code: GCV 04 108

Teacher: Omar Mezghanni

Grade: Master Assistant

University: National School of Engineers of Sfax ENIS

Email:

[Omar.mezghanninr@enis.tn](mailto:Omar.mezghanninr@enis.tn)

Total module duration

35 h

Contact hours	Out of class activities
14h CI + 7h P	14h

The equivalent credits

1 ECTS

Semester 3

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

This course includes:

- Description of the physical phenomenon of sound waves,
- Description of the acoustic properties in a closed environment,
- Description of the sound intensity in a building according to its external environment,
- Definition of the sound attenuation index in buildings.
- Description of the regulatory approach to judge the sound performance of a building,
- Description of the regulatory limitations for the acoustic design of buildings.
- Project: working on real projects and use of professional digital software

### Objectives

The objectives of this course are to:

- Calculate the reverberation times in materials. (M)
- Calculate the reverberation times in the building based on the outdoor sound level. (A)
- Design and acoustic insulation of buildings in compliance with technical design standards

### 1.2: Prerequisites

Mathematics, Physics and Thermics

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Sound waves	3h	Understand the physical phenomenon of sound waves
<b>Chapter 2</b>	Acoustic properties in a closed environment	3h	Understanding acoustic properties in a closed environment
<b>Chapter 3</b>	Sound intensity in a building according to its external environment,	3h	Understand and analyze the sound intensity in a building as a function of its external environment
<b>Chapter 4</b>	Sound attenuation index in buildings	3h	Understand and analyze the sound attenuation index in buildings
<b>Chapter 5</b>	Regulations	2h	Understand the regulatory approach to judge the noise performance of a building Understand the regulatory limitations of building acoustical design
<b>Chapter 6</b>	Project	7h	Develop and master real-life projects and use professional digital software

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## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	
Project (h)	7h
Visits (h)	

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		30%
Practical work	*****	*****
Mid-Term	*****	*****
Oral test	*****	*****
Final exam	All	70%

## 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Transferts Thermiques, Radhouani M.S, CPU (2001) ISBN9973-37-026-0
- Le Conditionnement d’Air : les Calculs d’air humide; Editions parisiennes.
- Manuel Technique du froid; Nouveau Polmann. PYC Editions.
- Le Conditionnement d’Air : les Systèmes; Editions parisiennes.

# ROADS

**Code: GCV 04 109**

**Teacher: Ilhem Borcheni**

**Grade: Permanent teacher and head of the Civil Engineering department**

**University: International Institute of Technology (IIT)**

**Email:**

**Ilhem.borcheni@iit.ens.tn**

**Total module duration**

**70 h**

Contact hours	Out of class activities
28h CI+14h TP	28h

**The equivalent credits**

**3 ECTS**

**Semester 3**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course consists of the following parts:

- Vehicle movement on roads and highways (classification of roads and highways, road construction design, vehicle dynamics, motor effort and resistance to movement, stopping distance and passing distance, grip and smoothness)
- General information on pavement operation (Pavement operation, role of different pavement layers, different types of pavements).
- Road traffic (types of vehicles, counting, survey, statistics, traffic classes, traffic conditions, lane typologies)
- Geometrical characteristics of roads (Plan layout, Longitudinal profile, Coordination between plan layout and longitudinal profile, Cross profile)
- Geometrical road construction (Minimum values of the radii of the plan layout, Minimum values of the radii of the longitudinal profile in re-entrant and protruding angles, Calculation of the elements of circular connections, Connection in progressive curvature (clothoid)).
- Road geotechnics: - Soil classification and identification tests (granulometric analysis, Atterberg limits, Sand equivalent, Methylene blue test, Micro-Deval test, Los Angeles test, Sand friability, Proctor test, CBR test, Plate test) - Effects of frost on soils (Frost swelling test)
- Road materials: Materials used in the pavement body and their properties (Untreated gravel, Gravel treated with hydraulic binders, Gravel and sand treated with hydrocarbon binders, cement concrete) Materials used in wearing courses and their properties (Surface dressings, Hot-mixed hydrocarbon asphalt mixes)
- Sizing of new and reinforced road structures (Traffic classes, soil classes, classes of existing pavements, Tunisian road sizing catalog)
- Road earthworks (excavation, backfilling, compaction, soil treatment, subgrade)
- Sanitation and road drainage (Road drainage systems, Motorway drainage systems, Hydrological calculation, Dimensioning of hydraulic structures, Underground road drainage)

### Objectives

This course allows the student to:

- Master the geometrical construction elements of a road project and provide the necessary parts (plan layout, longitudinal and cross profile) and evaluate the cubature of the earthworks.
- Know the road materials and their properties from the analysis of the results of the various identification tests.
- Be able to dimension new pavements
- Be able to rehabilitate and reinforce existing roads,
- Control the dimensioning of road and highway drainage structures

## 1.2: Prerequisites

Topography, survey layout, hydrology and hydraulic works, construction materials, concrete technology (concrete composition)

## 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Vehicle movement on roads and highways	3h	-Classify roads and highways, -To know the motor effort and the resistance to movement, -Calculate stopping distance and passing distance, -Knowing the adhesion and smoothness
<b>Chapter 2</b>	General information on pavement operation	2h	-Control the operation of the pavements, -To know the role of the different pavement layers and the different types of pavements
<b>Chapter 3</b>	Road traffic	3h	-To know the necessary data for road traffic studies
<b>Chapter 4</b>	Geometric characteristics of roads	3h	- Know the constituent elements of a road project (plan layout, longitudinal profile, and cross-sectional profile)
<b>Chapter 5</b>	Geometric road construction	3h	To know the standards and the minimum values of the radii of the plan layout, the minimum values of the radii of the long profile in re-entrant and protruding angles - To master the calculation of the elements of circular connections and connections in progressive curvature (clothoid)
<b>Chapter 6</b>	Road Geotechnics	3h	-Mastering soil identification and classification tests
<b>Chapter 7</b>	Road materials	6h	-To know the materials used in the pavement body and in the wearing course of pavements as well as their behaviours and properties
<b>Chapter 8</b>	Dimensioning of road structures	3h	-Dimensioning new pavements and to be reinforced through the classification of traffic, soil and existing pavement in case of reinforcement.
<b>Chapter 9</b>	Roadworks	2h	-Master the techniques of road earthworks (excavation, embankment ...) -To know the road machines and their utilities -To know the behaviour of road materials treated with hydraulic and hydrocarbon binders.
<b>Chapter 10</b>	Sanitation and road drainage	2h	-Dimensioning of hydraulic road drainage structures

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### Practical work (14h)

- PW1: Topographic Survey
- PW 2: Drawing in plan
- PW 3: Long el profile
- PW 4: Cross Profile
- PW 5: Cubatures

### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	28h
Practical work (h)	14h
Project (h)	*****
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work	3 & 4	25%
Mid-term	1, 2, 3, & 4	20%
Oral test	*****	*****
Final exam	All	55%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Course Routes of the Teacher Sami Yaich
- Support for practical work in geometrical road design (1.0) of the teacher Ahmed KSENTINI
- B40 (technical standards for road development).
- Catalog for dimensioning new pavements (C.T.T.P.).
- I.C.T.A.A.L (instruction on the technical conditions for the development of connecting freeways).



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- Graduation theses from previous studies at the UMMTO and at the National Superior School of Public Works (ENSTP).
- Road courses 1st year master UMMTO.
- Algerian Highway Code.
- Recommendation for road sanitation (SETRA).
- The Public Works Directorate (DTP) of Tizi-Ouzou city
- ARP development of main roads (technical recommendations (august -1994))
- RPA99/version 2003
- SITE internet : [www.SETRA.com](http://www.SETRA.com)
- CTTTP, 2001, Catalog for dimensioning new pavements
- Road Courses I, road layout ELYASSARI Soufiane 11/03/2014 at ENSAH

# Hydrology and hydraulic works

Code: GCV 04 110

**Teacher: Sleh Bouraoui**

**Grade: Master Technologist**

**University: Higher Institute of Technological Studies of Sfax (ISET)**

**Email:**

**bouraouisleh@gmail.com**

**Total module duration**

**49 h**

Contact hours	Out of class activities
28h CI	21h

**The equivalent credits**  
**2 ECTS**

**Semester 3**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course includes:

- A first part which focuses on the study of the water cycle and in particular on the exchanges between the different components of this cycle, namely the atmosphere, the earth's surface, the subsoil and the ocean. The course first deals with the general aspect of the water cycle and introduces the notion of balance.
- The second part consists of the study of watershed characteristics and hydrological variables such as rainfall, including data measurements and statistical processing.
- The third part deals with precipitation (meteorological principles, rainfall measurement, analysis of rainfall data, regional rainfall assessment).
- The last part presents the hydrological response (Analysis of rain-flow events, Genesis of floods, Factors influencing the hydrological response, Factors related to rainfall, Importance of antecedent moisture conditions, Approaches for the calculation of the rain-flow transformation which constitutes a particularly important part for a future civil engineer, Software for the calculation of the hydrological response).

### Objectives

This hydrology course provides the student with the necessary tools to carry out hydrological studies in order to move on to the hydraulic calculations required for any design study of hydraulic structures (bridges, gutters, nozzles, cassis).

### 1.2: Prerequisites

Basic Mathematics and Physics for the Engineer

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Introduction	6h	-Know the water cycle and water balance
<b>Chapter 2</b>	The watershed	6h	-Understand the characteristics of the watershed (rainfall, data measurements and statistical treatments)
<b>Chapter 3</b>	Precipitation	6h	-Know meteorological principles, rainfall measurement, analysis of rainfall data, regional rainfall assessment
<b>Chapter 4</b>	The Hydrological Response	10h	-Analyze rainfall-flow events, -To know the genesis of floods, the factors influencing the hydrological response, the factors related to rainfall, the importance of the antecedent humidity conditions, -Master the approaches for the calculation of the rain-flow transformation -Master the hydrological response computation

## MODULE DESCRIPTION

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	28h
Practical work (h)	
Project (h)	
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-term	Chapter1, 2	30%
Oral test		
Final exam	All chapters	70%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

<http://echo2.epfl.ch/e-drologie/chapitres/chapitre11/chapitre11.html>  
<http://www.hqe.guidenr.fr/cible-1-hqe/methode-hydrogramme-unitaireruissellement>  
<http://jlbkpro.free.fr/teachingmaterial/oshu3-04-ruissellement.pdf>  
<http://www.scribd.com/doc/87629510/36/Methode-A-GHORBEL>  
<http://hmf.enseiht.fr/travaux/CD9899/travaux/optsee/bei/g3pj3/hu.htm>  
<http://echo2.epfl.ch/e-drologie/chapitres/chapitre3/main.html>

# Organization and construction site machinery

Code: GCV 04 111

**Teacher : MOALLA Badis**

**Grade: Engineer//Master Technologist**

**University: Higher Institute of Technological Studies**

Email:

.....

Total module duration

63 h

Contact hours	Out of class activities
28h CI + 7h Projet	28

The equivalent credits

3 ECTS

Semester 3

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This module allows studying the need of the building site in construction equipment by taking into account the types of work and the budget appropriate to the materials.

In fact, it presents the study of the operating cost of the various machines by calculating its depreciation, its consumption of diesel oil and lubricant, its preventive and curative maintenance and of course the driver's load without forgetting the cost of renting if necessary. In order to adapt to the nature of the work and the level of progress of the site, this module presents the different types of civil engineering machinery and studies their capacity and performance. These machines are divided into :

- Earthmoving machinery (Backhoe loader, Hydraulic excavator, Backhoe loader ...)
- Construction site transport equipment (Trucks, flatbed trucks, tank carriers ...)
- Compaction equipment (Pneumatic cylinder, tandem compactor, tire roller ...)
- Road Construction Equipment (Scraper, Paver, Gravel Paver, Hot Mixer, Slipform paver, etc.)
- Deep foundation materials (Drilling machine: drilling machine ...)
- Lifting and handling equipment (Tower Crane, Mobile Crane)

### Objectives

The objectives of this course are

- To know the various types of construction equipment
- Choose the most appropriate machine for the nature of the work and meets the estimated budget.

### 1.2: Prerequisites

General Construction Procedures «PGC », Geotechnics, Roads

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Operating cost of construction site machinery	5h	Know the various types of construction equipment  Study and know how to choose the most suitable machine for the nature of the work and meets the estimated budget.
Chapter 2	Earth Moving Machinery	5h	
Chapter 3	Construction site transportation equipment	5h	
Chapter 4	Compaction equipment	5h	
Chapter 5	Road construction equipment	5h	
Chapter 6	Deep foundation materials	5h	
Chapter 7	Lifting and handling equipment	5h	

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	28
Practical work (h)	
Project (h)	7
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All chapters	30%
Practical work		
Mid-Term		
Oral test		
Final exam	All chapters	70%

# Title of the Module

## Charpente Métallique

Code: GCV 04 112

**Teacher : Mounir Ben Jdidia**

Grade: Professor

University: National School of Engineers of Sfax ENIS

Email:

mounir.benjdida@enis.rnu.tn

Total module duration

77 h

Contact hours	Out of class activities
42h CI	35

The equivalent credits  
3 ECTS

Module responsable  
Mounir Ben Jdidia

Semester 3



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course presents:

- The terminology and design of industrial building frames
- Climatic effects on buildings
- Eurocode Settlement Calculation Basis and Cross Section Classification
- Justification of cross sections according to EC3
- The phenomena of elastic instability
- Design and calculation of bolted connections
- Design and calculation of welded connections
- Design and calculation of connections at the feet of the foundation

### Objectives

The objectives of this course are:

- To know some general notions on the design of the load-bearing structure of an industrial building.
- To master the evaluation of wind and snow actions on load-bearing elements according to the NV85 or Eurocode 1 rules.
- Acquire from the students the principles of justification of the supporting elements with regard to the solicitations according to the rules of Eurocode 3.
- To teach students the principles of justification of load-bearing elements subjected to simple buckling and bending according to the rules of Eurocode 3.
- To acquire to the students the principles of justification of the load-bearing elements with regard to the elastic instabilities; Discharge according to the rules of the Eurocode 3
- To master the design and calculation of connections between load-bearing elements using ordinary bolts and prestressed bolts according to the rules of Eurocode 3.
- To master the design and calculation of welded connections according to the rules of Eurocode 3.
- To master the design and calculation of connections at the feet of the foundation.
- To apply the acquired knowledge in a concrete case: Study of the bearing structure of an industrial building

### 1.2: Prerequisites

Structural Design I, Structural Design II

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Terminology and framing design of an industrial building	6 h	Know the types and grades of steel used in structural steelwork Understand the Properties of Standard and Merchant Profiles and PRS Knowing the terminology of the structural elements of a

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<b>Chapter 2</b>	Climatic effects on buildings	3h	Master the calculation of wind and snow actions on an industrial building according to: NV 3 or EC1 rules. To study and analyze the effect of wind on a current gantry in case of maximum bending and maximum uplift.
<b>Chapter 3</b>	Bases of Calculation of the Eurocode Regulation and Classification of Cross Sections	3h	To know the main actions applied to an industrial building and to establish the combinations to the ELU and the ELS To know the different modes of ruin of a cross section. To master the classification of the cross sections according to the modes of ruin of the section
<b>Chapter 4</b>	Justification of cross sections according to EC3	9h	Master the verification of cross sections by determining the ultimate strengths of the stressed sections in tension, in compression for short parts, in pure shear, in pure bending, in simple bending, in compound bending and in deviated or bi-axial bending.
<b>Chapter 5</b>	The phenomena of elastic instability	6h	Master the justification of compression members with respect to simple buckling and flexural buckling.
<b>Chapter 6</b>	Design and calculation of bolted connections	6h	Master the design and verification of standard and pretensioned bolt connections according to EC3
<b>Chapter 7</b>	Design and calculation of welded connections	6h	Know the different welding processes. Master the calculation of different types of weld beads according to EC3.
<b>Chapitre 8</b>	Design and calculation of connections at the foundation's bases	3h	Master the design and calculation of a hinged assembly as well as a flush-mounted assembly

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	42h
Practical work (h)	
Project (h)	
Visits (h)	

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### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-Term	Chapter 1, 2, 3 et 4	30%
Oral test		
Final exam	All	70%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- ITBTP et CTICM : L'institut Technique Du Bâtiment Et Des Travaux Publics Et Le Centre Technique Industriel De La Construction Métallique ; Règles De Calcul Des Constructions En Acier(C.M.66) ; Les Editions EYROLLES ( 8ème édition ) Paris 1979.
- GCTT : Le Groupe De Coordination Des Textes Techniques ; Règles Définissant Les Effets De La Neige Et Du Vent Sur Les Constructions ( NV 65 et N 84 modifiées 95) ; Les Editions EYROLLES ( Douzième édition ) Paris 1976.
- LEHEMBRE BERNARD ; La Construction Métallique ; Les Editions NATHAN 1997.
- MOREL JEAN ; Conception Et Calcul Des Structures Métalliques ; Les Editions EYROLLES (3th edition) 1995.
- MOREL JEAN ; Structures Métalliques ; Les Editions EYROLLES (2ème tirage) 1997.
- D. Didier- M. Le Brazidec- P. Nataf- G. Simon- R. Pralat- J. Thiesset-J.-P. Trotignon ; Structures de Génie Civil ; Editions Nathan Paris 1998.
- MOREL JEAN ; Calcul Des Structures Métalliques Selon L'EUROCODE3 ; (troisième tirage) ; Editions EYROLLES 1997.
- RAMAZANOV Eldar ; Charpentes métalliques Calcul des éléments selon l'Eurocode 3 Centre de Publication Universitaire Tunis1998

# Soil Mechanics II

Code: GCV 04 113

**Teachers: Moncef ZAIRI**

Grade: Professor

University: National School of Engineers of Sfax ENIS

Email:

[moncef.zairi@enis.rnu.tn](mailto:moncef.zairi@enis.rnu.tn)

Total module duration

70 h

Contact hours	Out of class activities
28h CI +14h TP	28 h

The equivalent credits

3 ECTS

Semester 3

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

Soil mechanics studies the behaviour of superficial geological formations under the action of construction works (settlements, landslides...). Soils are characterized from the point of view of mechanical strength (shear strength and bearing capacity) and their behaviour or deformation (settlements...).

### Objectives

The objectives of this course are

- Characterize the mechanical resistance parameters of soils: from shear tests and in situ tests.
- Select tests to characterize the resistance parameters in situ
- Master the design and calculation of surface foundations and settlement calculations

### 1.2: Prerequisites

Engineering Geology, MMC, Soil Mechanics 1

### 1.3: Learning Outcomes

Chapter	Title	Duration	Leraning Outcomes
<b>Chapter 1</b>	Soil Shear Resistance	8h	Characterize the mechanical resistance parameters of soils: from shear tests and in situ tests.
<b>Chapter 2</b>	In-situ tests	8h	Select tests to Characterize the resistance parameters in situ
<b>Chapter 3</b>	Shallow foundations	12h	Study the design and master the calculation of the surface foundations and the Calculation of settlements
<b>Chapter 4</b>	<b>Practical work : In-situ tests</b>	14h	Practice and apply the tests: Pressure gauge Penetrometer Auger and core drilling Shear test in the laboratory

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	28h
Practical work (h)	14h
Project (h)	
Visits (h)	

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### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-term		30%
Oral test		
Final exam	All	70%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Course Material (Moncef Zairi)
- The practice of soils and foundations Georges Filliat, Moniteur Editions, Paris 1981, 1392 pp.
- Practical course in soil mechanics. 1 Plasticity and settlement calculation, Costet and Sanglerat, Bordas, Paris 1981, 284 pp.
- Practical course in soil mechanics. 2 calculation of works, Costet and Sanglerat, Bordas, Paris 1983, 447 pp.
- Elements of soil mechanics, Schlosser, Presses de l'Ecole Nationale des Ponts et Chaussées, 1984, 151pp.
- Soils in construction, Schroeder, John Wiley and Sons, NY, 1984.
- Canadian Foundation Engineering Manual, the Canadian Geotechnical Society, 1978, 345 pp.
- Soil mechanics, Cordarey, Tec Doc, Paris 1994, 380 pp.
- Geotechnical Instrumentation for Monitoring Field Performance, dunnicliff and Green, John Wiley and Sons, 1988, 577pp.

# Design and stability of retaining structures

Code: GCV 04 114

**Teachers : Moncef ZAIRI**

**Grade: Professor**

**University: National School of Engineers of Sfax ENIS**

**Email:**

**moncef.zairi@enis.rnu.tn**

**Total module duration**

**28 h**

Contact hours	Out of class activities
14h CI	14 h

**The equivalent credits**

**1 ECTS**

**Semester 4**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

Retaining structures, retaining walls, sheet piling etc., are frequently used to support and sustain ground slopes. The design and construction of these structures requires a satisfactory knowledge of the lateral forces acting between the retaining structure and the supported soil.

It is therefore essential to determine the force that the soil exerts on these structures. This force depends considerably on the relative movement of the soil/structure. Depending on the direction of movement, it is called thrust or stop.

This course covers:

- Retaining and support techniques and includes: Shafts, tunnels, caverns, underground storage, underground mining.
- Excavation design using analytical, numerical and empirical methods.
- Retaining systems (bolts, anchor cables, shotcrete, wire mesh, ties, etc.).
- Design of support systems.
- Usual applications.
- Quality control of support installation, monitoring, design projects.

### Objectives

The objectives of this course are to:

- Determine the force that the ground exerts on these structures: thrust or stop.
- Know the lateral forces acting between the retaining structure and the supported soil for the design and stability of these structures.

### 1.2: Prerequisites

Engineering Geology, Soil Mechanics 1, Soil Mechanics 2

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Thrust and earth stop	6h	To know how to calculate the pressure of active and passive earths: thrust and stop by the methods: Coulomb, Rankine, and limit equilibria
<b>Chapter 2</b>	Retaining walls	4h	Design and know how to calculate the stability of a retaining wall
<b>Chapter 3</b>	Sheet piling	4h	Design and know how to calculate the stability of a sheet pile curtain



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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	
Project (h)	
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-Term	1	30%
Oral test		
Final exam	All	70%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Notes de cours (Moncef Zairi)
- La pratique des sols et fondations Georges Filliat, Editions du Moniteur, Paris 1981, 1392 pp.
- Cours pratique de mécanique des sols. 1 Plasticité et calcul des tassements, Costet et Sanglerat, Bordas, Paris 1981, 284 pp.
- Cours pratique de mécanique des sols. 2 calcul des ouvrages, Costet et Sanglerat, Bordas, Paris 1983, 447 pp.
- Eléments de mécanique des sols, Schlosser, Presses de l'Ecole Nationale des Ponts et Chaussées, 1984, 151pp.
- Soils in construction, Schroeder, John Wiley and Sons, NY, 1984.
- Canadian Foundation Engineering Manual, the Canadian Geotechnical Society, 1978, 345 pp.
- Mécanique des sols, Cordarey, Tec Doc, Paris 1994, 380 pp.
- Geotechnical Instrumentation for Monitoring Field Performance, dunncliff et Green, John Wiley and Sons, 1988, 577pp.

# Environmental impact

**Code: GCV 04 115**

**Teacher : Monia Bouchaala**

**Grade: Assistant Technologist**

**University: ISET Sfax**

**Email:**

**Monia.ingenieur@gmail.com**

**Total module duration**

**28h**

Contact hours	Out of class activities
14h CI	14h

**The equivalent credits**

**1 ECTS**

**Semester 4**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

The consideration of environmental issues in the projects of

Civil engineering is essential to protect our environment.

This course includes:

- General Introduction
- Legislative framework for environmental impact studies in Tunisia
- Contents of the environmental impact study
- General approach for the realization of the environmental impact study
- Several case studies

### Objectives

The objectives of the course are:

- To understand the importance of environmental impact study
- I.e. the administrations responsible for the EIA.
- understand the content of an EIA and understand the steps to be taken to prepare it.

### 1.2: Prerequisites

Environmental Engineering

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapitre 1</b>	General Introduction	2h	Understand the importance of the environmental impact study
<b>Chapter 2</b>	Legislative framework for environmental impact studies in Tunisia	2h	Know the administrations responsible for the EIE
<b>Chapter 3</b>	Content of the environmental impact study	2h	Understand the content of an EIE
<b>Chapter 4</b>	General approach for the realization of the environmental impact study	4h	Understand the steps to follow to establish an EIE
<b>Chapter 5</b>	Studies of several cases	4h	Practice several real case studies

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	7h
Project (h)	*****
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	3 & 4	30%
Practical work		
Mid-term		
Oral test		
Final exam	1, 2,3 & 4	70%

### 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

1- Décret n° 2005 - 1991 Du 11 juillet 2005, relatif à l'étude d'impact sur l'environnement et fixant les catégories d'unités soumises à l'étude d'impact sur l'environnement et les catégories d'unités soumises aux cahiers des charges.

2-Etude d'impact environnemental et social des travaux d'aménagement et de construction du site du ZiE à Kamboinsé, Burkina Faso

3- ETUDE D'IMPACT SUR L'ENVIRONNEMENT ET PLAN DE GESTION ENVIRONNEMENTALE ET SOCIALE RELATIFS AU DOUBLEMENT DE LA RN 12 DU PK 5 AU PK 54 DANS LES GOUVERNORATS DE SOUSSE ET DE KAIROUAN

4- Gaëlle Guesdon : ÉVALUATION DES IMPACTS ENVIRONNEMENTAUX (EIE) 5d. Méthodes et outils Comparaison ordinaire de Holmes

5-Guide étude d'impact sur l'environnement ANPE

6- <http://www.anpe.nat.tn/Fr/>

7- Rosa Galvez-Cloutier Gaëlle Guesdon : ÉVALUATION DES IMPACTS ENVIRONNEMENTAUX (EIE)

8- Yonkeu Samuel : Introduction à l'étude d'impact sur l'environnement : rappel sur les objectifs, procédure type, principales étapes de mise en œuvre

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Signature de l'enseignant

**.. Juin 2020**

Date

# **Title of the Module**

## **Business English Certificate**

### **B1//B2**

**Code: GCV 04 101**

**GCV 04 201**

**Teacher: Nada BEN MAHFOUDH FOURATI**

**Grade: Full-time faculty member**

**University: International Institute of Technology**

**Email:**

**Nada.benmahfoudh@iit.ens.tn**

**Total module duration**

**63h \* 2**

Contact hours	Out of class activities
21h CI + 14h Project	28h
21h CI + 14h Project	28h

**The equivalent credits**

**2\*2 ECTS**

**Semester 3 + 4**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course focuses on familiarizing students with the level and content of the BUSINESS ENGLISH CERTIFICATE abbreviated as BEC. It prepares students to communicate in a good way whether in a written way or orally in the context of work. Each lesson is organized so that it develops and enhances all skills and sub-skills necessary to learn the English language adequately and to be familiarized with international tests.

According to the European framework, the BEC PRELIMINARY is B1.

### Objectives

The student will be able to:

- ✓ use English in an International context of business.
- ✓ To help students revise the necessary skills to learn business English and to sit for the exam
- ✓ To learn time management
- ✓ To encourage students to speak
- ✓ To enhance students to write correctly and up to the point.

### 1.2: Prerequisites

The student should be a good A2 in order to follow these lectures.

When the student is B1 in General English, he excels and gets the gist of these tasks and training

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	- Getting to know each other - Introduction to the main axes of the course - Job Application - Employment	15	- To know the benefits and the utility of learning business English - To understand the context in which business English is used - To differentiate and use formal and informal language - To establish the link between learning English and being prepared for the professional career
<b>Chapter 2</b>	- Travel /Business Accommodation/ Organizing a conference	15	- To learn the vocabulary related to accommodation - To discover another context of business English in which you should necessarily use a foreign language
<b>Chapter 3</b>	- Money - Graphs and Charts	15	- To understand that business English can be part of their engineering knowledge - To learn the comparative, the

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			superlative, contrasting words, adverbs ... that describe a movement in a graph
<b>Chapter 4</b>	- Exams	25	<ul style="list-style-type: none"> <li>- To understand the format of the exam</li> <li>- To learn that time management is an important skill to succeed in this certificate</li> <li>- To raise the student's awareness that the exam covers the four skills</li> </ul>

The content and order of lessons are subject to change.

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	
Project (h)	14h
Visits (h)	

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-Term	*	15%
Oral test	*	15%
Final exam	*	70%

## 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

These references are not ordered.

- English for Business
- Pass Cambridge BEC Preliminary



# Prestressed Concrete

Code: GCV 04 203

**Teacher: Dr. Moncef Makni**

**Grade: Professor Technologist**

**University: Higher Institute of Technological Studies of Sfax**

**Email:**

**moncefmakni@gmail.com**

**Total module duration**

**56 h**

Contact hours	Out of class activities
28h CI	28h

**The equivalent credits**  
**2 ECTS**

**Semester 4**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

The course is intended for students of the 2nd year Civil Engineering. It presents the basic concepts of prestressed concrete and their application to the dimensioning of prestressed concrete elements.

The course covers the following aspects:

- General principles and prestressing;
- Definition of prestressing and its modes of realization;
- Characteristics of the materials used for prestressed concrete
- Study on post-tensioning losses of prestressing ;
- Dimensioning of isostatic beams: choice of cross-section, calculation of required prestressing, layout of the average cable;
- Bending service limit states
- Ultimate limit states of bending and shear stress.

### Objectives

The concepts to be studied in this course will allow students to:

- Acquire the principles of operation and dimensioning of prestressed elements while respecting the safety standards in force.
- To know the characteristics of the materials used for prestressed concrete as well as the installation techniques and the equipment used.
- To master the verification of isostatic beams in bending and their resistance to shear stress.

### 1.2: Prerequisites

Materials; RDM; Structural design, Building materials; Reinforced concrete I and II

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	General information on prestressing	4h	Develop the fundamental principles of prestressing
<b>Chapter 2</b>	Characteristics of the materials used for prestressed concrete	2h	Study the characteristics of the materials used for prestressed concrete.
<b>Chapter 3</b>	Prestressed concrete application techniques	2h	Study implementation techniques and equipment generally used for prestressed concrete.
<b>Chapter 4</b>	Calculation of the tension of a cable in post-tensioning	4h	Study the tension losses of a cable in post-tensioning.
<b>Chapter 5</b>	Regulatory Context - Security conditions	2h	Knowing and respect codes and calculation rules regarding the safety conditions of prestressed concrete.

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<b>Chapter 6</b>	Bending of isostatic beams in the absence of cracking	8h	Dimensioning of isostatic beams in bending and in the absence of cracking (in service).
<b>Chapter 7</b>	Justifications for the bending of isostatic beams with respect to ultimate boundary conditions	4h	Verify isostatic beams in bending with respect to the ultimate limit states.
<b>Chapter 8</b>	Resistance to shear force	2h	Checking isostatic beams for resistance to shear stress.

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	28h
Practical work (h)	
Project (h)	
Visits (h)	

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-term	Chapter 1,2,3	30%
Oral test		
Final exam	All	70%

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### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

1. Prestressed Concrete, Robert CHAUSSIN; ENGINEERING TECHNIQUES, C2 360 (1990).
2. Prestressed Concrete in the limit states; Henry THONIER, Press of the Ecole Nationale des Ponts et Chaussées (National School of Civil Engineering) (1992).
3. Fascicule n° 62 - Titre I - Section II. Technical rules for the design and calculation of prestressed concrete structures and constructions according to the limit states method - BPEL 91 révisé 99 (1999).
4. Prestressed Concrete: Techniques of implementation; P. JARTOUX, B. FARGEOT, C. ENGINEER'S TECHNICAL TURNER, C2 372 (2000).
5. Design and dimensioning of prestressing; AURELIO MUTTONI, Swiss Federal Institute of Technology Lausanne (2012).

# Design and calculation of building structures

Code: GCV 04 204

Teacher: Atef DAOUD

Grade: Professor

University: National Engineering School of Sfax (ENIS)

Email:

Atef.daoud@enis.tn

Total module duration

63 h

Contact hours	Out of class activities
28h CI+ 7h TP	28h

The equivalent credits

3 ECTS

Semester 3

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This module consists of four parts:

- The first one consists in giving some elements of building design taking into account the various architectural, environmental, regulatory constraints etc., to understand the composition of the framework of a building (load-bearing system, floor, foundation etc.) and to know the calculation rules specific to building structures.
- The second part aims to calculate the floor elements to have solid slabs, continuous beams etc..
- The third part deals with the calculation of the foundations and particularly the reinforced concrete footings on soil and piles.
- The last part deals with the bracing of buildings, which consists in determining the action of wind on a building and evaluating the distribution of this action on all the sheaves that make up the bracing system.

### Objectives:

The objectives of this course are:

- To know how to design the framework of a building
- Carry out the descent and the transmission of loads on the different elements
- Modeling and calculation of the different elements of a building structure

### 1.2: Prerequisites

Structures, reinforced concrete, materials

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Elements of building design	5h	- Knowing how to design the framework of a building (choice of load-bearing elements and type of floors)
<b>Chapter 2</b>	Calculation of continuous floors according to the BAEL91 regulation	10h	- Control the descent and transmission of loads on the various structural elements of buildings - Calculate the floor elements (solid slabs, isostatic and continuous beams,...)
<b>Chapter 3</b>	Design and calculation of foundations	10h	- Master the calculation of the various structural elements of the foundations (insulated footings, footings, etc.).
<b>Chapter 4</b>	Bracing of buildings	10h	- Controlling the bracing of buildings

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	28h
Practical work (h)	7h
Project (h)	*****
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work	All	25%
Mid-term	1 & 2	20%
Oral test	*****	*****
Final exam	All	55%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

Course handouts (ENIS)

H. Thonier: « Design and calculation of building structures », Tome 1 to 6, Press of the Ecole Nationale des Ponts et Chaussées (National School of Civil Engineering)

# Structural dynamics

Code: GCV 04 205

Teacher: Taher Fakhfekh

Grade: Expert

University: National Engineering School of Sfax (ENIS)

Email:

Total module duration

56 h

Contact hours	Out of class activities
28h CI	28h

The equivalent credits  
2 ECTS

Semester 4



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course is an introduction to the fundamentals of structural dynamics. It focuses on the study of the vibrations of discrete systems: one-degree-of-freedom oscillator and multi-degree-of-freedom oscillator.

This course includes:

- Introduction to structural dynamics
- Free oscillation of a 1 ddl system
- Response of a 1 ddl system to harmonic excitation
- Response of a 1 ddl system to periodic excitation
- Response of a 1 ddl system to any dynamic excitation
- Study of vibrations by the Rayleigh method
- Dynamics of discrete systems with several degrees of freedom
- Undamped free oscillation of an N-degree-of-freedom system
- Study of the dynamic response by the modal superposition method

### Objectives

The objectives of this course are to:

- Acquire the basic theories in transient mechanics (or dynamics),
- Understand the different phases of dynamic analysis (masses and springs, temporal, spectral) applied to civil engineering structures,
- Introduction to building seismic calculations.

### 1.2: Prerequisites

MMC, RDM, Structural Mechanics and Finite Element Method.

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Introduction to structural dynamics	3h	Acquire basic theories in dynamic mechanics
<b>Chapter 2</b>	Free oscillation of a 1 ddl system	3h	Determine the form of movement of 1DDL Vibration System Models
<b>Chapter 3</b>	Response of a 1 ddl system to harmonic excitation	3h	Solving 1DDL vibrating system models to harmonic excitations
<b>Chapter 4</b>	Response of a 1 ddl system to periodic excitation	3h	Describe the response of 1DDL Vibratory System Models to periodic excitations

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<b>Chapter 5</b>	Response of a 1 ddl system to any dynamic excitation	3h	Calculate the response of a 1ddl system to any excitation using the Laplace Transform method.
<b>Chapter 6</b>	Study of the vibrations by the Rayleigh method	3h	Present the methods allowing the calculation and dimensioning of structures subjected to vibrations by the Rayleigh method.
<b>Chapter 7</b>	Dynamics of discrete systems with several degrees of freedom	4h	Describe the movement of a system in oscillation with several degrees of freedom (ddl)
<b>Chapter 8</b>	Undamped free oscillation of an N-degree-of-freedom system	3h	Determine the expression of the general vibration of undamped free oscillations of a system with N degrees of freedom.
<b>Chapter 9</b>	Study of the dynamic response by the modal superposition method	3h	Study the dynamic response by the modal superposition method through the projection of the equation of dynamic motion in the base of the eigenvectors of the stiffness matrix relative to the mass matrix.

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	28h
Practical work (h)	*****
Project (h)	*****
Visits (h)	*****

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work	*****	*****
Mid-term	1, 2, 3, 4, 5	30%
Oral test	*****	*****
Final exam	All	70%

## 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- F. Axisa. Modeling of mechanical systems. Vol. I: discrete systems. Hermes Science Publications, Paris, 2001.
- F. Axisa. Modeling of mechanical systems. Vol. II: continuous systems. Hermès Science Publications, Paris, 2001.
- M. Bruneau. Introduction to the theories of acoustics. University of Maine, 1983.
- M. Del Pedro and P. Pahud. Vibration mechanics of discrete linear systems. Polytechnic and University Presses, Romanedes, Lausanne, 1989.
- J.-L. Guyader. Vibrations of continuous media. Hermès, Paris.
- M. Geradin and D. Rixen. Vibration theory, application to structural dynamics. Masson, Paris, 1992.
- C. Lesueur. Acoustic radiation from structures. Eyrolles, Paris.
- A. Metrikine. Dynamics of systems and slender structures. Technical report, TU Delft.
- H.J.P. Morand and R. Ohayon. Fluid-structure interaction. Lavoisier, Paris.
- M. Roseau. Vibrations of mechanical systems, analytical methods and applications. Masson, Paris, 1984.
- S. Timoshenko, D. Young, and W. Weaver. Vibration problems in engineering. Wiley, 1974.
- K. Aas, C. Czado, A. Frigesi, H. Bakken. Pair-copula constructions of multiple dependence, Insurance: Mathematics and Economics, 44:182-198, 2009.
- T. Bedford, R.M. Cooke. Probability density decomposition for conditionally dependent random variables modeled by vines., Annals of Mathematics and Artificial Intelligence, 32 :245-268, 2001
- A. Girard, N. Roy. Dynamics of industrial structures, Hermes, 2003.
- S. Dubreuil, M. Salaün, E. Rodriguez, F. Petitjean. Construction of frequency response function by a semi analytical approach, Uncertainty in structural dynamics. ISMA-USD, 4637-4652, 2014
- S. Dubreuil. Probabilistic modal superposition: application to the dimensioning of spatial structures, PhD thesis, University of Toulouse, 2014

# Finite Element Methods

Code : GCV 04 206

Teacher: Bassem ZOUARI

Grade: Professor

University: National Engineering School of Sfax

Email:

bzouari@yahoo.com

Total module duration

42 h

Contact hours	Out of class activities
21h C	21h

The equivalent credits  
2 ECTS

Semester 4

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course aims to show students the different steps to follow to solve an engineering problem, written as a partial differential problem, using the finite element method. This method is used in structural design software (ROBOT, ABAQUS, RDM6, ANSYS).

This course includes the formulation of a physical problem and variational formulations.

It presents the elements and their space of interpolation functions, discretization and study the deformations and plane constraints for 2D elements.

### Objectives

The objectives of this course are

- Write the variational formulation associated with a physical problem
- Know the different types of interpolation in elements
- To know the different types of elements available in the software
- Write the matrix system to be solved following finite element discretization

### 1.2: Prerequisites

Mechanics of continuous media " MMC ", Resistance of materials " RDM ", Thermal, Mathematics

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Formulation of a physical problem	3h	-Know and practice the equations of equilibrium of a continuous environment and behavioral relationship. -Understand boundary conditions
<b>Chapter 2</b>	Variational formulations	3h	Write variational formulations from equilibrium equations and CL for 3D and curved media
<b>Chapter 3</b>	Elements and their interpolation function space	4h	-Know how to build an interpolation on a domain (1D, 2D and 3D). -Know how to integrate and derive on the real element. -Know the notions of reduced integration.
<b>Chapter 4</b>	Discretization	3h	Understand the construction of the stiffness matrix and the stress vector
<b>Chapter 5</b>	2D elements: plane deformations and stresses	4h	Understand the construction of the stiffness matrix and make the assembly for the 2D case
<b>Chapter 6</b>	Plate elements	4h	Know the formulation of DKT and DKQ elements

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	
Project (h)	
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-Term	1, 2, 3 1 4	30%
Oral test		
Final exam	All	70%

### 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

J. L. BATOZ, G.DHATT, "Modélisation des structures par éléments finis", Vol.1, solides élastiques. Hermes, 1995.

J. L. BATOZ, G.DHATT, "Modélisation des structures par éléments finis", Vol.2, Poutres et Plaques. Hermes, 1995.

D.V. Hutton, "Fundamentals of finite elements analysis", Published by McGraw-Hill, 2004.

O.C. ZIENKIEWICZ, R.L. TAYLOR, "The finite element method, volume1: the basis", Published by Butterworth Heinemann, 2000.

K. J. Bathe, "Finite Element Procedures", Prentice Hall, Pearson Education, Inc.

# Pathologies, Diagnosis and rehabilitation of structures II

Code: GCV 04 207

**Teacher: Mehrez Khemakhem**

**Grade: Professor Technologist**

**University: ISET Sfax**

**Email:**

[mehrez.khemakhem2@gmail.com](mailto:mehrez.khemakhem2@gmail.com)

**Total module duration**

**35 h**

Contact hours	Out of class activities
14h CI + 7h TP	14h

**The equivalent credits**

**1 ECTS**

**Semester 4**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course deals with the pathological problems of reinforced concrete constructions and includes the following parts:

- Concepts on the life span of structures
- Notions on the anomalies of structures and materials
- Non-destructive testing and civil engineering
- Control and visual diagnosis
- Cracking follow-up
- Concrete control
- The control of reinforced concrete
- Control of deep foundations
- Soil control and monitoring
- Maintenance work
- Repair work
- Rehabilitation work

### Objectives

The concepts to be studied in this course will allow students to:

- To know the different origins of degradation (chemical, mechanical, physico-chemical and physical, faulty calculation, design and operation)
- Mastering the diagnostic methodology (preliminary visit, document collection, visual inspection, in-depth inspection with expert equipment, interpretation and analysis of measurement results)
- Know the different techniques used in the expertise of materials and works
- Knowing the various standards available to diagnose or appraise a material or work
- Mastering repair and reinforcement methods and techniques

### 1.2: Prerequisites

Concepts on engineering structures, reinforced concrete, prestressed concrete, soil mechanics, PGC

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Origins and prevention of disorders and degradations	5h	Know the various standards available associated with the expertise of a material or a work Know the different origins of degradation
<b>Chapter 2</b>	Diagnostic Techniques	10h	Master the diagnostic methodology
<b>Chapter 3</b>	Repair and reinforcement methods and techniques	6h	Master repair and reinforcement methods and techniques



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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	7h
Project (h)	
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work	Chapter 2	30%
Mid-Term	*****	*****
Oral test	*****	*****
Final exam	All	55%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Diagnostic, entretien et réparation des ouvrages en béton armé en 44 fiches pratiques, Mehrez Khemakhem & Omrane Ben Jeddou, Expertise Technique- Editions Le Moniteur, 2020
- Défauts apparents des ouvrages d'art en béton, 1975

# Building Thermal

Code : GCV 04 208

**Teacher: Omar Mezghanni**

**Grade: Master Assistant**

**University: National School of Engineers of Sfax ENIS**

Email:

[Omar.mezghanninr@enis.tn](mailto:Omar.mezghanninr@enis.tn)

Total module duration

49 h

Contact hours	Out of class activities
21h CI +7h TP	21h

The equivalent credits

2 ECTS

**Semester 3**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

Building thermics is the set of sciences and techniques aimed at studying the energy needs of buildings.

It mainly deals with the notions of thermal insulation and ventilation in order to offer the best thermal comfort to the occupants.

### Objectives

The objectives of this course are to:

- To know the fundamental notions of thermics,
- Identify the parameters that characterize thermal comfort in buildings,
- To know the modes of heat transfer and be able to make a heat balance knowing all the heat losses.

### 1.2: Prerequisites

Basic Mathematics and Physics for the Engineer

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Fundamentals of thermics	2h	To know the fundamentals of thermics
<b>Chapter 2</b>	Thermal comfort	4h	To identify the parameters that characterize thermal comfort in buildings
<b>Chapter 3</b>	Heat Transfers	4h	To know the modes of heat transfer
<b>Chapter 4</b>	Heat loss	4h	To know the heat losses Establish a heat balance
<b>Chapter 5</b>	Hygrométrie	3h	Mesurer le taux d'humidité de l'atmosphère
<b>Chapter 6</b>	Thermal insulation: Choice of materials	4h	Maitriser le choix des matériaux offrant l'isolation thermique

## Thermal Practical work (7h)

Thermal conductivity: The aim of this work is to determine experimentally the thermal conductivity of copper.

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	7h
Project (h)	
Visits (h)	

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work	Chapter 3	30%
DS		
Oral test		
Final exam	All	55%

## 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Building energy and thermal simulation ; Eyrolles, 2015
- Natural ventilation in Buildings - a design handbook, Edited by Francis Allard and Mat Santamouris, James & James Ltd., ISBN 1 873936 72 9, 368 pp., 1998.
- Heat transmission - Conduction: Volume 1 (tomes 1 et 2), A. B; De Vriendt; Gaétan Morin editor, 1984. 3)

# Roads and Miscellaneous Networks (VRD)

Code: GCV 04 209

**Teacher : SMAOUI Moncef**

**Grade: Principal Engineer**

**Establishment : ONAS**

**Email:**

**m.smaoui@yahoo.fr**

**Total module duration**

**49 h**

Contact hours	Out of class activities
28h CI	21h

**The equivalent credits**  
**2 ECTS**

**Semester 4**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

The course focuses on the design and dimensioning of the various components of a VRD project, namely all underground networks (wet and dry) and roads.

### Objectives

The objectives of this course are to teach students the theoretical and practical knowledge that will enable them to:

- to master, design and dimension the various networks, in particular the wastewater and rainwater treatment networks and the drinking water supply network including the associated pumping systems,
- To acquire knowledge on the different types of roads and the methods of their design and dimensioning.

### 1.2: Prerequisites

Fluid Mechanics, General and Urban Hydraulics

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Introduction	2	Learn the definition, consistency and importance of VRD work. Understand the different phases of a VRD project and the different stakeholders.
<b>Chapter 2</b>	Sewerage systems in waste water	10h	To know the different sewerage systems, the elements constituting sewerage networks and the dimensioning of pipes and pumping stations.
<b>Chapter 3</b>	Stormwater sewerage systems	5h	Know how to determine and calculate the flow of rainwater in a watershed and size the collectors
<b>Chapter 4</b>	Drinking water supply systems	10h	Define the design and control the dimensioning of drinking water distribution networks and storage tanks.
<b>Chapter 5</b>	Public lighting	3h	To know the notions on public lighting networks

## 2. METHODOLOGY:

The contact hours consist of:

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Integrated Course (h)	28h
Practical work (h)	*****
Project (h)	*****
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work	*****	*****
Mid-Term	1, 2 & 3	30%
Oral test	*****	*****
Final exam	All	70%

# Plates and shells

Code: GCV 04 106

Teacher: Salma HADJ KACEM

Grade: Full-time faculty member

University: IIT

Email:

Salma.hadjkacem@iit.ens.tn

Total module duration

77 h

Contact hours	Out of class activities
35h C + 14h TP	28

The equivalent credits

3 ECTS

Semester 4



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This module consists of three parts:

- Contract: The first part consists of defining the various types of contracts, understanding the components of a file (CCLS, PSAB, CPTC, Plans, etc...) and the method and documents for participating in a contract.
- Metric: The second part makes it possible to analyze quantitatively a market by calculating the quantities of its items and to estimate the offer of participation by the realization of a sub detail of the prices.
- Planning: The third part aims to establish a schedule in order to program the work and organize the interventions of third parties while ensuring the respect of the required execution time.

### Objectives

The objectives of this course are:

- To know how to read a market, prepare the offer and participate in an RFP.
- Know how to calculate quantities and prepare a sub-detail of prices
- Know how to establish, analyze and control a schedule

### 1.2: Prerequisites

Building Materials, Engine and Materials, Method of execution


### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
Chapter 1	The contract	12h	Knowing how to read a contract, prepare the offer and participate in an AO
Chapter 2	Metered	12h	Know how to calculate quantities and prepare a sub-detail of prices
Chapter 3	Planning (course + Practical work)	11h+14h	Know how to establish, analyze and control a schedule

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	35
Practical work (h)	14
Project (h)	

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	Visits (h)		

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work	3	25%
Mid-Term	1 & 2	30%
Oral test		
Final exam	All	55%

# Mixed Buildings

Code: GCV 04 211

Teacher: Mounir Ben Jdidia

Grade: Professor

University: National School of Engineers of Sfax ENIS

Email:

[mounir.benjdida@enis.rnu.tn](mailto:mounir.benjdida@enis.rnu.tn)

Total module duration

42 h

Contact hours	Out of class activities
21h CI	21h

The equivalent credits

2 ECTS

Semester 2

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course consists of the following parts:

#### **UNITS and ASSOCIATED STANDARD TEXTS**

#### **GENERAL PROCEDURE FOR VERIFYING A MIXED SLAB AND MIXED POUTRE**

#### **DURATION OF USE OF THE PROJECT**

#### **DURABILITY REQUIREMENTS**

- INDICATIVE STRENGTH CLASSES FOR DURABILITY
- EXPOSURE CLASSES
- CALCULATION OF MINIMUM COATINGS

#### **SHARES (EN1991-1-1): SHARE COMBINATIONS (EN-1990) and SOLICITATIONS M, N, V**

- ANALYSIS OF MIXED Slab to ELU; ELS
- ANALYSIS OF MIXED POWDERS with ELU; ELS: Simplified Method 1; Simplified Method 2
- T-beams / Participating width of slab

#### **MATERIALS: CONCRETE; REINFORCING STEEL**

#### **HEAD BOLT CALCULATION RESISTANCE**

#### **SECTION VERIFICATIONS**

- MIXED SLABS
- MIXED BEAMS

### Objectives

The objectives of this course are:

- To know the normative texts associated with the justifications of mixed slabs and mixed beams and to master the units of the different physical quantities used.
- To know the principles of verification of a composite slab and a composite beam
- Acquire sustainability requirements from students
- To master the calculation of the actions in a slab and in a beam in ELU and ELS
- To know the properties of the materials used, concrete and steel.
- To justify the connectors
- To justify a mixed slab
- To justify a composite beam

### 1.2: Prerequisites

RDM, Structural Design I, Structural Design II, Structural Steelwork

## 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
Chapter 1	<b>GENERAL VERIFICATION PROCEDURE:</b> COMPOSITE SLAB AND COMPOSITE BEAM	2h	Master the UNITS and ASSOCIATED STANDARD TEXTS Know the principles of : PRINCIPLE OF VERIFICATION OF A MIXED SLAB PRINCIPLE OF VERIFICATION OF A COMPOSITE BEAM
Chapter 2	<b>DURATION OF USE OF THE PROJECT DURABILITY REQUIREMENTS</b>	2h	Know the classification of a concrete according to the standard in force: <ul style="list-style-type: none"> <li>• Indicative classes of resistance for durability</li> <li>• Exposure classes</li> <li>• Calculation of minimum coatings</li> </ul>
Chapter 3	<b>ACTIONS &amp; COMBINATIONS OF ACTIONS SOLICITATIONS M, N, V</b>	2h	<b>Mastering the calculation of SHARES</b> - PERMANENT LOADS - OPERATING EXPENSES - ACTIONS FOR STEEL RIBBED PLATES USED AS MIXED SLAB FORMWORK <b>Write the combinations of actions and determine the internal forces M, N, V in ELU and ELS</b> - ANALYZING Slabs Mixed with ELU; ELS - ANALYZING MIXED POWDERS with ELU; ELS: Simplified Methods 1 and 2 - Determine Participating Slab Width Tee Beams
Chapter 4	<b>MATERIALS:</b> CONCRETE; REINFORCING STEELS	3h	<b>Know the properties of CONCRETE</b> <b>To know the properties of CONSTRUCTION STEEL</b> - HOT-ROLLED MILLS - PROFILED SHEET STEELS - MINI CATALOG OF RIBBED SHEETS FOR MIXED

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			<b>SLABS</b> - CONNECTOR STEELS BIAXIAL CONNECTOR LOADING
<b>Chapter 5</b>	<b>HEAD BOLT CALCULATION RESISTANCE</b>	2h	<b>Determining the BIAXIAL LOADING OF CONNECTORS</b> <b>Know the CONSTRUCTIVE PROVISIONS</b>
<b>Chapter 6</b>	<b>VERIFICATIONS OF MIXED SECTIONS OF SLABS</b>	5h	<b>Calculate MIXED Slabs</b> - Check the profiled sheet metal during the <b>construction phase at the Ultimate Limit States (ULS)</b> - Checking the profiled sheet metal during the construction phase at the limit states of service (ELS) <b>Check the mixed slab at the ultimate limit states (ELU)</b> - Types of ruin - Verification of the positive bending strength of the mixed slab (type I ruin) - Verification of the negative bending strength of the mixed slab (type II ruin) - Vertical shear verification (type III ruin) - Design resistance to longitudinal shear without end anchorage (type II ruin) - Design longitudinal shear strength with end anchorage (type II ruin) - Relationship between ruin mode and scope <b>Check the mixed slab in the service limit state</b> - Concrete cracking control - Arrows - Elastic Section Properties (ELS) - Constructive arrangements of mixed slabs - Slab thickness and reinforcement - Aggregates - Support Requirements

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<b>Chapter 7</b>	<b>CHECKS OF THE MIXED SECTIONS OF THE BEAMS</b>	5h	<p><b>Calculate MIXED POWERS</b></p> <p><b><u>Classify sections of composite beams</u></b></p> <p><b><u>Check the ultimate limit state</u></b></p> <ul style="list-style-type: none"> <li>- Resistive moment of calculation of class 1 and 2 sections (type I)</li> <li>- Resistant calculation cutting force</li> <li>- Bending-Sharpening Interaction (If <math>V_{Ed} &gt; 0.5 V_{Rd}</math>)</li> <li>- Spill</li> <li>- Sizing of the connection of isostatic beams of Class 1 or 2</li> <li>- Sizing of the connection of continuous beams of Class 1 or 2</li> <li>- Longitudinal shear in the slab</li> </ul> <p><b><u>Check service limit status</u></b></p> <ul style="list-style-type: none"> <li>- Checks to be carried out</li> <li>- Calculation of arrows</li> <li>- Concrete cracking</li> <li>- Vibrations</li> </ul>
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## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	
Project (h)	
Visits (h)	

## 3. EVALUATION :

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Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-term	Chapter 1, 2, 3	30%
Oral test		
Final exam	All	70%

#### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- MOREL JEAN ; Metallic Structures; Editions EYROLLOS (2ème tirage) 1997.
- GRAMME INSTITUTE –CONSTRUCTION UNIT: Dr Ir P. BOERAEVE : Steel-Concrete Mixed Construction Calculation Manual according to EN1994-1.1 de déc.2004
- Steel bridges - Design and sizing of steel and steel-concrete composite bridges
- Civil Engineering Treaty of the Swiss Federal Institute of Technology in Lausanne Volume 12
- Jean-Paul Lebet, Manfred A. Hirt - Civil Engineering Treaty of the Swiss Federal Institute of Technology in Lausanne
- Mixed steel-concrete constructions, Jean-Marie Aribert, Hoang-Tung Vu, Mohammed Hijaj, Samy Guezouly - Collection Guide Eurocode
- Mixed steel-concrete constructions - Eurocode 4 " Design and dimensioning of mixed steel-concrete structures" and National Application Documents – Part 1-1 : General rules and regulations for AFNOR buildings



# Design and calculation of engineering structures

Code: GCV 04 212

**Teacher: Mohamed Hadj Taieb**

**Grade: Higher Education Assistant**

**University: National School of Engineers of Sfax ENIS**

**Email:**

**mohamedhtaieb@yahoo.com**

**Total module duration**

**77 h**

Contact hours	Out of class activities
28h CI + 14h Projet	35h

**The equivalent credits**

**3 ECTS**

\$

**Semester 3**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course includes and presents:

- Generalities about engineering structures
- A classification of bridges
- The data necessary for the study of a bridge
- A Design of common reinforced and prestressed concrete bridges
- Load regulation for bridges according to SETRA & Eurocodes 0-1 and calculation of the stresses in a main girder
- Calculation of girder bridge stiffnesses
- Bridge equipment

### Objectives

This course enables students of the Second Year taking Civil Engineering to:

- Design and calculate the decks of common bridges such as slab bridges, "TIBA" reinforced concrete girder bridges and "VIPP" prestressed concrete girder bridges according to SETRA and Eurocodes regulations.
- Mastering the dimensioning and the verifications of braced elastomer bearings are also developed,

### 1.2: Prerequisites

Materials resistance, Urban hydraulics, Structures I & II, Hydrology

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	General information on engineering structures	3h	- Know the different types of engineering structures and the terminology of the different components of a bridge
<b>Chapter 2</b>	Bridge Classification	3h	- Know the bridge classification criteria
<b>Chapter 3</b>	Data required for the study of a bridge	3h	- Know the various stakeholders in a bridge project and knowledge of natural and functional data for the study of a bridge
<b>Chapter 4</b>	Design of standard reinforced and prestressed concrete bridges	8h	- Design a BA & BP girder bridges, BA & BP slab bridges and frame bridges.
<b>Chapter 5</b>	Regulation of loads on bridges	10h	- know about the different actions applied on bridges according to Setra and Eurocodes 0-1 regulations.

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	according to SETRA & Eurocodes 0-1 and calculation of stresses in a main girder		- Calculate the stresses in a main beam
<b>Chapitre 6</b>	Calculation of girder bridge stiffnesses	9h	- Study the local, global and total bending in girder bridge stiffeners
<b>Chapitre 7</b>	Bridge equipment	6h	- Know the bridge equipment - Studies of braced elastomer bearings

### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	28h
Practical work (h)	
Project (h)	14
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		25%
Mid-term	Chapitres : 1, 2,3 & 4	20%
Oral test		
Final exam	All	55%

#### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Designer's Guide for Structures « current bridges» technical studies service for roads and highways
- Jean-Armand Calgaro : Design of bridges by Press of the Ecole Nationale des Ponts et Chaussées (National School of Civil Engineering)
- Eurocodes 0 et 1 « Application to road bridges and footbridges»

# Computer Aided Calculation

Code: GCV 04 213

**Teacher : Ilhem Borcheni**

**Grade: Full-time faculty member**

**University: International Institute of technology IIT Sfax**

**Email:**

**ilhem.borcheni@iit.ens.tn**

**Total module duration**

**63 h**

Contact hours	Out of class activities
42h TP	21h

**The equivalent credits**

**2 ECTS**

**Semester 4**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This Practical work is divided into 3 parts:

- Calculation of building frames: design, modeling and calculation of a R+1 building using the ARCHE software.
- Calculation of Reinforced Concrete Structures: ROBOT
- Calculation of metallic structures: ROBOT (modeling of a 2D gantry and a metallic lattice structure: two-dimensional trusses; 3D spatial lattice)

### Objectives

The objective of this TP is to familiarize students with calculation software in civil engineering. The student must:

- Know the essential functionalities of calculation software, based on an existing project,
- Be able to master the software interface and correctly enter data and retrieve results.

### 1.2: Prerequisites

CAD, CSBA, Reinforced concrete, steel structure, computer science

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
TP 1	Calculation of building frames : Arch	16h	-Master the construction lines - Master the design of a R+1 building - Master the BA beam and BA column element -Differentiate the various types of support -Apply the different types of loading (G and Q) -Define the combinations of actions in the ELU and ELS -Analyze and develop the reinforcement of the elements of the BA framework: BA slab, beam, columns, footing, sail, staircase...
TP 2	Calculation of Reinforced Concrete Structures: ROBOT	14h	
TO 3	Design of steel structures: ROBOT	12h	-Define axes, profile sections, supports, loads, combinations of a 2D gantry and a 3D frame structure - Analyze calculation results - Mastering profile assemblies

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## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	
Practical work (h)	42h
Project (h)	
Visits (h)	

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work	All	100%
Mid-Term		
Oral test		
Final exam		

## 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Manuel d'utilisation du logiciel Graitex OMD Arche
- Manuel d'utilisation du logiciel Autodesk Robot Structural Analysis Professional 2018

### Personal Professional Project

Code: GCV 05 101

**Teacher: Mrs. Amel Trabelsi Elloumi**

**Grade: Ph.D. in economics**

Full-time faculty member

Head of the department of career preparation

**University: International Institute of Technology**

**Email:**

**Dep.PCP@iit.ens.tn**

**Total module duration**

**42 h**

Contact hours	Out of class activities
21h	21h

**The equivalent credits**  
**2 ECTS**

**Semester 5**



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description:

- **P as Project:** before job search or further study
- **P as Professional:** to move towards a trade or a sector of activity
- **P as Personal:** after reflecting on their own abilities and needs

### Objectives

This course aims to:

- Teach the student to get to know himself better in order to evaluate his professional potential skills.
- Prepare him for professional integration.
- Make it confront the professional reality.
- Help him to be an actor of his professional future

### 1.2: Prerequisites

- Entrepreneurship culture
- Behavioral and professional skills

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning outcomes
<b>Chapter 1</b>	Self-knowledge	5 hours	To master: What I am (to know how to be)! What I know (know)! What I can do (know how)!
<b>Chapter 2</b>	Choice of profession	5 hours	To Know: What I can do!
<b>Chapter 3</b>	Development of an action plan	5hours	To know job search techniques, CV and LM
<b>Chapter 4</b>	Rehearsals	6 hours	To train students to present their skills in a way that imitates the job interview

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	10
Practical work (h)	
Project (h)	11
Visits (h)	

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### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	*	70%
Practical work		
Mid-term		
Oral test	*	30%
Final exam		

### 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- *Henderson, Linda S.; Stackman, Richard W. An Exploratory Study of Gender in Project Management: Interrelationships with Role, Location, Technology, and Project Cost, Part of Project management journal* vol. 41 (2010). December s. 37-55.
- 
- *Launching and Leading Change Initiatives in Health Care Organizations: **Managing Successful Projects***. San Francisco: Jossey-Bass, 2014, pages 83 138.

# Introduction to Marine and Coastal Engineering

Code: GCV 05 102

**Teacher : MOALLA Badis**

**Grade: Engineer//Master Technologist**

**University: Higher Institute of Technological Studies**

Email:

.....

**Total module duration**

**35 h**

Contact hours	Out of class activities
21h CI	14h

**The equivalent credits**

**2 ECTS**

**Module responsible**

**Bedis Moalla**

**Semester 5**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course allows students to learn the basic principles of Maritime Hydrodynamics, which is embodied in the phenomena of the tide and the effects of the swell. It also presents the causes of silting of basins, beach erosion and silting of channels.

Through this course, students study the risks, understand the importance of coastal protection and are familiar with the various protective structures such as the design elements of a sea wall and the breakwaters protecting a beach to ensure the stability of marine structures,

There are also the types of ports, their characteristics and design elements (Commercial ports; fishing ports, marinas) as well as the CG works in the ports and their equipment.

This course presents maintenance works in ports such as: port dredging operations, dredging of channels and underwater vegetation and the safeguarding of fauna and flora.

We discover the maintenance and shipbuilding yards in ports such as Port Lock, Boat Lifts, Sailing Vessel Maintenance, Trawler Maintenance and Vessel Maintenance.

This course closes with applications and practices on appropriate software in order to know the basic principles of numerical modeling: Software Engineering such as SWAN; SBEACH; SMC.

### Objectives

The objectives of this course are:

- To know the basic principles of Maritime Hydrodynamics: Tidal phenomena, swell effects, etc.
- To know the causes of silting of basins, erosion of beaches, silting of channels
- To know the works of protection: seawalls, breakwaters, etc.
- To know the risks and to establish protection schemes
- To know the types of ports and their characteristics and design elements: Commercial ports; fishing harbors, marinas
- To know about CG works in ports and harbours
- To know the equipment in the ports
- To know the basic principles of numerical modeling: Software Engineering such as SWAN; SBEACH; SMC
- To know the shipyards of construction or ship maintenance

### 1.2: Prerequisites

Sustainable development; urban planning; architecture

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Maritime Hydrodynamics	4h	Know the basic principles of Maritime Hydrodynamics: -Tidal phenomena and consequences on maritime structures -Effect of the swell -Beach Erosion -Siltation of fairways -Siltation of port basins -Stability of a protective dike
<b>Chapter 2</b>	Seawalls and protection works	3h	Know and study protective works such as -Elements of Design of a sea wall -Blade breakers for the protection of a beach Studying risks and protection schemes Understanding Shoreline Protection
<b>Chapter 3</b>	Port Infrastructures and Works	4h	Know the types of ports, their characteristics, design elements and equipment
<b>Chapter 4</b>	Maintenance work in ports	2h	Know and understand maintenance work in ports such as : -Port dredging operations -Dredging of fairways -Underwater vegetation and protection of the fauna and flora
<b>Chapter 5</b>	Shipbuilding and maintenance yards	2h	Discover and identify maintenance and shipbuilding yards : -Harbour lock -Boat elevators -Yacht maintenance -Trawler maintenance -Vessel maintenance -Shipbuilding
<b>Chapter 6</b>	Basic principles of numerical modeling	6h	Know the basic principles of numerical modeling: Software Engineering such as SBEACH; SMC; SWAN <b>Practice and apply common examples</b>

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## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21 h
Practical work (h)	
Project (h)	
Visits (h)	

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-Term	Chapter 1, 2, 3	30%
Oral test		
Final exam	All	70%

## 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

1- Article published by SHF and available at <http://www.shf-lhb.org> or <http://dx.doi.org/10.1051/lhb/1957057>

2- Physique de la houle et des lames Jean Larras Eyrolles

3- Houle et Vagues. "Écoulements en Milieux Naturels" Cours ...  
[www.lmm.jussieu.fr](http://www.lmm.jussieu.fr) > COURS > MFE<sub>Env</sub> > MFE<sub>Houle</sub>

4- École d'application du génie maritime. Cours de construction du navire Tome 2 (Français)  
 Broché – 1 août 2016 de Léon-Charles Callou (Auteur)

5- Cours de construction du navire, par L. Callou,... Tome 1 / École d'application du génie maritime Callou, Léon-Charles (1863-1946). Auteur du texte

6- Vauban, génie maritime - Livre de Arnaud

7- TRAVAUX MARITIMES PR. Y. AJDOR

# Modeling of structures: BIM REVIT structure

Code: GCV 05 103

Teacher: Salem Mabrouki

Grade: S. Structural & Civil Engineer, PMP  
ACI, PRODDSIGN

Establishment : International Training and Certification Center  
PRODDSIGN TRAINING

Email:

[salem.mabrouki@proddesign.net](mailto:salem.mabrouki@proddesign.net)

Total module duration

63h

Contact hours	Out of class activities
14h CI + 21h Projet	28h

The equivalent credits  
2 ECTS

Module responsible  
Salem Mabrouki

Semester 5

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This Autodesk Revit Structure training will allow the student to master the BIM technology for structural design.

At the end of this course, the student will know how to implement and use different features of Revit Structure

- Presentation of REVIT (Work environment, Management of views and elevations, Organization of the Revit file, Initiation of families)
- Starting the project (Details of the Structure module, Starting a new project, Project information, Project reference (levels, grids...), Initiation to the different elements (bearing walls, beams, columns, networks, slabs, etc.), Controlling the visibility of objects)
- Creation of the model (Load-bearing posts, Beams (frames), Slabs, Radies and foundations)
- The Analytical Model (Presentation, Analytical Properties and Structural Parameters, Model Setup, Supporting Conditions, Load Cases and Load Combinations)
- Families (System families, External or downloadable families (BIM&CO), In-situ families (unique to the project), Realization of a family)
- Referencing and documentation (View templates: Plans, sections, elevations, ..., Detail view management, Sheet management, Metrics and quantities, Annotations)
- Collaborative work: Export / Import ( Export: cross geometry, layers, Import of REVIT models with link, Import of Autocad drawings)

### Objectives

- Discover Revit Structure and the principles of object modeling
- Be able to use and create projects in the field of structure with Revit structure
- Master BIM technology for structural design.
- Prepare for the transition to Autodesk ACU Certification

### 1.2: Prerequisites

CAD, CCOB, steel structure, reinforced concrete...

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Project 1</b>	Presentation of BIM and REVIT	4h	- Know the work environment, the management of views and elevations, the organization of the Revit file, the initiation of families



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<b>Projet 2</b>	Starting the project	4h	-Know the details of the Structure module, -Start a new project, -Study and analyze information on the project, the project reference (levels, grids...), initiation to the different elements (bearing walls, beams, columns, networks, slabs, etc.), -Control the visibility of objects
<b>Projet 3</b>	Création du modèle	5h	Create Load-bearing Posts, Beams (frames), Slabs, Raders and Foundations
<b>Projet 4</b>	Le modèle Analytique	5h	-Master the Presentation, and the analytical properties and structural parameters, -Set the model, -Set the support conditions, -Setting load cases and load combinations
<b>Projet 5</b>	Les Familles	4h	-Master System Families, External or downloadable families (BIM&CO), In-situ families (unique to the project), - Make and add a family
<b>Projet 6</b>	Référencement et documentation	4h	-Generate view templates: Plans, sections, elevations, -Manage detail views, sheets, Metrics and Quantitative, Annotations
<b>Projet 7</b>	Travail collaboratif (Export / Import)	2h	-Mastering export: cross geometry, layers, - Mastering the import of REVIT models with linkage, and the import of Autocad drawings

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	*****
Practical work (h)	*****
Project (h)	28h
Visits (h)	*****

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All	100%
Practical work	*****	*****
Mid-Term	*****	*****

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	Oral test	*****	*****
	Final exam	*****	*****

#### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

-Initiation au logiciel Autodesk REVIT® Structure, Olivier BAYLE BIM Technical Specialist

### **Rheology of new materials** **Code: GCV 05 104**

**Teacher: Amira Bouaziz**

**Grade: Permanent teacher**

**University: IIT**

**E-mail:**

**Amira.bouaziz@iit.ens.tn**

**Total module duration**

**42 h**

Contact hours	Out of class activities
21 CI	21

**Equivalent credits**

**2 ECTS**

**Module Responsible**

**Amira Bouaziz**

**Semester 5**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

The practical interest of rheology lies on the one hand, in the study of the field of low deformations to better understand the correlations between the structure of the material and its properties and, on the other hand, in the examination of the field of large deformations, in order to determine the constitutive laws necessary, in particular to apprehend the best conditions of implementation of the material.

### Objectives

This module provides, in a first part, the fundamental knowledge of rheology and deals with its applications to polymers in the solid state; in a second part, the rheology of polymers in the molten state is examined. This module therefore makes it possible to choose a material for a given application and to optimize its transformation processes.

### 1.2: Prerequisites

- Structure and morphology of polymers
- Average molar masses and distribution
- Formulation of plastics
- Quantities and mechanical behavior of materials

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	- <b>Fundamentals of rheology.</b> Definition of the main quantities. Creep and relaxation experiences. Tests in dynamic regime. Complex module. Cole-Cole representation.	3h00	- Be interested the laws of behavior of matter and the study of the phenomena of deformation and flow of materials. - Establish the rheological behavior of materials, through the relation between $\sigma$ , $\epsilon$ and $t$ .
<b>Chapter 2</b>	- <b>Classification of materials.</b> <b>Analog models.</b> Kelvin-Voigt delayed elasticity solid and Polymer retardation time spectrum. Maxwell's viscoelastic liquid and polymer relaxation time spectrum. Bingham plastovisco-elastic and strong body.	3h00	- Classify materials according to their rheological behavior (elastic, viscous, plastic). - Know Behavior of polymers in the solid state and in the molten phase: relaxation and creep of generalized Maxwell and kelvin-Voigt models. - Arrive to the expression of the

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			complex mechanical modulus $E^*$ and the tangent of the loss angle.
<b>Chapter 3</b>	<p>- <b>Types of simple shear flows.</b> Newton's liquids, pseudo-plastic and rheo-thickening. Power and logarithmic laws, Square and hyperbolic tangent models. Poiseuille, Couette and Weissenberg flows. Bagley and Rabinowitsch corrections</p>	4:30	<ul style="list-style-type: none"> <li>- Know the behavior of polymers in the molten state and the descriptive laws (viscosity versus shear curves).</li> <li>- Determine hot melt flow index (grade, MFI and MFR): advantages and limitations.</li> <li>- Know the principle and mode of operation of a capillary rheometer (T. Practices).</li> <li>- Treat concrete examples (tutorial exercise)</li> </ul>
<b>Chapter 4</b>	<p>- <b>Viscosity of polymers in the molten state.</b> Influence of experimental parameters and molecular characteristics. Influence of temperature, shear and activation energy on flow. Reduced and master curves. Relationship between viscosity and molar mass. Bueche and Grassley's entanglement theory. Influence of the distribution of molar masses and branchings.</p>	4:30	<ul style="list-style-type: none"> <li>- Understand the correlation between the structure and the flow behavior during the thermomechanical cycle of implementation on an industrial scale.</li> <li>- Know how to achieve the choice of a material for a given application and to optimize its transformation processes.</li> <li>- Control the procedure for comparing materials with each other, in a wide temperature and shear range, experimentally inaccessible to the capillary rheometer.</li> </ul>
<b>Chapter 5</b>	<p>- <b>Elasticity of polymers in the molten state.</b> Normal force, swelling at the outlet of the die, flow defects and draw resonance.</p> <p>- <b>Viscoelasticity of polymers in the molten state.</b> Modeling of flows. Parallelism between complex dynamic viscosity and steady state viscosity. Measures in transitional regime.</p>	6h00	<ul style="list-style-type: none"> <li>- Invest the phenomena for which there is manifestation of an elastic component of the material during its transformation.</li> <li>- Know extrudate defects of viscoelastic origin in the molten phase (sharkskin, plug defect and extrudate breakage)</li> <li>- Locate the origins of these defects (entry, interior and exit of the sector) and understand the associated phenomena.</li> </ul>

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21
Practical work (h)	
Project (h)	
Visits (h)	

### 3. EVALUATION:

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-Term		30%
Oral test		
Final exam	All	70%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- G. COUARRAZE and JL GROSSIORD - Initiation to rheology. Lavoisier, Tec & Doc, 272 p. (1991).
- FR EIRICH - Rheology, theory and applications (6 volumes), Academic Press, New-York, 1982.
- B. PERSOZ - Introduction to the study of rheology, Dunod, Paris, 1980.
- JA BRYDSON - Flow properties of polymer melts, Iliffe, London, 1990.
- JL LEBLANC - Experimental rheology of polymers in the molten state, Cebedoc, cork, 1984.
- CD HAN - Rheology in polymer processing, Academic Press, New-York, 1996.
- LE NIELSEN - Polymer Rheology, Marcel Dekker, New-York, 1997.
- RS LENK - Polymer Rheology, Applied Sciences, London, 1998.
- JL WHITE - Principles of polymer engineering rheology, John Wiley and Sons, New-York, 1988.
- HA BARNES, JF HUTTON and K. WALTERS - An introduction to rheology, Elsevier, New-York, 1998.
- NW TSCHOGL - The phenomenological theory of linear viscoelasticity behavior, Springer Verlag, New-York, 1998.
- C. CARROT and J. GUILLET - From dynamic moduli to molecular weight distribution: a study of various polydisperse linear polymers. J. of Rheology 41 (1997) p. 1203-1221.

### Mini Project 2: Metal works

Code : GCV 05 105

**Teacher: Abderraouf KAMEL**

**Grade: Phd Student**

**University: National School of Engineers of Sfax**

**Email:**

**Abderraof.kamel@gmail.com**

**Total module duration**

**63 h**

Contact hours	Out of class activities
14h CI + 21h Project	28h

**The equivalent credits**

**2 ECTS**

**Module responsible**

**Mounir Ben Jdidia**

**Semester 5**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This study is an alternation between the course and the use of the Robot software. In fact, this mini project is a transition phase from academic study to professional study.

This mini project consists in studying two real projects: industrial building with gantry in trusses and industrial shed with gantry in crossbeams.

This study covers the structural design, the modeling of the load-bearing framework, the dimensioning and verification of the foundation, the assemblies and the structural elements according to the appropriate standard.

### Objectives


This course aims, by combining the professional skills with the theoretical skills of the course, to :  
 -train civil engineers capable of designing, modeling and dimensioning steel construction projects

1.2: Prerequisites  
 Steel frame, CAD

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	General presentation	4h	Remembering and highlighting the standards used in the design of the different elements of an industrial building
<b>Chapter 2</b>	Introduction to the ROBOT software	5h	Use the robot software for the dimensioning of steel structures
<b>Chapter 3</b>	Presentation and design of the two projects	5h	Master the steps followed in the pre-sizing and design phase of industrial buildings.
<b>Chapter 4</b>	Modeling, dimensioning and verification of the load-bearing structure	14h	<ul style="list-style-type: none"> <li>Learn ROBOT's tools for modeling steel structures</li> <li>Understand and enter the parameters to be introduced for the dimensioning of the various elements</li> <li>Interpreting the results</li> <li>Check the foundation according to NV 65</li> <li>Checking structural elements and assemblies according to EC3</li> </ul>
<b>Chapter 5</b>	Manual calculation	7h	Apply the course and calculate structural elements manually Interpret the limitations of the software by comparing the results of the manual



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			calculation with the results of the ROBOT software.	

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14 hrs
Practical work (h)	0
Project (h)	21 hrs
Visits (h)	0

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All	100%
Practical work	**	**
Mid-Term	**	**
Oral test	**	**
Final exam	**	**

## 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Structural Steel Course material
- ROBOT software user manual

# Design of reinforced concrete buildings

**Code: GCV 05 106**

**Teacher: Mohamed Hadj Taieb**

**Grade: Teaching Assistant**

**University: National School of Engineers of Sfax**

**Email:**

**mohamedhtaieb@yahoo.com**

**Total module duration**

**63 h**

Contact hours	Out of class activities
14h CI + 21h Project	28h

**The equivalent credits**

**2 ECTS**

**Module responsable**

**Mohamed HadjTaieb**

**Semester 5**

## MODULE DESCRIPTION

### 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

#### 1.1: Course Description

Design of reinforced concrete buildings using “AutoCad software”; Modeling of the building structure using “Arch software”; pre-dimensioning of the structure elements; dimensioning of sample members of the structure such as reinforced concrete “RC” Slab; RC beam; RC column; footing “shallow foundation” and stairs structure.

#### Objectives

The aim of this course is to let the engineering students confront a real project as to prepare them to the professional life. Also it allow students to master the pertinent software used in the building design field such as Autocad ; Arch ; Robot structural analysis and RDM6.

#### 1.2: Prerequisites

Strength of material; intermediate structural analysis; Reinforced concrete I; Reinforced concrete II; Design and analysis of reinforced concrete building structure and Soil mechanics.

#### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Design criteria in buildings	2hrs	To optimize a building structure with respect to the stability, economy and the esthetic criteria
<b>Chapter 2</b>	Manual pre-dimensioning of the structural elements “Rc Beams and Rc columns”	3hrs	To Know how to pre-estimate the dimensions of structural elements without using any software
<b>Chapter 3</b>	Modeling of the structure using Arch software	3hrs	To analyze of building structure with Arch software
<b>Chapter 4</b>	Evaluation of the Rc Beam deflection	3hrs	To check the deflection of an RC beam against limit value
<b>Chapter 5</b>	Design and calculation of reinforced concrete stairs structure	3hrs	To master the geometrical design of the stairs To load evaluation on the stair’s slab To analyze of the stair’s structure Reinforcement detailing
<b>project</b>	Supervising project work	21hrs	To Prepare the design and construction plans To write the project report

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## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14 hrs
Practical work (h)	0
Project (h)	21 hrs
Visits (h)	0

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	Project report	70%
Practical work	**	**
Mid-Term	**	**
Oral test	Oral présentation	30%
Final exam	**	**

## 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Jean Perchat & Jean Roux: Pratique du BAEL 91 Eyrolles 1997
- Henry Thonier : Conception et Calcul des Structures de Bâtiment Tome 1,2,3,4,5,6; Presse de l'Ecole des Ponts et Chaussées 1996

# Fire safety of buildings

Code: GCV 05 107

Teacher : Atef DAOUD

Grade: Lecturer

University: National Engineering School of Sfax (ENIS)

Email:

Atef.daoud@enis.tn

Total module duration

49 h

Contact hours	Out of class activities
21h CI+ 7h Projet	21h

The equivalent credits

2 ECTS

Module responsible

Atef DAOUD

Semester 5

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This module consists of three parts. The first part focuses on fire safety in buildings. In this part some basic concepts are defined, namely fire action, reaction and resistance to fire, protection etc. and the design rules to be followed are detailed. The second part deals with the physical and mechanical behaviour of concrete and steel materials at high temperatures. The third part is devoted to the understanding of the design rules in fire situations and the stages of fire checks of the various elements of reinforced concrete structures.

### Objectives

The objectives of this course are

- To know the principles of fire engineering
- Mastering fire safety rules in buildings
- Mastering the hot calculation of conventional reinforced concrete elements

### 1.2: Prerequisites

Reinforced concrete, materials, thermal, RDM

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Fire Safety	8h	Know the principles of fire engineering Mastering fire safety rules in buildings
<b>Chapter 2</b>	Material behaviour at high temperature	6h	Know the physicochemical changes in building materials when exposed to high temperatures.
<b>Chapter 3</b>	Fire verification of reinforced concrete structural elements	14h	Master the hot calculation of conventional reinforced concrete elements

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (h)	*****
Project (h)	7h
Visits (h)	*****

## 3. EVALUATION :

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Type	Covering which Chapter (s)	The weighting factors
Project	*****	*****
Practical work	*****	*****
Mid-Term	1 and 2	30%
Oral test	*****	*****
Final exam	3	70%

#### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Polycopié de cours (ENIS)
- MM. Perchat - Roux : Maîtrises du BAEL 91 et des DTU Associés (Eyrolles)
- J.P Bretin : Technique de l'ingénieur, Sécurité contre l'incendie dans les bâtiments d'habitation, C3 283
- J.F.Denoel : Sécurité incendie et constructions en béton, FEBELCEM,
- Eurocode 2 : Calcul des structures en béton Partie 1-2 : Règles générales — Calcul du comportement au feu

# Introduction to Seismic Analysis

Code: GCV 05 108

**Teacher: Ahmed Kallel**

**Grade: Expert**

**University: Industrial Projects Services (IPAS - Group IPS)**

**Email:**

**ahmed-kallel@outlook.fr**

**Total module duration**

**49 h**

Contact hours	Out of class activities
14h CI+ 14h Projet	21h

**The equivalent credits**  
**2 ECTS**

**Module responsible**  
**Ahmed Kallel**

**Semester 5**



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course is an introduction to the methods of seismic analysis of linear structures: the temporal method and the spectral modal method.

- Generalities on earthquakes.
- Seismic response of the linear oscillator at one degree of freedom (Introduction of the regulatory spectrum concept of Eurocode 8)
- Seismic response of linear structures with several degrees of freedom ( temporal modal method, spectral modal method, buildings with several floors symmetrical in plan, buildings with several floors asymmetrical in plan)
- Typical seismic damage and seismic design of buildings.
- Applications of seismic design of buildings and steel structures on Autodesk Robot Structural Analysis Professional software

### Objectives

The objectives of this course are

- To know the seismic response of structures using the regulatory standard of Eurocode 8
- Knowing the damage of earthquakes
- Master the seismic design of buildings and steel structures

### 1.2: Prerequisites

Structural Mechanics, Finite Elements and Structural Dynamics

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	General information on earthquakes	2h	-To know the earthquake movements
<b>Chapter 2</b>	Seismic response of the linear oscillator with one degree of freedom	4h	- To know the notion of regulatory spectrum of Eurocode 8 in the seismic response of the linear oscillator at one degree of freedom
<b>Chapter 3</b>	Seismic response of linear structures with several degrees of freedom	5h	To know the seismic response of linear structures with several degrees of freedom by the different methods: temporal modal method, spectral modal method, multi-storey buildings symmetrical in plan, multi-storey buildings asymmetrical in plan.
<b>Chapter 4</b>	Typical Seismic Damage and Seismic Design of Buildings	3h	-Know the damage of earthquakes -Know the seismic design of buildings

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<b>Chapter</b> <b>5</b>	Projects	14h	-Master the calculation and seismic design of buildings and steel structures using Autodesk Robot Structural Analysis Professional software
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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	*****
Project (h)	14h
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All	100%
Practical work	*****	*****
Mid-Term	*****	*****
Oral test	*****	*****
Final exam	*****	*****

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Analyse et dimensionnement sismiques. Comportement sismique, dimensionnement en capacité, construction parasismique, January 2009, Edition: TECHNOSUP
- Méthodes Sismiques Introduction, Bernard Giroux, Version 1.0.2 Automne 2011
- Modélisation tridimensionnelle du comportement sismique du système sol-pieux-pont : Prise en compte des non-linéarités du sol et du béton, Mohamed Al fach

### Mini project Girder bridge

Code: GCV 05 109

**Teacher : ELLOUZE Ali**

**Grade: Master assistant**

**University: National School of Engineers of Sfax ENIS**

Email:

**ali.ellouze@enis.tn**

Total module duration

**70 h**

Contact hours	Out of class activities
14h CI + 28h Project	28h

The equivalent credits

**2 ECTS**

Module responsible

**Ellouze Ali**

**Semester 5**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This mini-project includes a presentation of the project, a longitudinal and transverse design of the bridge and a pre-dimensioning of the supports, a study of the deck elements (beam, spacer, hoist) and a study and modeling of the supports (Supporting device, transition slab, Return wall, Guard wall, Abutment, Pier).

### Objectives

The student must be able to calculate, dimension, check and control elements of a girder bridge.

### 1.2: Prerequisites

Structures, Hydraulic Structures, Geotechnical Structures, Reinforced Concrete, RDM, Structure, CAD,

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Presentation of the project	3 h	Know and analyze project data : - Functional data - Natural Data - Environmental data - Architectural and landscape data
<b>Chapter 2</b>	Bridge design and pre-dimensioning	9 h	Master Longitudinal Design Master Transversal Design Pre-measure the supports
<b>Chapter 3</b>	Study of the deck	18 h	Study the beam Study the spacer Study the hourdis Model in 3D
<b>Chapter 4</b>	Study and modeling of supports	15 h	Study the Supporting Devices Study the transition slab Studying the Wall in return Study the Wall guards strike Study the Fucked Up Study the Battery

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	*****
Project (h)	28h
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All	100%
Practical work	*****	*****
Mid-Term	*****	*****
Oral test	*****	*****
Final exam	*****	*****

### Mini project: Study and design of a Road

Code: GCV 05 110

Teacher: Ilhem Borcheni

Grade: Permanent teacher and head of the Civil Engineering department

University: International Institute of Technology (IIT)

Email:

Ilhem.borcheni@iit.ens.tn

Total module duration

56h

Contact hours	Out of class activities
14h CI+ 14h Projet	28h

The equivalent credits

2 ECTS

Module responsible

Ilhem Borcheni

Semester 5

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This mini project presents a path for students towards professional insertion by applying theoretical notions and academic study to the practical study of road projects.

This mini project aims to make the study and design of a pavement and the calculation of the estimated cost of the project. It is divided into two parts:

-A general presentation of the road project (project situation and location, topographic survey, description of the current state of the pavement, traffic data, geotechnical data, rainfall data...)

-A requested work (Location of the project area on Google Earth, Hydrological study, Hydraulic study, Traffic study, Route dressing, Plan layout, Longitudinal profile, Cross profile, Calculation of cubature, Estimated project estimate)

### Objectives

The objectives of this mini project are to:

- Acquire professional skills for the calculation and design of a pavement by exploiting project data
- Mastering the calculation and study of hydraulic structures crossing the road section
- Mastering the road drawing, calculation and design tool: the Covadis software.
- Calculate the estimated cost of a road project

### 1.2: Prerequisites

Roads, Hydrology and Hydraulic Structures, Building Materials, Concrete Composition, Structures, Soil Mechanics1 and 2, SIG

### 1.3: Learning Outcomes

Chapter	Title	Duration	Targeted skills
<b>Chapter 1</b>	Project presentation	2h	Study the project data : -Situation of the project (localization on Google Earth) -Topographic survey -Current state of the roadway, -Traffic data, -Geotechnical data and tests, -Rainfall data
<b>Chapter 2</b>	Hydrological study,	6h	-Calculate the hydrological flow upstream of the hydraulic structure using empirical formulas and the Global Mapper software.

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<b>Chapter 3</b>	Hydraulic study	4h	-Pre-dimension the hydraulic structure crossing the roadway -calculate its hydraulic flow -Verify that the hydraulic flow > hydrological flow
<b>Chapter 4</b>	Pavement design and cubature calculation	14h	-Study and classify traffic, -Analyze geotechnical test results for support soil classifications -Sizing the roadway with the Tunisian catalog -Verify the dimensioning of the roadway using the Alizé software -Dressing the layout, Designing the layout in plan, designing the longitudinal profile, designing the typical cross profile using Covadis -Calculate the cubature and quantities of materials used
<b>Chapter 5</b>	Preparation of a project estimate	2h	-Prepare an estimate for the project

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	*****
Project (h)	14h
Visits (h)	*****

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All	100%
Practical work	*****	*****
Mid-term	*****	*****
Oral test	*****	*****
Final exam	*****	*****



#### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Course material Roads of the teacher Sami Yaich
- B40 (technical standards for road development).
- Catalog of dimensioning of new pavements (C.T.T.P.).
- I.C.T.A.L (instruction on the technical conditions for the development of connecting freeways).
- Recommendation for road sanitation (SETRA).
- ARP development of main roads (technical recommendations (August 1994)).
- RPA99/version 2003
- WEBSITE: [www.SETRA.com](http://www.SETRA.com)
- CTPP, 2001, Catalogue for the Design of New Pavements
- Course of Roads I, road layout ELYASSARI Soufiane 11/03/2014 at ENSAH
- Hydrological and hydraulic studies of bridges over the wadis, M.Ben Ouézdou

# Title of the Module

## Mini project Study of Sanitation Networks

Code: GCV 05 111

Teacher : SMAOUI Moncef

Grade: Principal Engineer

Establishment : ONAS

Email:

m.smaoui@yahoo.fr

Total module duration

49h

Contact hours	Out of class activities
14h CI+14h projet	21h

The equivalent credits  
2 ECTS

Module responsible  
Ilhem Borcheni

Semester 5

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This is a mini project which deals with the subdivision of plots of land in a communal area according to the type of housing and accompanied by a study of the development of roads and various networks (wastewater and stormwater) using Covadis software.

### Objectives

The objectives of this mini project are to:

- To know the allotment of a communal zone using Covadis software
- Control the development of roads and various networks (wastewater and stormwater) using Covadis software.
- Mastering road safety standards

### 1.2: Prerequisites

Roads, Hydrology and Hydraulic Structures, Building Materials, Concrete Composition, Structures, Soil Mechanics1 and 2, SIG, VRD, Urban Planning and Development

### 1.3: Learning Outcomes

Chapter	Title	Duration	Targeted skills
<b>Chapter 1</b>	Project Presentation	2h	Study the project data : -Topographic survey -Project Status
<b>Chapter 2</b>	Subdivision	3h	-Lotir the communal zone
<b>Chapter 3</b>	Pavement design and cubature calculation	11h	-Dress the track, -Design the layout in plan, -Design the profile lengthwise, -Designing the cross profile urban type
<b>Chapter 4</b>	Storm water network	6h	Designing the stormwater network (plan layout and longitudinal profile)
<b>Chapter 5</b>	Waste water network	6h	Designing the wastewater network (plan layout and longitudinal profile)

## 2. METHODOLOGY:

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The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	*****
Project (h)	14h
Visits (h)	*****

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All	100%
Practical work	*****	*****
Mid-term	*****	*****
Oral test	*****	*****
Final exam	*****	*****

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Course material Roads of the teacher Sami Yaich
- B40 (technical standards for road development).
- Catalog of dimensioning of new pavements (C.T.T.P.).
- I.C.T.A.L (instruction on the technical conditions for the development of connecting freeways).
- Recommendation for road sanitation (SETRA).
- ARP development of main roads (technical recommendations (August 1994)).
- RPA99/version 2003
- WEBSITE: [www.SETRA.com](http://www.SETRA.com)
- CTTTP, 2001, Catalogue for the Design of New Pavements
- Course of Roads I, road layout ELYASSARI Soufiane 11/03/2014 at ENSAH
- Hydrological and hydraulic studies of bridges over the wadis, M.Ben Ouézdou
- VRD Courses

### Calculation of deep foundations

Code: GCV 05 112

**Teacher: Ellouze Souhir**

**Grade: Master Assistant**

**University: ENIS**

**Email:**

**souhir.ellouze@enis.tn**

**Total module duration**

**49 h**

Contact hours	Out of class activities
14 CI+14 project	21h

**The equivalent credits**

**2 ECTS**

**Module responsible**

**Ellouze Souhir**

**Semester 5**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

It begins with a description of the concepts of deep foundations and shallow foundations and then discusses the different classifications of piles. The calculation of the bearing capacities of axially or laterally loaded piles is discussed based on the results of laboratory tests or in-situ tests. The mechanisms of negative or positive lateral friction and settlements are discussed. The effect of pile grouping on bearing capacity and settlements is discussed. Thus, the general objectives are in particular to familiarize the students with the different methods of calculation and justification of a deep foundation on piles. The technical specifications and the usual calculation rules are discussed and applied.

### Objectives


The course is designed to prepare future Civil Engineers to be able to design and calculate deep pile foundations.

### 1.2: prerequisites

Soil Mechanics Course

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	General information on foundations	6h	Differentiate between Deep foundation- Shallow foundation - Define and classify piles
<b>Chapter 2</b>	Dimensioning of piles under axial load	12h	<ul style="list-style-type: none"> <li>- Apply the dimensioning of an insulated pile under axial load</li> <li>- Calculate the limit load and creep load</li> <li>- Determine the bearing capacity of an insulated pile under axial load</li> <li>- Determine the load-bearing capacity from field tests and predict the limit load <math>Q_l</math> and creep load <math>Q_c</math> from static loading tests.</li> <li>- Know the Definitions and mechanisms of lateral friction (positive and negative)</li> <li>- Calculate the settlement of an insulated pile</li> <li>- To study and analyze the modifications of the behavior of a pile under axial stress by group</li> </ul>

	<b>MODULE DESCRIPTION</b>			Department: Civil.Eng
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				effect. - Understand the limit states of load-bearing capacity mobilization
<b>Chapter 3</b>	Sizing of piles under lateral load	3h		Apply an insulated pile under lateral load.

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	
Project (h)	14h
Visits (h)	

## 3. EVALUATION :

Type	Covering which chapter (s)	
Project	1 and 2	30%
TP		
Mid-term		
Oral Exam		
Final Exam	1;2;3	70%

## 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

Frank R. Deep Technical Foundations of the Engineer, Treaty Construction C248.

3- Technical rules for the calculation and design of foundations for civil engineering works.

Book of general technical clauses applicable to works contracts. Fascicle no 62, title V.

Logiciel: Excel, Plaxis

### Management of Civil Engineering projects

Code : GCV\_op 05 113

**Teacher: Salma HADJ KACEM**

Grade: Full-time faculty member

University: IIT

Email:

Salma.hadjkacem@iit.ens.tn

Total module duration

42 h

Contact hours	Out of class activities
14h CI + 7h Project	21

The equivalent credits

2 ECTS

Module responsible

.....

Semester 5



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This module presents the method of management and management of a civil engineering project before its start, during its execution and at its closing.

- Before the start of the project:

We begin by studying and rechecking the basic documents of the contract (plans, CCAP, CCTP,...) as well as the selected participation documents (price lists, cost estimate, detailed prices, technical documents...).

Then, the installation plan is established in accordance with the ground plan and the types of work. The work is then planned and the need for materials, equipment and labor is identified according to the time and by estimating their performance.

Finally, a financial planning (revenue table) and a budget planning (expenditure table) are prepared.

- During the execution of the project:

We control and guarantee the respect of the project management documents (various schedules) by comparing the actual state of progress against the estimated one. In case of failure or discrepancy, these schedules and all related documents are updated.

- Closing of the project :

We program and attend the provisional acceptance. We plan the survey of the reserves and then prepare and approve the final settlement and the final settlement account.

### Objectives

The objective of this course is to prepare students to be project managers capable of implementing the fundamental notions necessary to manage a civil engineering project.

### 1.2: Prerequisites


Marketplace, Metering, Planning, Price Detailing, Microsoft Project, Microsoft Excel

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Management of the civil engineering project before its start	12 h	Able to manage and direct a civil engineering project
Chapter 2	Management of the civil engineering project in progress	6 h	
Chapter 3	Management of the closing of a civil engineering project	3 h	

## 2. METHODOLOGY:

The contact hours consist of:

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	Integrated Course (h)	14	
	Practical work (h)		
	Project (h)	7	
	Visits (h)		

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All	100%
Practical work		
Mid-term		
Oral test		
Final exam		

# Quality of the works and safety of the building sites

Code: GCV\_op 05 114

**Teacher: Salma HADJ KACEM**

**Grade: Full-time faculty member**

**University: IIT**

**Email:**

**Salma.hadjkacem@iit.ens.tn**

**Total module duration**

**42 h**

Contact hours	Out of class activities
14h CI + 7h Project	21

**The equivalent credits**

**2 ECTS**

**Module responsible**

.....

**Semester 5**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This module has two chapters:

- The quality control of the works:

The control concerns all the checking, measuring and testing operations aimed at verifying that the required quality of the final work is respected.

This control covers all levels of progress of each work. In fact, it begins with the verification of the study according to the standards. It then ensures the reception of the materials used, the authorization of the workforce and the verification of the calibration and adjustment of the manufacturing plants and the implementation equipment. It guarantees that the method of execution or the operating procedure chosen complies with the rules of the trade. And it ends with the acceptance of the work in its final state.

The quality control is spread over all types of works: the infrastructure (foundation and deep foundation), superstructure (posts, beams, sails, slabs, floors ...) and the second works (masonry, plaster, coating ...).

- Safety on construction sites:

The purpose of this chapter is to define the organization to be implemented for the prevention of occupational safety risks on construction sites. Risks are identified and analyzed as the work progresses so that the most appropriate preventive measures can be taken for each situation. It takes place in the installation of the construction site, in the management (storage, conservation, waste) of the various types of materials (hazardous or not) and in the awareness actions and training of the workforce on the importance of OHS (PPE, working at heights and fall prevention, mechanical handling of loads: lifting, safe use of construction site machinery, ....).

### Objectives

The objective of this course is to acquire the necessary skills to guarantee a final work of well respected quality and executed in complete safety.

### 1.2: Prerequisites

General enforcement procedures

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
Chapter 1	Quality control of the works	11 h	To know how to guarantee and ensure a final work of well respected quality and executed in complete safety.
Chapter 2	Safety on construction sites	10 h	

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### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14
Practical work (h)	
Project (h)	7
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All	100%
Practical work		
Mid-term		
Oral test		
Final exam		

### Mini Project Planning

**Code : GCV\_op 05 115**

**Teacher: Salma HADJ KACEM**

**Grade: Full-time faculty member**

**University: IIT**

**Email:**

**Salma.hadjkacem@iit.ens.tn**

**Total module duration**

**56 h**

Contact hours	Out of class activities
14h CI + 14h Project	28

**The equivalent credits**

**2 ECTS**

**Module responsible**

.....

**Semester 5**

## MODULE DESCRIPTION

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### 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

#### 1.1: Course Description

This mini project is used to manage a real project and plan its tasks. Based on the sub detail of the prices and the planning of the works, the need of the building site in materials, Materials and Labor according to the time is identified. Consequently, a supply schedule, a material allocation schedule and a hiring schedule will be established.

#### Objectives

The objectives of this course are

- To be able to carry out and control schedules of works, supplies, materials and manpower.

#### 1.2: Prerequisites

Under Price Details, Microsoft Project, Microsoft Excel

#### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning outcomes
Step 1	Convert the price sub-detail into a summary table	3 h	Carry out, control and monitor schedules of works, supplies, materials and labor.
Step 2	Elaborate the list of tasks in chronological order	3 h	
Step 3	Establish a work schedule	2 h	
Step 4	Elaborate a quantitative table of materials	3 h	
Step 5	Elaborate a labor schedule table	2 h	
Step 6	Elaborate a schedule of materials	3 h	
Step 7	Establish schedules of supply, assignment of staff and equipment	12 h	

### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14
Practical work (h)	
Project (h)	14
Visits (h)	

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### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All	100%
Practical work		
Mid-term		
Oral test		
Final exam		

### 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Price sub detail of a real Project



## Building electricity

Code : GCV\_op 05 116

**Teacher: MSED DI Amina**

**Grade: Permanent Teacher**

**University: IIT**

**Email:**

**Amina.mseddi@iit.ens.tn**

**Total module**

**duration 42 h**

Contact hours	Out of class activities
14h C + 7h P	21

**The equivalent credits**

**2 ECTS**

**Module responsible**

**MSED DI Amina**

**Semester 5**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course presents the scientific, technological and regulatory bases for the design and dimensioning of low-voltage electrical installations (high and low currents) for residential and other buildings.

### Objectives

At the end of this course, the civil engineer acquires the necessary notions to manage a building project and to carry out the corresponding works.

The activities of the course have as main reference point the standards NFC 12100 (establishment receiving from the public), NFC 13-100 (HV/LV substations), NFC 13-200(HV), NFC 14-800 (connection), NFC 15100 (low voltage) as well as the international standards IEC (International Electrotechnical Committees) complementary to the NFC standards. This must be completed by the missing didactic elements. At the same time, it is a question of developing human skills in order to put it into practice and then anchor it in the vocational training sector at the national and then international level. The objectives of this course can be summarized as follows:

- To have a consolidated knowledge of the mathematical-scientific and technical principles of electrical engineering (Fundamental laws of electromagnetism, Single-phase and three-phase electrical systems: power calculation, ...)
- Acquire basic knowledge for the study of single-phase and three-phase transformers (constitution, role, type).
- Evaluate applicable techniques based on their imminent knowledge in order to identify standards and requirements for the design of an industrial electrical installation, from its origin to the terminal circuits. Within this framework, students will be expected to know :

1. Characterize the different types of neutral regimes
2. Identify standards and requirements for the choice of protective devices (roles, characteristics, calibres, etc.)

At the end of this course, the student engineer acquires in-depth technical knowledge of the requirements of electrical standards allowing him to act responsibly in his professional activities related to the field of electricity in buildings, from the study, dimensioning, realization to maintenance.

### 1.2: Prerequisites

Electrical engineering basics

Basic electricity laws (OHM Law, KIRCHOFF Laws)

Physical concept : (electrostatic force, electromagnetic force...)

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### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	General notions in electricity : Linear Electrical Circuits in Sinusoidal Single and Three Phase Operation Single-phase and three-phase transformers	4h	Know and become familiar with <ul style="list-style-type: none"> <li>- Serial and parallel RLC circuit</li> <li>- Instantaneous active, reactive and apparent power</li> <li>- Simple and compound sizes</li> <li>- Star and triangle coupling</li> <li>- Principle of the iron core coil</li> <li>- Constitution, role and type of transformers</li> </ul>
<b>Chapter 2</b>	Domestic lighting	4 h	<ul style="list-style-type: none"> <li>- Become familiar with the different lighting fixtures in living areas: <ul style="list-style-type: none"> <li>• Decode the electrical part of an architectural plan.</li> <li>• Understand the functions of the different elements of a lighting installation.</li> <li>• Emergency lighting</li> </ul> </li> <li>- To know the lighting quality criteria and guide values for indoor and outdoor lighting</li> <li>- Know the basics of efficient lighting.</li> </ul>
<b>Chapitre 3</b>	Neutral regime and protection device	6h	To know the different neutral regimes To know, characterize and choose the protection devices
<b>Chapitre 4</b>	Electrical wiring and connection	7h	Use the pre-acquired theoretical knowledge to be able to : -Establish a power balance Select the appropriate cables for the installation according to international standards. <ul style="list-style-type: none"> <li>- Interpret different wiring diagrams</li> <li>- Establish an architectural and single-line diagram of a domestic installation</li> </ul>

## **2. METHODOLOGY:**

The contact hours consist of:

Integrated Course (h)	21h
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	Practical work (h)	*****	
	Project (h)	*****	
	Visits (h)	6h	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-Term	1 et 2	30%
Oral test		
Final exam	All	70%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

1. Catalogue Schneider Electric-Guide de l'installation électrique, 2010
2. Dominique SERRE, Technique de l'ingénieur, « installation électrique BT », 2011
3. O.Maerte, F.Maréchal, « préparation et réalisation d'ouvrages électriques », Dunod, 2002

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# Plumbing, Air Conditioning and Heating

**Code: GCV\_op 05 117**
**Teacher:** .....

**Grade:** .....

**University:** .....

**Email:**

.....

**Total module duration**
**42 h**

Contact hours	Out of class activities
21	21

**The equivalent credits**
**... ECTS**
**Module responsible**

.....

**Semester 5**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This module consists of three parts:

- Plumbing consists of defining sanitary appliances and fittings by presenting the methods and accessories for installation and connection. It presents the water and gas supply systems, sewage and storm water drainage systems and the ventilation system.
- Air-conditioning studies all the factors and conditions necessary to ensure the thermal comfort of well-being. It calculates the heat balance of a place to choose the right air conditioner and ensure its ideal location.
- Heating presents the general principle of central heating. It explains the various types of boilers and their accessories.

### Objectives

The objectives of this course are

- Know basic plumbing terminology
- Understand the general principle of air conditioning and heating

### 1.2: Prerequisites

Building Materials, Engine and Materials, Method of execution

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
Chapter 1	Plumbing	7	Know basic plumbing terminology
Chapter 2	Air conditioning	7	Understand the general principle of air conditioning and heating
Chapter 3	Heating	7	

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14
Practical work (h)	
Project (h)	7
Visits (h)	

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### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-Term		
Oral test		
Final exam		

# Title of the Module

## Mini project green building

Code: GCV\_op 05 118

**Teacher: Hajer Béjaoui**

**Grade: Architect**

**University: IIT**

**Email:**

**Hager.bejaoui@iit.ens.tn**

**Total module duration**

**56 h**

Contact hours	Out of class activities
14h CI + 14h Project	28

**The equivalent credits**

**2 ECTS**

**Module responsible**

**Hajer Béjaoui**

**Semester 5**



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course allows to analyze the life cycle of a building and study the environmental impact on its progress. It encompasses the study and design of an ecological or green building by choosing urban planning and bioclimatic architecture.

With reference to standards and labels for green construction, the various types of non-polluting renewable energies and fuels used in eco-construction are examined as well as the types of Mediterranean Sustainable Buildings BDM.

### Objectives

The objectives of this course are

To know the analysis of the life cycle of an eco-construction

-To know some general notions on the design of a green building

-To master the choice and use of ecological materials in a building.

To be familiar with low-energy consumption building equipment

To know the non-polluting renewable energies and the fuels used in an eco-construction.

-To control the parameters for reducing environmental degradation and waste.

### 1.2: Prerequisites

Sustainable development; urban planning; architecture

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Life cycle assessment of a building	4 h	Understanding the life cycle Knowing about reusable and self-degradable materials Define the parameters influencing the health of the occupants
<b>Chapter 2</b>	Design of an ecological or green building	6h	Knowing how to choose urban planning: urban ecology How to choose architecture: bioclimatic architecture <ul style="list-style-type: none"> <li>• Natural sunshine</li> <li>• Thermal insulation</li> <li>• Acoustic insulation</li> </ul> Mastering Healthy Energy in Construction Knowing how to reduce water consumption
<b>Chapter 3</b>	Environmental impact of the building during its life cycle	4h	Study the environmental impact of a building Know Ecological Materials Operate low-energy building equipment

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<b>Chapter 4</b>	Standards and labels for green building	4h	Know the Energy Labels Know the construction standards and insulation coefficient of the walls.
<b>Chapter 5</b>	Non-polluting renewable energies and fuels used in eco-construction	4h	Define non-polluting fuels Understanding and knowing renewable energies <ul style="list-style-type: none"> <li>• Wind energy</li> <li>• Solar energy</li> </ul>
<b>Chapter 6</b>	Mediterranean Sustainable Buildings BDM	6h	Understand and know the following terms: -High Environmental Quality (HQE) building -HPE High Energy Performance Building -Mediterranean Sustainable Buildings BDM -Green building guides and technical data sheets - Eco habitation

### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	
Project (h)	14h
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project		
Practical work		
Mid-Term	Chapter 1, 2, 3	30%
Oral test		
Final exam	All	70%

### 4. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Dominique Gauzin-Muller, La Construction écologique, le Moniteur, Paris 2000
- Lætitia Fontaine et Romain Anger, Bâtir en terre – Du grain de sable à l'architecture, Éditions Belin/Cité des Sciences et de l'Industrie, 2009
- Caractéristique des produits pour la construction durable, Éditions Le Moniteur, Paris, 2008 (ISBN 978-2-281-11411-9)

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- Jean Hetzel, Indicateurs du développement durable dans la construction, Afnor Éditions, 2009 (ISBN 978-2-12-465191-7)
- La gouvernance du développement durable sous la direction de Pierre Jacquet, Rajendra K. Pachauri et Laurence Tubiana, Paris, Presses de Sciences PO, 2009 (ISBN 978-2-7246-1091-8)
- Bâtir éthique et responsable ouvrage collectif de : J. Benoit, S. Déoux, C. Desmoulins, A. Farel, D. Fauré, E. Fradin, D. Gauzin-Müller, T. Jusselme, P. Madec, J. Testart, collection « Questions d'architecture », Éditions Le Moniteur, Paris, 2007 (ISBN 978-2-281-19332-9)
- Françoise Jadoul, Vers un nouvel habitat, Aparté éditions, 2010 (ISBN 978-2-930327-25-9)
- Sylvain Moréteau, Le b-a-ba de l'habitat écologique, Rustica éditions, 2008 (ISBN 978-2-84038-833-3)
- Sylvain Moréteau, Murs et toits végétalisés, Rustica éditions, 2009 (ISBN 978-2-84038-943-9)

# Rail infrastructure

Code: GCV\_op 05 119

**Teacher: ELLOUZE Ali**

Rank: Master assistant

University: National School of Engineers of Sfax ENIS

E-mail:

ali.ellouze@enis.tn

Total module duration

42 h

Contact hours	Out of class activities
14h CI + 7h Project	21h

The equivalent credits

2 ECTS

Module Responsible

Ellouze Ali

Semester 5

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

After the roads and canals, the construction of the railways is entrusted to the engineers of the roads and bridges responsible for the design of a specialized rail infrastructure allowing the circulation of trains. It will be made up of buildings (stations, depots, workshops, etc.), engineering structures (bridges, viaducts, tunnels, etc.), level crossings, electric traction installations (substations, feeders, catenaries, etc.) as well as fixed equipment necessary for the movement of trains such as the platform on which the railway track will be placed (rails, sleepers, ballast), switches and crossings (connections, crossings and crossings-junction) which will allow trains to change lanes or fork onto another line ...

This course consists of the following parts:

- An introduction to railway technology
- Geometric characteristics of railway tracks
- The sizing of the seat structures
- Rail traffic actions and other specific actions on rail bridges
- Resistance to fatigue: APPLICATION TO BRIDGES-RAILS

### Objectives

The student must:

- Know the notions of railway operation which bring together notions of the organization of railway production, of technology applied to the railway system (track, switches, power supply for locomotives, fixed and on-board signaling, etc.)
- Master the geometric construction of the railway route and the dimensioning of the base structures according to the American method of AASHTO, French method of dimensioning of the roadway).
- Master actions due to rail traffic due to traffic and derailment
- Master the concepts of fatigue resistance of rail bridges.

### 1.2: Prerequisites

Structures, roads

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### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Introduction to railway technology	3 hrs	Know the fundamental elements of railways and the technologies used to serve the transportation market.
<b>Chapter 2</b>	Geometric characteristics of railway tracks	6 h	Master the geometry of the layout (plan layout, longitudinal profile, cross section) Know the center distances and traffic patterns Master the platform type section Know switches and crossings Know dilation devices
<b>Chapter 3</b>	Sizing of seat structures	6 h	Master the mechanical characteristics of the studied soil Master the principle and the application of dimensioning methods (American method of AASHTO, French method of dimensioning the pavement)
<b>Chapter 4</b>	Rail traffic actions and other specific actions on rail bridges	3 hrs	Control of actions due to rail traffic (actions due to rail traffic, actions due to derailment)
<b>Chapter 5</b>	Fatigue resistance: APPLICATION TO BRIDGES-RAILS	3h	Control of the correction factor Mastery of the verification principle Control of loads and lifespans Mastery of the fatigue limit state calculation Mastery of the concepts of fatigue resistance

## **2. METHODOLOGY:**

The contact hours consist of:

Integrated Course (h)	2 p.m.
Practical work (h)	*****
Project (h)	7h
Visits (h)	*****

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### 3. EVALUATION:

Type	Covering which Chapter (s)	The weighting factors
Project	All	30%
Practical work	*****	*****
Mid-term	*****	*****
Oral test	*****	*****
Final exam	All	70%

### **Roads, Crossroads and Interchanges**

**Code : GCV\_op 05 120**

**Teacher: Bouaziz Amal**

**Grade: Consulting Engineer in Civil Engineering**

**University: IIT**

**Email:**

**Futurcivil.fce@gmail.com**

**Total module duration**

**42 h**

Contact hours	Out of class activities
21	21

**The equivalent credits**

**2 ECTS**

**Module responsible**

**Bouaziz Amal**

**Semester 5**



## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course describes the following parts:

- Geometric Construction of Roads (application of road construction standards in the proper development of the plan layout, length profile and cross profile of a road project)
- Intersections (types of intersections, standards for calculating and sizing intersections, and problems related to intersection design)
- Exchangers (types of exchangers, standards for the design and sizing of exchangers, economic study, multi-criteria analysis and factors acting on the design and sizing of exchangers)
- Design project for a roadway and roundabout using Covadis software

### Objectives

The purpose of this course is to:

- Master the standards of geometric road design,
- Know the different types of road junctions,
- Know the different types of road interchanges,
- Determine the standards and criteria affecting the design and sizing of intersections and interchanges.
- Have the ability to design and select the appropriate type of a proposed interchange, taking into account the inherent constraints and acting factors, in order to determine the right solution that meets the requirements of the standards.

### 1.2: Prerequisites

Roads, engineering structures

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Geometric road construction	9h	-To know the standards and the minimum values of the radii of the plan layout, the minimum values of the radii of the long profile in re-entrant and protruding angles - -- -To master the calculation of the elements of circular connections and connections in progressive curvature (clothoid)
<b>Chapter 2</b>	Carrefours	3h	-Know the types of intersections -Know the standards for the design and dimensioning of intersections -Identify issues related to the traffic signal plan intersection

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<b>Chapter 3</b>	Echangeurs	6h	-Know the types of exchangers -Know the standards for the design and dimensioning of exchangers -Carry out the calculation of the economic study -Determine the various factors that affect the design and sizing of exchangers
<b>Chapter 4</b>	Project	3h	- Designing a pavement on Covadis software - Designing a roundabout on Covadis software

### 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	21h
Practical work (2h)	
Project (h)	
Visits (h)	

### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All	30%
Practical work		
Mid-term		
Oral test		
Final exam	All	70%

### 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Tunisian method of dimensioning pavements (1984 catalog)
- Course Routes of the teacher Sami Yaich
- Support of practical work in geometric road design (1.0) by teacher Ahmed KSENTINI
- B40 (technical standards for road development).
- Catalog of dimensioning of new pavements (C.T.T.P.).

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- I.C.T.A.L (instruction on the technical conditions for the development of connecting freeways).
- Previous theses at the UMMTO and the Ecole Nationale Supérieure des Travaux Publics (ENSTP).
- Road courses 1st year master UMMTO.
- Algerian Highway Code.
- Recommendation for road sanitation (SETRA).
- Directorate of Public Works (DTP) of the wilaya of Tizi-Ouzou.
- ARP development of main roads (technical recommendations (Aug 1994))
- RPA99/version 2003
- WEBSITE: [www.SETRA.com](http://www.SETRA.com)

# Mini project of study and design of a Dalle bridge

Code : GCV\_op 05 121

**Teacher: Ellouze Souhir**

**Grade: Master Assistant**

**University: ENIS**

**E-mail:**

**souhir.ellouze@enis.tn**

**Total module duration**

**56 h**

Contact hours	Out of class activities
14. CI + 14. Project	28h

**The equivalent credits**

**2 ECTS**

**Responsible module**

**Ellouze Souhir**

**Semester 5**

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course involves designing a slab bridge in reinforced concrete longitudinally and transversely. Then, the dimensioning of the deck will be developed according to two models (1D and 2D) followed by its reinforcement. Finally, the bearings are pre-sized and checked.

### Objectives

- Master the regulations for the design of slab bridges
- Master the payment of Eurocodes 0 and 1 charges
- Use of Robot software
- Deck reinforcement

### 1.2: Prerequisites

Civil engineering courses, Structural courses and Reinforced concrete courses.

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Study of project data	3h	Study project data
<b>Chapter 2</b>	Design and modeling of the dale bridge on Robot	6h	Control regulations for the design of slab bridges
<b>Chapter 3</b>	Application of permanent loads and operation on Robot	5h	Control payment of Eurocodes 0 and 1 charges
<b>Chapter 4</b>	Sizing and reinforcement of the deck	8h	Control the dimensioning of the deck and the reinforcement
<b>Chapter 5</b>	Pre-dimensioning and verification of bearings	6h	Measure and check bearings

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## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14
Practical work (h)	
Project (h)	14
Visits (h)	

## 3. EVALUATION:

Type	Covering which Chapter (s)	The weighting factors
Project	All	100%
Practical work	*****	*****
Mid-Term	*****	*****
Oral test	*****	*****
Final exam	*****	*****

## 3. RECOMMENDED BIBLIOGRAPHY AND LOGISTICS:

- Eurocode 0: Annex A1 of NF EN 1990
- Eurocode 1: Calculation bases and actions on structures and - Part 1: "Calculation bases" and Part 3: Loads on bridges due to traffic.
- SETRA Guide "Shrink-wrapped elastomer bearing. 2007"

# Title of the Module

## GENERAL CONSTRUCTION PROCEDURES APPLIED TO MARINE ENGINEERING

Code : GCV\_op 05 122

Teacher : MOALLA Badis

Grade: Engineer//Master Technologist

University: Higher Institute of Technological Studies

Email:

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Total module duration

42 h

Contact hours	Out of class activities
14h CI+7h Project	21h

The equivalent credits

2 ECTS

Module responsible

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Semester 5

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This course has six chapters:

- Marine Geotechnical Reconnaissance: Laboratory and Field Testing
- Materials used in marine works: laboratory tests
- Construction methodology for embankment dikes (works parallel and perpendicular to the coast)
- Fishing port construction methodology (requirements, spatial constraints of traffic, efforts ...)
- Methodology for the construction of commercial ports (requirements, spatial constraints of traffic, efforts ...)
- Flexible protections and beach stabilization structures: Overview

### Objectives

The objectives of this course are:

- To know the specificities of marine geotechnics and to have an idea about the adequate materials used in marine works to guarantee durability.
- To know the methodology of construction of embankment dikes, fishing and commercial ports and to master their requirements, spatial constraints of traffic, efforts...
- To have an idea about flexible protections and beach stabilization works


### 1.2: Prerequisites

Introduction to marine and coastal engineering, soil mechanics, construction materials, calculation and stability of retaining structures, general construction processes

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning outcomes
<b>Chapter 1</b>	Marine Geotechnical Reconnaissance	3	Know the study of foundations in a marine environment: static and dynamic analysis of superficial or deep foundations on piles, as well as pipelines and anchoring systems.
<b>Chapter 2</b>	Materials used in marine works	2	Elaborate and control laboratory tests and analyses of materials used in maritime works
<b>Chapter 3</b>	Methodology for the construction of embankment dikes	3	-Master the requirements, spatial constraints of traffic and efforts. -Know the construction methodologies for embankment dikes and fishing and commercial harbours
<b>Chapter 4</b>	Methodology for the construction of fishing harbours	5	
<b>Chapter 5</b>	Methodology for the	5	



 <b>IIT</b> INSTITUT INTERNATIONAL TECHNOLOGIE <small>Université Nord Américaine privée</small>	<b>MODULE DESCRIPTION</b>		Department: Civil. Eng
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	construction of commercial ports		
<b>Chapter 6</b>	Flexible protections and beach stabilization works	3	-To know about flexible protections and beach stabilization works

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14
Practical work (h)	
Project (h)	7
Visits (h)	

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All	30%
Practical work		
Mid-Term		
Oral test		
Final exam	All	70%

# Design and study of port works

Code: GCV\_op 05 123

**Teacher : MOALLA Badis**

**Grade: Engineer//Master Technologist**

**University: Higher Institute of Technological Studies**

Email:

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Total module duration

42 h

Contact hours	Out of class activities
14h CI + 7h Project	21h

The equivalent credits

2 ECTS

Module responsible

Badis Moalla

Semester 5

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1:Course Description

Waterway redeployment programs, as well as port facilities and coastal protection works, offer port managers, design offices and specialized companies new perspectives for the design, construction and maintenance of structures such as dikes, wharves, dams, locks... and the dredging they require.

This course consists in presenting the Generalities on the tide and the swell, the Coastal developments (Morphology, materials, balance of the coasts, evolution of the coastline, defence works), the port developments and the main structures, the berthing works on low bearing capacity ground.

### Objectives

The objectives of this course are to :


- Acquire general and technical knowledge related to the management of port projects
- Acquire knowledge related to the design, construction, maintenance and management of port facilities.
- To know the major aspects of taking into account soils
- Know how to perform sizing and execution calculations

### 1.2:Prerequisites

General physics, soil mechanics, materials, engineering structures, roads, stability of retaining structures

### 1.3:Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Tide and swell generalities	4.5	To know the generalities on the phenomena of the tide (response of the ocean to the attractions of the moon and the sun) and the swell (undulatory movement of the sea surface )
<b>Chapter 2</b>	Coastal facilities	4.5	To know the basic notions necessary for coastal development: Morphology, materials, coastal equilibrium, evolution of the coastline, defensive works...
<b>Chapter 3</b>	Port facilities - main works	9	To know the main works of port development
<b>Chapter 4</b>	Berthing structures on low bearing capacity soil	3	To know the different systems implemented when the natural

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			terrain does not offer good quality.	

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	
Project (h)	7h
Visits (h)	

## 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All	30%
Practical work		
Mid-Term		
Oral test		
Final exam	All	70%

### Mini project of Study of maritime works

Code: GCV\_op 05 124

**Teacher : MOALLA Badis**

**Grade: Engineer//Master Technologist**

**University: Higher Institute of Technological Studies**

Email:

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Total module duration

56 h

Contact hours	Out of class activities
14h CI+14h project	28h

The equivalent credits

2ECTS

Module responsible

**Bédis Moalla**

Semester5

## 1. DESCRIPTION OF COURSE AND SKILLS COVERED:

### 1.1: Course Description

This mini project consists in applying the theoretical notions studied on maritime works in the professional study of real projects. It covers the following parts:

- Design and dimensioning of embankments and edition of cross-sections, calculation of cubatures, measurements, etc...
- Dimensioning of the various structural elements of a dock (beams, spacers, headers, pre-slabs, hoistings and equipment...)
- Dimensioning of the various structural elements of a wharf

### Objectives

The objectives of this mini project are to:

- Mastering the design and dimensioning of maritime works (embankments, docks, etc.), Wharf)

### 1.2:Prerequisites

Introduction to maritime and coastal engineering, maritime geotechnics, design and study of port structures, engineering works, reinforced concrete, materials, and roads.

### 1.3: Learning Outcomes

Chapter	Title	Duration	Learning Outcomes
<b>Chapter 1</b>	Design and dimensioning of embankment dikes	12	Master the edition of cross profiles, calculation of cubatures, metrics...
<b>Chapter 2</b>	Dimensioning of a dock	10	Measure beams, spacers, headers, pre-slabs, slabs and equipment...
<b>Chapter 3</b>	Sizing of a wharf	6	

## 2. METHODOLOGY:

The contact hours consist of:

Integrated Course (h)	14h
Practical work (h)	
Project (h)	14h
Visits (h)	

## MODULE DESCRIPTION

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### 3. EVALUATION :

Type	Covering which Chapter (s)	The weighting factors
Project	All	100%
Practical work		
Mid-term		
Oral test		
Final exam		