study Program

Industrial Engineering

2023-2024

MANUAL STUDY PLAN & MODULE SHEETS

Industrial engineering Program

The Industrial engineering training is based on the principles of process optimization, efficient resource management and continuous improvement. This training aims to develop the fundamentals and advanced practices of this field. During this program, we explore key concepts, modeling and analysis methods relating to the supply chain, including the design of effective systems. We discover how to apply technological tools and innovative techniques to solve complex problems and increase productivity.

After solid basic training in Industrial Engineering acquired during the first four semesters, engineering students choose from two specialty courses:

- Quality and continuous improvement
- Maintenance and diagnosis of industrial systems

At the end of a semester of courses in their responsible, the engineering student completes their training with a six-month End of Study Project (PFE) in industry

Content table

Industrial Engineering
Study Plan

Industrial Engineering: Common Core: S1

Codes	Teachings	Coef	Credit	Course/week	work/week
FR-ABC	French	1,5	2	1,5	0
ENG-ABC	English	1,5	2	1,5	0
Ind 3 1 03	Organization of the company	1,5	2	1,5	0
Ind 3 1 04	Mathematics	1,5	2	1,5	0
Ind 3 1 05	Numerical analysis	1,5	2	1,5	0
Ind 3 1 06	Probability and statistics	3	4	3	0
Ind 3 1 07	Economy for the GI	3	4	3	0
Ind 3 1 08	Industrial management	3	4	3	0
Ind 3 1 09	SI in Automatic	3	3	3	0
Ind 3 1 10	SI in Mechanics	3	3	3	0
Ind 3 1 11	Industrial logistics	1,5	2	1,5	0
		24	**30**	**21**	**3**

Industrial Engineering: Common Core: S2

Codes	Teachings	Coef	Credit	Course/week	work/week
FR-ABC	French	1,5	2	1,5	0
ENG-ABC	English	1,5	2	1,5	0
Ind 3 2 03	Renewable energies	1,5	2	1,5	0
Ind 3 2 04	Design of industrial systems	3	4	3	0
Ind 3 2 05	Value analysis	1,5	3	1,5	0
Ind 3 2 06	Industrial risk management	1,5	3	1,5	0
Ind 3 2 07	Database	3	3	1,5	1,5
Ind 3 2 08	Metrology and Instrumentation	3	3	1,5	1,5
Ind 3 2 09	Materials sciences	3	3	1,5	1,5
Ind 3 2 10	Thermal machines	1,5	2	1,5	0
Ind 3 2 11	PPE	3	3	0	3
		24	**30**	**16,5**	**7,5**

Industrial Engineering: Common Core: S3

Codes	Teachings	Coef	Credit	Course/week	work/week
FR-ABC	French	1,5	2	1,5	0
ENG-ABC	English	1,5	2	1,5	0
Ind 4 1 03	DOA in engineering	1,5	2	0	1,5
Ind 4 1 04	Machining manufacturing process	2,25	3	1,5	0,75
Ind 4 1 05	Operational research	3	3	3	0
Ind 4 1 06	Management of information systems	1,5	2	1,5	0
Ind 4 1 07	Production management	3	4	3	0
Ind 4 1 08	Supply and inventory management	3	4	3	0
Ind 4 1 09	Maintenance management	3	4	3	0
Ind 4 1 10	Electric machine	2,25	2	1,5	0,75
TV-401	Preparing for MOS certification	1,5	2	0	1,5
		24	**30**	**19,5**	**4,5**

Industrial Engineering: Common Core: S4

Codes	Teachings	Coef	Credit	Course/week	work/week
Ind 4 2 01	FR-ABC	1.5	2	1,5	0
Ind 4 2 02	ENG-ABC	1.5	2	1,5	0
Ind 4 2 03	R&D and innovation management	3	3	3	0
Ind 4 2 04	GPAO	3	4	0	3
Ind 4 2 05	GMAO	3	4	0	3
Ind 4 2 06	Quality Engineering	3	4	3	0
Ind 4 2 07	Embedded computing	3	3	0	3
Ind 4 2 08	Ergonomics	1.5	2	1,5	0
Ind 4 2 09	Implementation of workshops	1.5	3	1,5	0
TV-402	*PFA (end of year project)*	3	3	0	3
		24	**30**	**12**	**12**

Industrial Engineering Major: Quality and Continuous Improvement S5

Codes	Teachings	Coef	Credit	Course/week	work/week
TV-501	GRH	1,5	2	1,5	0
TV-502	Labor law	1,5	2	1,5	0
TV-503	Preparation for certification in Entrepreneurship	1,5	2	0	1,5
Ind-QAC 5 1 04	Supply Chain Management	1,5	3	1,5	0
Ind -QAC 5 1 05	Project management	3	3	3	0
Ind-QAC 5 1 06	industry 4.0	1,5	3	1,5	0
Ind -QAC 5 1 07	ERP Odoo	3	3		3
Ind-QAC 5 1 08	Simulation of production systems	3	3	1,5	1,5
Ind-QAC 5 1 09	Lean Manufacturing	1,5	3	1,5	0
Ind-QAC 5 1 10	Quality audit	3	3	3	0
Ind-QAC 5 1 11	QHSE	3	3	3	0
		24	**30**	**18**	**6**

Industrial Engineering Major: Maintenance and Diagnosis of Industrial Systems S5

Codes	Teachings	Coef	Credit	Course/week	work/week
TV-501	GRH	1,5	2	1,5	0
TV-502	Labor law	1,5	2	1,5	0
TV-503	preparation for certification in Entrepreneurship	1,5	2	0	1,5
Ind-MDSI 5 1 04	Supply Chain Management	1,5	3	1,5	0
Ind-MDSI 5 1 05	Project management	3	3	3	0
Ind-MDSI 5 1 06	Industry 4.0	1,5	3	1,5	0
Ind-MDSI 5 1 07	ERP Odoo	3	3		3
Ind-MDSI 5 1 08	Simulation of production systems	3	3	1,5	1,5
Ind-MDSI 5 1 09	Lean Manufacturing	1,5	3	1,5	0
Ind-MDSI 5 1 10	Reliability and operational safety	3	3	3	0
Ind-MDSI 5 1 11	Diagnosis of production systems	3	3	3	0
		24	**30**	**18**	**6**

S6 : Professional Semester

Codes	Teachings	Coef	Credit	Course/week	work/week
Pro- 5 2 01	Introductory Traning	10	3	/	/
Pro- 5 2 02	Traning development		3	/	/
Pro- 5 2 03	PFE		24	/	/
		24	**30**	**18**	**6**

Content sheets

COMMON CORE

Course Specification

Company organization

1. General

Coded	*Ind 3 1 03*	Level/Semester	*1/s1*	Coefficient	*1.5*	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*21h*
Responsible	*Chriaa walid*					Volume. H. (TP)	
Module	*Company organization*					Self-study (h)	*25h*

Course description (Course objective):
At the end of this module, the engineering student must be able to understand the importance *of a company and the importance of choosing a structure, which are strategic criteria to its economic development and the success of its projects. As future entrepreneur it is fundamental to identify the essential activities and functions of a business.*

Prerequisites:	*Keywords :*
Bac+2; PowerPoint, excel	*Company, structure, projects*

Specific objectives of the course (OBJ):	
OBJ 1 :	*Identify the importance of managing companies*
OBJ 2 :	*Identify different functions of companies*
OBJ 3 :	*Identify the main structures of companies*

Necessary material:
NONE

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-3	*Chapter I: Role of the general management*	*4.5 hours*	*role of the general management overseeing day to day operations*

4-6	*Chapter II: Main functions of companies*	*4.5 hours*	*Identify the different departments of companies*
7-9	*Chapter III: Factors influencing companies structuring*	*4.5 hours*	*Identify different factors contributing to the choice of a company's structure*
10-12	*Chapter IV: Courseic organizational structures*	*4.5 hours*	*Identify the three main organizational structures (functional, divisional, matrix)*
13-14	*Study of practical cases*	*3 hours*	*Evaluate student's level of learning with practical cases*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…
13-14	*Mini-project support, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* x *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : x *No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: Clarity of ideas (5 points)*

- *Criterion 2: methodological approach (5 points)*
- *Criterion 3: innovation (5 points)*
- *Criterion 4: presentation and mastery (5 points)*

6- Web references (useful links) :

Christian Konkuyt et Gilles Bressy, Management et économie des entreprises, Éditions Sirey, 12e édition, 2018 (ISBN 978-2-247-17912-1)

Richard Soparnot, Management des entreprises : Stratégie. Structure. Organisation., Avant-propos, Dunod, 2009, 240 p. (ISBN 978-2-10-054254-3, lire en ligne [archive]), p. 4.

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

Mathematics

1. General

Coded	Ind 3 1 04	Level/Semester	*1/S1*	Coefficient	*1.5*	Credits	*2*
Course	*Industrial Engineering*					Volume. H. (CI)	*21h*
Responsible	*Zied Garbouj*					Volume. H. (TP)	
Module	Mathematics for engineers					Self-study	*26h*

Course description (Course objective):
This course allows students to gain advanced knowledge of mathematics and develop skills to solve engineering problems using mathematical techniques.

Prerequisites:	*Keywords:*
L1 and L2 mathematics courses *Mathematical tools at a BAC+2 level*	-Functions with a real variable (limit and continuity). - Derivation and primitive. - Integral calculation. -Differential equations.

Specific objectives of the course (OBJ $_i$):
At the end of this course, students will: **OBJ 1:** Be able to calculate Fourier transforms of non-periodic functions. **OBJ 2:** Understand the notion of the convolution product. **OBJ 3:** Understand the concepts of Laplace transforms and inverse Laplace transforms. Be able to solve a differential equation using Laplace transforms. **OBJ 4:** Know how to decompose a periodic signal into a Fourier sum.

Necessary material:

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	Chapter 1: Laplace Transformation - General - Properties - Convolution	3h	Introduction to the Laplace transform and its use to solve linear Ordinary Differential Equations (ODE) of order n
3-4	-Practical methods for calculating the image and an original -Application: Use the Laplace transform to solve a differential equation	3h	
5-6	TD-Series 1	*3h*	
7-8	Chapter 2: Fourier Transformation -General -Terms	*3h*	In this chapter, to simplify, we will introduce the notion of Fourier transform on R rather than on R^d. This short chapter is an interesting application of the previous integration course, in the sense that many results are used (dominated convergence theorem, continuity and differentiability theorems for parameter integrals, convolution product, density of step functions in L 1 ...).
9-10	-Properties -Convolution	*3h*	
11-12	- Inversion - Plancherel and Parseva formulas TD=Series 2	*3h*	

13-14	Detailed series of exercises throughout the course	*3h*	Evaluate the overall level of students and rectify gaps

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	☐ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☐ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- **100% CI material : Average = 40% DS + 60% EE**
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ■ *No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Mathematics for engineers. Authors: Yves Leroyer and Patrice Tesson - Edition Dunod
- **roud, K. A., & Booth, D. J. (2020). *Engineering Mathematics* (8th Edition). Red Globe Press.**
- A **Kreyszig, E. (2020). *Advanced Engineering Mathematics* (11th Edition). Wiley.**

7- Working environment (Facilities necessary for learning)

Course Specification

Numerical analysis

1. General

Coded	Ind 3 1 04	Level/Semester	*1/S1*	Coefficient	*1.5*	Credits	*2*
Course	*Industrial Engineering*					Volume. H. (CI)	*21 h*
Responsible	*Zied Garbouj*					Volume. H. (TP)	
Module	Numerical analysis					Self-study (h)	*23*

Course description (Course objective):
This course allows students to gain advanced knowledge of mathematics and develop skills to solve engineering problems using mathematical techniques.

Prerequisites:	*Keywords:*
L1 and L2 mathematics courses *Mathematical tools at a BAC+2 level*	*- Dies* *-Determinant of a matrix* *-Functions with a real variable*

Specific objectives of the course (OBJ):
Upon completion of this module, the student will be able to: **OBJ 1:** Numerically solve a system of linear equations. **OBJ 2:** Solve nonlinear equations numerically.

Necessary material:
NONE

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-3	*Chapter 1: Solving a system of linear equations using direct and iterative methods* *-Introduction:* ** Definition of a system of equations.* ** Existence and uniqueness of the solution.* ** Resolution by the Cramer method. -*	*4.5*	*At the end of this chapter, the student will be able to:* *1-Show the existence and uniqueness of a solution of a system of linear equations.*
4-6	*The exact methods:* ** Gauss's pivot* ** LU decomposition* ** Comparison of the two methods (calculation cost).*	*4.5*	*Apply LU decomposition to decompose a matrix.* *3-Describe and Apply the Gauss and LU method to solve a system of linear equations.*
7-9	*- Iterative Methods:* ** General principle* ** Jacobi's method:* ** The Gauss-Seidel method* ** Comparison of the two methods*	*4.5*	*4- Describe and apply the Jacobi and Gauss-Seidel method to solve a system of linear equations.* *5- Cite the convergence conditions of the Jacobi and Gauss-Seidel methods*

10-12	*Chapter 2: Solving non-linear equations* *-Application examples* *-Existence and uniqueness* *-The dichotomy method:* **Definition* **The dichotomy algorithm* **Estimated number of iterations* **Order of convergence* **Application* -	*4.5h*	*At the end of this chapter, the student will be able to:* *1- Define the Dichotomy method.* *2- Calculate the number of iterations necessary to solve* *a non-linear equation by the dichotomy method with a given precision.*
13-14	*Newton's Method:* **Definition* **Convergence condition (Choice of x_0)* ** Newton's algorithm* **Order of convergence* **Application* *- Comparison between the two methods.*	*3h*	*3-Define Newton's method.* *4-Define the convergence conditions of Newton's method.* *5-Discuss the choice of the initial solution of Newton's method.* *6-Compare the Dichotomy method and Newton's method*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting

CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	☐ *Yes* *No*	*40%*
EE - Written test (Final exam)	■ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ■ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ■ No*
- *Authorized search engine : ☐ Yes x No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- *Grégoire Allaire "Numerical analysis and optimization: An introduction to mathematical modeling and simulation*
- *https://celene.insacvl.fr/pluginfile.php/79706/course/overviewfiles/Analyse%20Num%C3%A9rique%20Cours%20ver%202022_2023.pdf*
- **Chapra, S. C., & Canale, R. P. (2021). *Numerical Methods for Engineers* (8th Edition). McGraw-Hill Education.**
- **Burden, R. L., & Faires, J. D. (2021). *Numerical Analysis* (10th Edition). Cengage Learning.**

7- Working environment (Facilities necessary for learning)

NONE

Course Specification

Probability and Statistics

1. General

Coded	*Ind 3 1 06*	Level/Semester	*1/S1*	Coefficient	*3*	Credits	*3*
Course	*Engineer*					Volume H. (CI)	*42h*
Responsible	*Ben Haj Mbarek mohamed Hedi*					volume. H. (TP)	*0*
Module	*Probability and Statistics*					Self-study (h)	*60h*

Course description (Course objective):
study of the laws governing random events, including the collection, analysis, interpretation, and display of numerical data.

Prerequisites:	*Keywords:*
Basic algebra	*- Probability* *- Statistics* - random experience

Specific objectives of the course (OBJ $_i$):
Upon completion of this module, the student will be able to: OBJ 1: random variable study. OBJ 2: Variance and standard deviation calculation.

Necessary material:
NONE

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR		Goals
1-3	Chapter 1: INTRODUCTION TO CALCULATION OF PROBABILITIES 1. Basic concepts 1.1 Notions of random experience and fundamental set 1.2 Concept of event 1.2.1 Relationships between events 1.2.2 Complete event system 2. Probable space and probability 2.1 Axioms of probability 2.2 Properties 3. Conditional probability 3.1 Definition 3.2 Formula for total probabilities 4. Independence of events 5. Bayes formula	*10.5*		*At the end of this chapter, the student will be able to:* knowledge of the conditional probability and Independence of events
4-6	CHAPTER 2: COUNTING METHODS AND PROBABILISTIC DRAWING SCHEMES 1. Enumeration method: combinatorial analysis 1.1 The multiplication rule 1.2 Permutations 1.3 Arrangements 1.4 Combinations 2. Probabilistic drawing schemes: urn models 2.1 General 2.2 Urn models	*10.5*		combinatorial analysis, Permutations, Arrangements, Combinations and Urn models
7-10	CHAPTER 3: RANDOM VARIABLES 1. General and distribution function 2. Discrete random variables 2.1 Definition of a random variable and distribution function 2.2 Moments of a discrete random variable 2.2.1 Mathematical expectation 2.2.2 Variance and standard deviation 3. Continuous real random variables 3.1 Definition of a real continuous random variable 3.2 Density function of a continuous random variable 3.3 Moments of a discrete random variable	*10.5*		*able to calculate the* Mathematical expectation, variance and standard deviation

	3.3.1 Mathematical expectation 3.3.2 Variance and standard deviation 3.4 Quantile of a continuous random variable 4. The moment generating function 5. Transformation of random variables		
11-14	CHAPTER 4: USUAL LAWS 1. Discreet laws 1.1 Bernoulli's law 1.2 The Binomial law 1.3 Poisson's law 2. Continuous laws 2.1 The Uniform Law continues 2.2 The exponential law 2.3 The Normal law and the reduced centered normal law 2.4 Laws derived from the normal law	*10.5h*	*Knowledge of different usual laws*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ■ *No*	
DS - Supervised Duty	☐ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☐ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ■ No*

- *Authorized search engine : ☐ Yes x No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

https://math.univ-lyon1.fr/irem/IMG/pdf/PolyTunis_A_Perrut.pdf

- Bernard CourtebNone, *À l'école des probabilités*, Press univ. Franche-Comté, 2006, 282 p.
- Bernard CourtebNone, *Mathématiser le hasard,* Vuibert, 2008
- Virginie Delsart et Nicolas Vaneecloo, *Méthodes statistiques de l'économie et de la gestion*, Presses Univ. Septentrion, 2010, 317 p.

7- Working environment (Facilities necessary for learning)

None

Course Specification

Economy for the GI

1. General

Coded	Ind 3 1 07	Level/Semester	*1/S1*	Coefficient	*3*	Credit	*4*
Course	*Industrial Engineering*					Volume. H. (THIS)	*42*
responsible	***Oussema TAGGAZ***					Volume. H. (TP)	
Race Title	***ECONOMICS FOR INDUSTRIAL ENGINEER***					Self-study	***58h***

Race Description (Race Objectives):
"Economics for Industrial Engineer» *has field that focuses we tea efficient allocation of limited resources in the management of businesses and firms. This course aims to familiarize students with the fundamental principles of microeconomics that are most relevant to managers. It emphasizes the analysis of market structures, the economic behavior of firms and other economic agents. Additionally, it integrates global business issues and practices, delivering to students the required knowledge necessary to allocate scarce resources and develop competitive strategies in dynamic business environment.* *Furthermore,* ***"Economics for Industrial Engineer"*** *course serves as a foundation for further studies in industrial management, production management, finance optimization, and marketing. Its objective is to enhance students' ability to analyze economic environments, deal with economic behavior, understand the benefits and costs associated with business activities, and recognize the constraints that firms encounter in different economic scenarios such ace market and competitiveness. By doing so, students will be capable to make* *optimal choices to fulfill managerial objectives under given economic situations.*

PRE-REQUISITES/CO-REQUISITES:	*Key issues:*
- Mathematics (Basic Algebra) *- Basic Statistics* *- Logistics Management (Production)*	*Market Equilibrium; Firm Objectives; Optimization Methods; Request and Supply Theory; Theory of Production; Cost Theory and Analysis; Pricing Model; Profits Maximization; Market Structures; Game Theory; Pricing in Practice; Competitiveness and Competitive (Non-competitive) Markets*

KEY LEARNING OBJECTIVES (OUTCOMES) (OBJ:
By tea end of tea module students will possess tea ability and knowledge to:
OBJ 1: *Elucidate the role of market mechanisms and comprehensively analyze the interchange between economic agents, while quantitatively examining the determination of market equilibrium (price and quantity)*
OBJ 2: *Breakdown the decision-making process of a firm with limited budget when selecting goods and services to produce.*
OBJ 3: *Understand the definition and measurement of production costs, while distinguishing between the economic concept of cost and its accounting counterpart.*
OBJ 4: *Analysis in various market structures how the firm, regardless of their competitive positioning, quantify and determined tea profit-maximizing output in both the short and long run.*
OBJ 5: *Quantify and analyze the level of risk associated with different choices, under competitive/non-competitive market.*
OBJ 6: *Use advanced pricing model to maximize profits for firms.*
OBJ 7: *Apply "game theory" to understand the evolution and operation of markets, as well as a guide managers in making strategic decisions in year ever-changing business landscape.*

Required Logistics:
- Calculators
- M.S. Excel software
- Courseroom
- Whiteboard

1- Race Thrilled

Week(s)	Chapters/Content	No. _ HR	Aimed Objective(s)
1	***CH0/*** *Race Overview and Basic Economic Concepts*	*3*	*OBJ 1*
2-3	***CH1/*** *Theory of Production*	*6*	*OBJ 2*
4-5-6	*C* ***H2/*** *Market Theory*	*9*	*OBJ 3*
7-8	***CH3/*** *Perfect Competition*	*6*	*OBJ 4*
9	***CH4/*** *Monopoly*	*3*	*OBJ 4*
10-11	***CH5/*** *Market Power and Uniform Pricing*	*6*	*OBJ 4*
12	***CH6/*** *Imperfect Competition*	*3*	*OBJ 4 + OBJ 5*
13	***CH7/*** *Duopoly and Oligopoly*	*3*	*OBJ 6*
14	*Cost; Budget; Production Maximization; Production Inputs/Outputs*	*3*	*OBJ 2 + OBJ 3 + OBJ 4+OBJ 7*

2- Practice work

Week(s)	Tutorial Activities/Content	No. _ HR	Goals) targeted

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	☒*Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒*No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes☒ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Guide to industrial management - Principles, methods and tools. Author(s): P. Arnould, J. Renaud Publication date: November 2008.
- **Park, C. S. (2018). *Contemporary Engineering Economics* (6th Edition). Pearson.**
- **Sullivan, W. G., Wicks, E. M., & Koelling, C. P. (2020). *Engineering Economy* (17th Edition). Pearson.**

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Industrial Management

1. General

Coded	Ind 3 1 08	Level/Semester	*1/ S1*	Coefficient	*3*	Credits	*4*
Course	*Industrial Engineering*					Volume. H. (CI)	*42*
Responsible	*Yassine DALLEL*					Volume. H. (TP)	
Module	*Industrial Management*					Self-study (h)	*56h*

Course description (Course objective):
Students learn to apply strategies and use management tools to improve the quality, productivity and efficiency of organizations, including production supply chain processes.

Prerequisites:	*Keywords:*
Logistics, industrial management	*Purchasing, production, inventory management, quality, supply chain*

Specific objectives of the course (OBJ):
OBJ 1 : Understand industrial management concepts ***OBJ 2 :*** Understanding industrial management tools ***OBJ 3 :*** Know and understand the current problems and challenges facing companies in terms of industrial management. ***OBJ 4 :*** Analyze and evaluate an industrial organization through a set of necessary tools and propose improvements

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1	introductory chapter	*3*	*Master the principles of*

			industrial management
2-3	chapter 1: purchasing management: definitions, evolution and importance of the purchasing function	*6*	*Understand the basic notions of purchasing and the importance of the function in the company*
4	purchasing strategies	*3*	*Distinguish between different purchasing strategies*
5-6	the purchasing cycle	*6*	*Understand the different stages of the purchasing process*
7-8	chapter 2: inventory management definitions and importance of stocks, functions of stock, concepts of minimum stock, safety stock and alert threshold	*6*	*Understand the basics of inventory management*
9	inventory costs	*3*	*Master the different elements of inventory costs*
10-11	chapter 3: production * definition and importance of production * the objectives of the production function *	*6*	*Understand the basics of production*
12	the notion of quality: definition, issues, non-quality, over-quality	*3*	*Master the concept of quality and its importance*
13-14	formulation in mathematical model	*6*	*Write a production problem as a mathematical model*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals

…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒*Yes* ☐ *No*	*20%*
DS - Supervised Duty	☒*Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒*No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes☒ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Guide to industrial management - Principles, methods and tools. Author(s): P. Arnould, J. Renaud Publication date: November 2008.
- **Heizer, J., Render, B., & Munson, C. (2020). *Operations Management: Sustainability and Supply Chain Management* (13th Edition). Pearson.**
- **Stevenson, W. J. (2021). *Operations Management* (14th Edition). McGraw-Hill.**

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

SI in Automatic

1- Generalities

Code	Ind 3 1 09	Level/Semester	*1/S1*	Coefficient	*3*	Credits	*3*
Course	*Industrial Engineering*					Vol. H. (CI)	*42h*
Responsible	*Tarek GARNA*					Vol. H. (TP)	
Module	Automatic industrial system					Self-study (h)	*31h*

Course Description (Course Objective):
Construct the transfer function modeling the behavior of a controlled system, analyze the stability of a controlled system, precision and speed.

Prerequisites:	Keywords:
Basic notions of mathematics	Transfer function, Bode diagram, PID controller

Specific course objectives (SCO):
OBJ 5 : Controlled systems: functional diagram (open loop, closed loop). **OBJ 6 :** Study the performances of controlled systems **OBJ 7 :** Summary of controlled systems: Correction, cascade controller, feedback controller, PID, phase advance controller and phase delay controller.

Equipment required:
Nothing to report

2- Content Elements (Course)

Weeks	Chapters/Content elements	Nbr. HR	Objectives
1-2	Generality on regulation and closed-loop control	6H	Principled conceptual Knowledge

3-5	Temporal and frequency study of linear systems	9H	Calculation and representation of time responses and frequency diagrams
6-8	Functional diagram and performances of controlled systems	9 H	Analysis of stability, precision and response time
9-12	Synthesis of analog controllers	12H	Analog controllers and Ziegler-Nichol's method
13-14	*Practical case study*	6 H	Analysis of stability

3- Content Elements (Practical work)

Weeks	Activities/ Content elements	Nbr. HR	Objectives
…	…	…	…
…	…	…	…

4- Evaluation methods and grade distribution

Evaluation type	Yes/No	Weighting rates
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	☒ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒ No*
- *Authorized search engine : ☐ Yes ☒ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- M. KSOURI et P. BORNE, Régulation industrielle, Edition Technip, 1997.
- LOUIS MARET, Régulation automatique, Presse polytechniques, 1987.
- R. Ben Abdennour, P. Borne, M. Ksouri et F. M'Sahli, Identification et commande numérique des procédés industriels, Edition Technip, 2001.
- **Groover, M. P. (2015).** ***Automation, Production Systems, and Computer-Integrated Manufacturing*** **(4th Edition). Pearson.**

7- Working environment (Installations nécessaires for learning)

- *None*
- *…*

Course Specification

SI in mechanics

1. General

Coded	Ind 3 1 10	Level/ Semester	*1/S1*	Coefficient	3	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*42h*
Responsible	*Nadia CHAKROUN*					Volume. H. (TP)	
Module	*SI in Mechanics*					Self-study (h)	*35h*

Course description (Course objective):
Study movements as well as static balance in mechanisms.

Prerequisites:	*Keywords:*
Bac+2 level	*Mechanical systems/ Modeling/ Parameterization/ Kinematic performances/ Static performances*

Specific objectives of the course (OBJ):
OBJ: 01 Model and configure mechanical systems. *OBJ 02:* Predict and verify the kinematic performance of mechanical systems. *OBJ 03:* Model, predict and verify the static performance of mechanical systems.

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1	*Chapter I/ Concept of the non-deformable solid-Notion of a mechanical connection between two solids-reference-solid equivalence*	*3*	*Configure an elementary connection*

2-3	*Chapter I/ Kinematic diagram-equivalence Coursees-closure of kinematic chains*	*6*	*-Establish the connection graph of a mechanism* *-Establish independent scalar relationships* *-Determine the degree of freedom of a mechanism* *-Determine the input-output law of a mechanism*
4-5	*Chapter II/Derivation of a moving vector with respect to a frame of reference-Velocity of a point which belongs to a solid with respect to another solid-Transfer of moments-Acceleration vector of a point with respect to a frame of reference*	*6*	*-Exploit vector derivation* *-Determine the velocity vector of a point of a solid relative to another solid* *-Determine the acceleration vector of a point of a solid relative to another solid*
6	*Chapter II/ Kinematic torque of a solid relative to another solid*	*3*	*-Determine the kinematic torso of a solid in motion relative to another solid*
7	*Chapter II/ Sliding speed vector between two solids in point contact - non-slip condition*	*3*	*-Determine the sliding speed vector at a point of contact of two moving solids*
8-9	*Chapter II/ Rolling rotation vector - Pivot rotation vector - plane problem*	*6*	*-Decompose the instantaneous rotation vector into a rolling rotation vector and a pivot rotation vector* *-Identify the type of movement*

10-11	*Chapter III/ Concentrated loads - Distributed loads - Static torques of perfect elementary connections*	*6*	*- Determine the torso representative of concentrated loads and distributed loads* *-Determine the torso of mechanical actions transmissible by a perfect elementary connection*
12-14	*Chapter III/ Interaction graph- Isolation of a subsystem- Concept of the external environment on the isolated system- Static unknowns*	*9*	*-Draw the mechanism interaction graph* *-Apply PFS to an isolated system* *-Determine static unknowns*

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☒ *No*	_
DS - Supervised Duty	☒ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒ *No*	_

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒ No*
- *Authorized search engine : ☐ Yes ☒ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- *https://eduscol.education.fr/sti/sites/eduscol.education.fr.sti/files/seminaires/3773/3773-presentation-is- version-finale.pdf*

- *https://perso.ensta-paris.fr/~chapoutot/mo103/docs/intro-is-2018.pdf*
- Rao, S. S. (2017). *Mechanical Vibrations* (6th Edition, SI Units). Pearson.

7- Working environment (Installations nécessaires for learning)

- *None*
- *…*

Course Specification

Industrial logistics

1. General

Coded	Ind 3 1 11	Level/Semester	*1 /S1*	Coefficient	*1.5*	Credits	*2*
Course	*Industrial Engineering*					Volume. H. (CI)	*21h*
Responsible	*Yassine DALLEL*					Volume. H. (TP)	
Module	Industrial logistics					Self-study	*25h*

Course description (Course objective):
Its purpose is to move material flows, to transport them from places of production to places of transformation, then from places of transformation to places of consumption.

Prerequisites:	*Keywords:*
- *Graphic Representation*	- *Warehouse* - *Logistics* - *InfNonetructure*

Specific objectives of the course (OBJ):
OBJ 01: move flows of materials, services and resources from places of supply of primary resources to places of production or processing industries then to the places of distribution or consumption. *OBJ 02 To ensure the management of all physical flows of products, from suppliers to the final customer. compare the importance of technical functions versus their costs* *OBJ* 03: know the handling tools *OBJ 04: know the storage methods* *OBJ 05: design storage areas and their sizing*

Necessary material:
- ***None***

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-3	***Chapter 1:*** *supply chain and basic concepts*	*4.5*	*The material structure of the logistics system* *Mission of the logistics system* *Logistics InfNonetructure*
4-6	***Chapter 2:*** *warehousing*	*4.5*	*The storage functions* *Roles of the warehousing function.* *The place of the warehousing function in the company.* *Technologies and storage methods*
7-10	***Chapter 3:*** *Handling equipment*	*6*	*Handling equipment* *compare between handling equipment*
11-14	***Chapter 4:*** *Storage areas and their dimensions*	*6*	*Defining warehouse areas* *Sizing the reception area* *Sizing of the storage area* *Sizing the order preparation area* *Sizing the shipping area*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals

…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒*Yes* ☐ *No*	*20%*
DS - Supervised Duty	☒*Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒*No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes x No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1. *LOGISTICS - Yves Pimor - Michel Fender*
2. **Christopher, M. (2016).** ***Logistics and Supply Chain Management*** **(5th Edition). Pearson.**
3. **Ghiani, G., Laporte, G., & Musmanno, R. (2013).** ***Introduction to Logistics Systems Management*** **(2nd Edition). Wiley.**

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Renewable energies

1. General

Coded	Ind 3 2 03	Level/ Semester	*1/S2*	Coefficient	1.5	Credits	*2*
Course	*Industrial Engineering*					Volume. H. (CI)	*21*
Responsible	*Nidhal HNAIEN*					Volume. H. (TP)	
Module	Renewable energies					Self-study (h)	*29h*

Course description (Course objective):
This renewable energy course mainly aims to provide students with detailed theoretical and practical knowledge of the different sources of renewable energy, as well as their industrial mechanisms and the sizing of its installations.

Prerequisites:	*Keywords:*
Heat transfer / Fluid mechanics	*Solar flow, renewable energies, photovoltaic panel, solar thermal, solar water heater.*

Specific objectives of the course (OBJ $_i$):
OBJ 1 : Being able to choose and size a solar thermal installation (intended for the production of domestic hot water) ***OBJ 2 :*** Being able to choose and size a photovoltaic solar installation (intended for electricity production) ***OBJ 3 :*** Study the different operating parameters of wind energy.

Necessary material:
No hardware needed

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals

1-2	**Chapter 1:** Origin, capture and uses of solar energy.	*3 hours*	-Astronomical reminder and origin of solar energy -Solar flux calculation steps
3-4	**TD Chapter 1:** Origin, capture and uses of solar energy. **Chapter 2:** Thermal conversion at low temperature.	*3 hours*	*- Calculation of solar flux* *- Different types of solar water heaters*
5-6	**Chapter 2:** Thermal conversion at low temperature. **TD Chapter 2:** Thermal conversion at low temperature.	*3 hours*	*-Sizing step of a solar water heater* *-Practical case study*
7-8	**Chapter 3:** Photovoltaic conversion.	*3 hours*	*-Know the photovoltaic effect*
9-10	**TD Chapter 3:** Photovoltaic conversion.	*3 hours*	*-- Components of a photovoltaic installation*
11-12	**Chapter 4:** Wind energy.	*3 hours*	*-Know the different components of a wind turbine*
13-14	*Practical case study*	*3 hours*	

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting

CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	*0%*
DS - Supervised Duty	☒ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒ *No*	*0%*

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒ No*
- *Authorized search engine : ☐ Yes ☒ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- "Solar radiation, thermal convection and application"; R. Bernard. G. Menguy, M. Schwarts. 2nd Technical Edition and documentation. Paris
- 1980.
- "Memento d'héliotechnique"; European Thermal and Industry Edition. Paris 1979.
- Solar energy: calculations and optimization, Bernard. J, Marketing Edition S. A, 2004.
- Wind energy, Gourieres. D, Publisher: Eyrolles, 1982.
- Solar energy in the building, Chauliaguet. Ch, Eyrolles edition, 1980.
- energy, Anne. L, Edition Dunod, 2004.

Boyle, G. (2012). *Renewable Energy: Power for a Sustainable Future* (3rd Edition). Oxford University Press.

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Design of industrial systems

1. General

Coded	Ind 3 2 04	Level/Semester	*1/ S2*	Coefficient	*3*	Credits	*4*
Course	*Industrial ENGINEERING*					Volume. H. (CI)	*42h*
Responsible	*Yassine DALLEL*					Volume. H. (TP)	*0*
Module	*Design of industrial systems*					Self-study (h)	*56h*

Course description (Course objective):
introduce students to the different tools necessary to: • describe a production system, its process, its organization, • the design of a product and/or service, • the design of the manufacturing process: workshop design, interactions between workstations, task assignment, etc. • understand the methods of piloting and supervising production systems

Prerequisites:	*Keywords:*
Industrial Management	*Production process, design, products, services ..*

Specific objectives of the course (OBJ):
OBJ 1 : Select and develop products and/or services ***OBJ 2 :*** Study workstations, layouts or handling and storage methods for industrial and service activities, and characterize them in economic terms (standard time, capacity, throughput, etc.) and in ergonomic terms ***OBJ 3 :*** Evaluate and quantify manufacturing costs and times (standard times and production methods) ***OBJ 4 :*** Measure performance, measure results obtained, resolve problems ***OBJ 5 :*** Diagnose the efficiency of workstations, identify bottleneck positions and define action plans

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	Chapter 1: General introduction: Recent developments: environmental, technological, social, Industry 4.0	*6*	*Understand the general context*
3-4	Chapter 2: Design of Products and Services: Product selection, Product development: Characteristics of industrial products: physical/service, standard/specific products, modular/non-modular, simple/complex,	*6*	describe a production system, its process, its organization,
5-6	Tree nomenclature and purchasing nomenclature, Analysis using the Pareto principle, Production documentation: drawing and assembly diagram, monitoring sheet, etc. The specificities of service activities: Innovation and design of new products: strategy, typology, approach, tools TD1: Management of Nomenclatures,	*6*	*Master the notion of nomenclature and the notion of innovation*
7-8	Chapter 3: Design of Production Processes: Basic notions, Typology of processes according to the nature of production: for stock, to order, with limited anticipation, Typology of processes according to the organization of means of production: Unit series production (in a fixed position), workshops specialized by technology (Job Shop), production lines (Flow Shop), grouping into islands (or cells): implementation process (example) Improved productivity	*6*	*Distinguish the different typologies of production processes*
9-10	Chapter 4: Capacity management: Capacity: definitions, units, types, theoretical/effective capacity, Balance between load and capacity: Concept of standard times, pace judgment, etc. Measurement of times: timing, time method predetermined “Motion Time Measurement” (MTM), etc. Action plan in case of imbalance between load and capacity TD2: Capacity Management	*6*	*Understand the concepts of charge, capacity, balance between charge and capacity*
11-12	Capacity planning: overall production plan, master production plan, calculation of needs, consider several	*6*	*Mastering the PDP*

	possible scenarios to evaluate in order to choose a better solution that minimizes costs TD3: Production Master Plan (PDP)		
13-14	Balancing of production chains: approach, sequence of operations graph, throughput, cadence, calculation of workforce and resources, priority of tasks, criterion for assignment of tasks, etc. TD4: Production Plan and Capacity Management TD5: Balancing production chains	*6*	*Perform balancing of a production line*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒*Yes* ☐ *No*	*20%*
DS - Supervised Duty	☒*Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒*No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes ☒No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Production management: Fundamentals and best practices. Paperback – May 27, 2011.
- Maurice Pillet Chantal Martin-Bonnefous, Pascal Bonnefous. Productivity Techniques: How to Earn Performance Points. For managers and supervisors. Paperback – April 2, 2009. Christian Hohmann.
- **Shtub, A., Bard, J. F., & Globerson, S. (2014).** ***Project Management: Processes, Methodologies, and Economics*** **(2nd Edition). Pearson.**
- **Groover, M. P. (2020).** ***Fundamentals of Modern Manufacturing: Materials, Processes, and Systems*** **(7th Edition). Wiley.**

7- Working environment (Facilities necessary for learning)

- *None*

Course Specification

Value Analysis

1. General

Coded	Ind 3 2 05	Level/Semester	*1/S2*	Coefficient	*1.5*	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*21h*
Responsible	*Rihem BEN NJIMA*					Volume. H. (TP)	
Module	Value analysis					Self-study (h)	*50h*

Course description (Course objective):
• *Value analysis is a set of techniques, knowledge and skills used to improve the value of a product by eliminating unnecessary costs or improving its functions without compromising its quality, reliability and performance.* • *Value analysis (VA) is a method of optimizing the design of products, services and organizations, which makes it possible to mobilize the required skills in a structured approach. Its specificity lies in the implementation of "value" reasoning, which aims to increase utility and/or reduce costs for its stakeholders, throughout the life cycle.*

Prerequisites:	*Keywords:*
- *histogram* - *PARETO method* - *Graphic Representation*	- *FAST diagram* - *Octopus diagram* - *horned beast tool*

Specific objectives of the course (OBJ):
OBJ 1 : Know how to analyze the need ***OBJ 2 :*** Develop a functional analysis of a product ***OBJ 3 :*** Knowing how to promote a product ***OBJ 4 :*** compare the importance of technical functions versus their costs ***OBJ 5 :*** Functional breakdown of the product

Necessary material:
- ***O***

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. _ HR	Goals
1- 2	***Chapter 1:*** *Analyze the need*	*3*	*sixteen the need* *analyze the need* *validate the need*
3-5	***Chapter 2:*** *Study the feasibility*	*4.5*	*inventory the environment* *identify service functions* *characterize service functions* *Hierarchize service functions* *Write the functional specifications*
6-8	***Chapter 3:*** *Analyze the existing*	*4.5*	*encrypt service functions* *analyze service function values* *distinguish what is necessary from service functions*
9-12	***Chapter 4:*** *Research and evaluate solutions*	*6*	*search for as many solutions as possible* *select solutions* *Study the solution* *carry out the technical-economic evaluation* *Perform the critical design review*
13-14	*Practical case study*	*3*	*Study the feasibility*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. _ HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & marks distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒*Yes* ☐ *No*	*20%*
DS - Supervised Duty	☒*Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒*No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1. Industrial Competitiveness (F. Dardy and C. Teixido)
2. **Lawrence, D. J. (2006). *Value Management: How to Achieve Best Value* (2nd Edition). Routledge..**
3. **Miles, L. D. (2015). *Techniques of Value Analysis and Engineering* (3rd Edition). CreateSpace Independent Publishing.**

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Industrial risk management

1. General

Coded	Ind 3 2 06	Level/Semester	*1 /S2*	Coefficient	*1.5*	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*21*
Responsible	*Yassine DALLEL*					Volume. H. (TP)	
Module	*Industrial risk management*					Self-study (h)	*51h*

Course description (Course objective):
understand, assess and manage potential risks associated with industrial environments.

Prerequisites:	*Keywords:*
Industrial Management	*Industrial risks, risk prevention, performance*

Specific objectives of the course (OBJ):
OBJ 1 : Understand the different types of risks to which industries are exposed and their potential impacts. ***OBJ 2 :*** Acquire skills to analyze industry-specific risks, identifying potential sources of danger and assessing their likelihood and severity. ***OBJ 3 :*** Study the methods and tools used to assess, manage and mitigate industrial risks

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	Introduction to industrial risks and their Courseification	*3*	*Understanding the different industrial risks*
3-4	Risk identification and analysis methods	*3*	*Master the different risk*

			identification methods
5-6	Risk assessment and quantitative analysis.	*3…*	*Understanding the quantitative aspect of risk*
7-8	Risk mitigation and prevention strategies.	*3*	*Describe the different risk management methods*
9-10	Industrial safety standards and regulations	*3*	*Learn about safety standards*
11-12	Crisis management and evacuation plans	*3*	*Understand the different solutions*
13-14	Case studies and practical examples	*3*	*concrete situations*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒*Yes* ☐ *No*	*20%*
DS - Supervised Duty	☒*Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes☒ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- "Risk analysis in engineering and economics" by Bilal M. Ayyub
- "Risk management in industry: engineering asset management" by JD Andrews, N. Bellinger, et al.

- Aven, T. (2015). *Risk Analysis: Assessing Uncertainties Beyond Expected Values and Probabilities* (2nd Edition). Wiley.
- Smith, E., & Watson, I. (2013). *Industrial Safety and Risk Management* (1st Edition). Springer.

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Databases

1- Generalities

Code	Ind 3 2 07	Level/Semester	*1/S2*	Coefficient	*3*	Credits	*3*
course	*Industrial Engineering*					Vol. H. (CI)	*21*
Responsible	*Dorra DHAW*					Vol. H. (PW)	*21*
Module	*Databases*					Self-study (h)	*30h*

Course Description (Course Objective):
The Database course provides a comprehensive exploration of theoretical and practical principles related to information management. Covered topics include data modeling using the entity-relationship model, normalization to ensure data integrity, and the use of SQL language to interact with relational databases. *At the end of this course, the student should master the fundamental concepts related to the management of relational databases, including design/conception, creation, manipulation, and querying of the database.*

Prerequisites:	Keywords:
***Basic computer concepts**: Understand the fundamental concepts of computer science, such as variables, data types, control structures (loops, conditions), functions, etc.*	*Data, data type, table, relation, Database Management System (DBMS), SQL.*

Specific course objectives (OBJ):
OBJ 1 : *Understand the set of concepts underlying databases.* ***OBJ 2 :*** *Deepen the concepts of modeling, design, and implementation of databases.* ***OBJ 3 :*** *Design a database while adhering to the rules and standards of data models: Conceptual Data Model (CDM) / Entity-Relationship Model (ER).* ***OBJ 4 :*** *Convert a conceptual schema into a coherent (relational) logical schema (LDM).* ***OBJ 5 :*** *Apply relational algebra operations to query a database.* ***OBJ 6 :*** *Study the structured query language SQL with its different categories: Data Definition Language (DDL), Data Manipulation Language (DML), and Data Query Language (DQL).*

Required Equipment:
- *Computer or Laptop* - *Internet Connection*

- Database Management Systems (DBMS) such as Access, MySQL, PostgreSQL, Microsoft SQL Server, Oracle, etc.

2- The content elements: (course)

Week(s)	Chapters / Content elements	Nbr. HR	Intended objectives
1	***Chapter 1:*** **General Presentation:** *Deficiencies of the Courseical approach, Database history, Database environment, Standard architecture of a database*	*1h30*	*- Understanding the advantages of using databases*
2-3	***Chapter 2***: **Entity/Association Model**: Entities, attributes, and identifiers, Types of entities, Binary associations, Weak entities, generalized associations, Rules for the proper formation of an E-A model, Application exercises	*3h*	*- Mastering the concepts of entities, attributes, and identifiers.* *- Understanding the types of entities and binary associations.* *- Applying the rules for the proper formation of an E-A model through exercises.*
4-5	***Chapter 3****:* **Relational Model***: Definition, Concepts of the Relational Model, Transition from the E/A Model to the Relational Model (Types of entities, One-to-many associations, Associations with weak entity type, many-to-many binary associations, Ternary associations, Revisiting the choice of identifiers), Application exercises*	*3h*	*- To know how to transition from the Entity-Relationship (E/A) model to the relational model.*
6	***Chapter 4****:* **Functional Dependencies and Normalization**: Update anomalies (Insertion, Modification, and Deletion), Goals of normalization, Functional dependencies, Normalization (First Normal Form, Second Normal Form, Third Normal Form), Application exercises	*1h30*	*- Identify update anomalies.* *- Master functional dependencies.* *- Apply normalization. up to the Third Normal Form.*
7-9	***Chapter 5****:* **Relational Algebra***: Introduction, Presentation of an example database, Operators of relational algebra (Selection, denoted σ; Projection, denoted π; Renaming, denoted α; Cartesian product, denoted ×; Union, ∪; Difference, −; Division /; Join ⋈), Application exercises*	*4h30*	*- Use and apply relational algebra operators on a sample database.*

10 - 12	***Chapter 6**: **SQL** **Language:** Introduction, Data Definition Language (DDL) (CREATE, DROP, ALTER), Data Manipulation Language (DML) (INSERT, UPDATE, DELETE), Data Query Language (DQL) (SELECT, SELECT with WHERE clauses, GROUP BY, HAVING, ORDER BY), Aggregation functions, Joins (inner, outer, cross).*	*4h30*	*- Create a database with tables.* *- Know how to manipulate data in the created database.* *- Write correct SQL queries.*
13 - 14	Application exercises	*3h*	*- Create a database with tables.* *- Know how to manipulate data in the created database.* *- Write correct SQL queries.*

3- The content elements: (Practical Work)

Week(s)	Chapters / Content elements	Nbr. HR	Intended objectives
1	*Introduction to Database Management System (DBMS)*	*1h30*	*- Become familiar with the chosen Database Management System (DBMS).*
2 - 5	- Data Definition Language (DDL) (CREATE DATABASE, CREATE TABLE, DROP DATABASE, DROP TABLE, ALTER TABLE with clauses ADD, MODIFY, RENAME, DROP, Addition, modification, and deletion of constraints (CONSTRAINT)) - Data Manipulation Language (DML) (INSERT, UPDATE, DELETE)	*6h*	*- Use Data Definition Language (DDL) commands to create, modify, and delete databases and tables.* *- Apply Data Manipulation Language (DML) commands to manipulate data within tables.*
6-7	- Data Query Language (DQL) (SELECT simple, SELECT with WHERE clause)	*3h*	*- Understand Data Query Language (LID).* *- Use SELECT to retrieve data (simple*

			select and with WHERE conditions).
8-10	- Data Query Language (DQL) (SELECT with WERE, GROUP BY, HAVING, ORDER BY using aggregation functions (MAX, MIN, AVG, SUM, COUNT))	*4.5h*	*- Master the use of GROUP BY, HAVING, ORDER BY clauses.* *- Utilize aggregation functions to analyze data in a grouped manner.*
11-12	- Joins (inner, outer, cross): SELECT with clauses JOIN ON, JOIN USING, NATURAL JOIN, INNER JOIN ON, LEFT JOIN, RIGHT JOIN, FULL JOIN, CROSS JOIN...	*3h*	*- Understand the different types of joins.* *- Use JOIN clauses to retrieve data from multiple tables.*
13-14	*Practical Exam*	*3h*	*Evaluation*

3- Evaluation methods & Marks Distribution

Evaluation Type	Yes/No	Weight Ratio
CA - Continuous Assessment (Test/Quiz, Presentation, Report, ...)	☐ *Yes* ☒*No*	
SA - Supervised Assignment	☒ *Yes* ☐ *No*	*20%*
WE - Written Exam (Final Exam)	☒ *Yes* ☐ *No*	*60%*
PA- Practical Exam (Lab Exam / Mini Project)	☒*Yes* ☐ *No*	*20%*

- *Subject 100% Lab: Average = 20% CA + 80% PE*
- ***Subject 100% Theory: Average = 40% SA + 60% WE***
- *Subject Theory + Lab: Average = 20% SA + 20% PE + 60% WE*

4- Evaluation Criteria

- *Allowed Documents:* ☐ *Yes* ☒ *No*
- *Allowed Search Engine:* ☐ *Yes* ☒*No*
- *Criterion 1:* ***Relevance of Content*** *(5 points)*
- *Criterion 2:* ***Application of Knowledge*** *(5 points)*
- *Criterion 3:* ***Quality of Modeling/Design*** *(5 points)*
- *Criterion 4:* ***Query Efficiency*** *(5 points)*

5- Web References (Useful Links):

- *Database course and tutorial: https://sql.sh/cours/*
- *W3Schools SQL Tutorial: https://www.w3schools.com/sql/*

- *Coursera - "Introduction to Databases and SQL Querying": https://www.coursera.org/learn/introduction-to-databases*
- *Marcenac, P., SGBD relationnels, Optimisation des performances, Eyrolles*
- *Date C.J., An Introduction to Database Systems, Addison Wesley*
- *Date C.J., A Guide to SQL Standard, Addison Wesley …*

6- Learning Environment (Required Installations for Learning)

- *Microsoft Access*
- *Oracle Database Express Edition (XE) 18c : https://www.oracle.com/database/technologies/xe18c-downloads.html*
- *Oracle SQL Developer: https://www.oracle.com/database/sqldeveloper/technologies/download/*

On line: https://livesql.oracle.com/

Course Specification

Metrology and Instrumentation

1. General

Coded	Ind 3 2 08	Level/Semester	*1/S2*	Coefficient	3	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*42h*
Responsible	*Hana MOSBAHI*					Volume. H. (TP)	*0*
Module	Metrology and Instrumentation					Self-study (h)	*29h*

Course description (Course objective):
Apply metrology in an industrial context

Prerequisites:	*Keywords:*
Statistics, mathematics	…

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Deepen the understanding of measurement concepts* ***OBJ 2 :*** *Master measurement tools and instruments* ***OBJ 3 :*** *Evaluate and optimize measurement processes*

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. _ HR	Goals
1-2	*Basic and Vocabulary of Metrology*	*6h*	*Principle of measurement and definition of metrology, Metrology vocabulary,*

			standards, and regulatory texts *Traceability in Metrology, organization of the Metrological Chain*
3-4	*Measurement and Error of Measurement*	*6h*	*Definition of measurement, Types of measurement (direct measurement, indirect measurement), The International System of Units, Revision of the International System of Units, Dimensional Equations, Measurement errors (systematic errors, random errors, corrections of measurement errors), Characteristics of measuring instruments, Origins and causes of errors (Ishikawa diagram), Corrections of measurement errors*
5-6	*Measurement Uncertainty*	*6h*	*Introduction to the concept of uncertainty, Uncertainty and*

			error, Standard Uncertainty, *Assessment of uncertainties (Standard Uncertainty type A, Standard Uncertainty type B, Composite Standard Uncertainty, Expanded Standard Uncertainty, confidence interval)*
7-8	*Measurement Uncertainty*	*6h*	*Law of propagation of uncertainties, Examples of calculating type A and type B uncertainties, Expanded standard uncertainty and confidence interval, Uncertainty in the counting rate, Poisson distribution, Expression of a measurement result and significant numbers*
9-10	*Role of Metrology in the Enterprise*	*6h*	*Legal Metrology VS Industrial Metrology, The Challenges of Industrial Metrology, Certified Calibration Laboratories, Management of Measurement,*

			Control, and Testing Equipment
11-12	*Role of Metrology in the Enterprise*	*6h*	*Role of the Metrology Function in the Enterprise*
13-14	*Role of Metrology in the Enterprise*	*6h*	*Control and Compliance System, The Metrological Function in the Enterprise*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. _ HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	☒*Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*

- *Authorized search engine : ☐ Yes ☒No*
- *Criterion 1: Accuracy of measurements (5 points)*
- *Criterion 2: Understanding of fundamental principles (5 points)*
- *Criterion 3: Data analysis (4 points)*
- *Criterion 4: Technical skills (6 points)*

6- Web references (useful links):

- *VIM, Joint Committee for Guides in Metrology , www.bipm.org/utils/common/documents/jcgm/JCGM_200_2012.pdf*
- *GUM, Guide to the expression of Uncertainty in Measurement, www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_F.pdf*

7- Working environment (Facilities necessary for learning)

- *Table,*

Course Specification

Materials sciences

1. General

Coded	Ind 3 2 09	Level/Semester	*1/S2*	Coefficient	*3*	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*21h*
Responsible	*Nadia CHAKROUN*					Volume. H. (TP)	*21h*
Module	Materials sciences					Self-study (h)	27h

Course description (Course objective):
The manufacture of an object requires reflection on the function it will have to fulfill, the material which will constitute it and the manufacturing process which will achieve the desired shape. Thus, the notion of material is inseparable from the interest that the substance chosen may represent with the aim of obtaining a finished object having a precise function. *Every engineer must have a minimum knowledge of the mechanical behavior of materials. In addition, the engineer is frequently called upon to consult documents dealing with related subjects such as, for example, rational approach to the choice of materials, cleanliness of materials and microstructure.* *This course therefore has the main objective of familiarizing students with the field of materials, as well as providing them with in-depth knowledge of the properties of materials to better choose the right candidate according to the conditions of use.*

Prerequisites:	*Keywords:*
Bac+2 level	*Materials; shapes; processes*

Specific objectives of the course (OBJ):
OBJ 1 : *Understand and know the standardized designation, properties and areas of application of metallic materials and the techniques for their development.* ***OBJ 2 :*** *Describe the equilibrium structures, based on phase diagrams, of binary alloys (ferrous and non-ferrous alloys).* ***OBJ 3 :*** *Understand treatments to improve the use and serviceability properties of metallic materials*

Necessary material:
Data show; handout

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. _ HR	Goals

1--2	*Chapter 1: Metallic materials: Designation, properties and application*
	- *General Introduction*
	- *Properties*
	- *Material Courseification*
	- *Courseification of metals and designation*
	  - *Ferrous metals (steel and cast iron)*
	  - *Non-ferrous metals*
	Chapter 2: Elaboration of metals
	- *Introduction*
	- *Production of ferrous metals*
	- *Production of non-ferrous metals*
	Tutorials
		3	*-Enter the standard designation, properties and areas of application of ferrous and non-ferrous materials*
			-Know the different processes for producing ferrous and non-ferrous metals.

3-4-5	*Chapter 3: Balance diagram of binary alloys* - *Introduction* - *Law of phases (Gibbs)* - *Binary alloy consisting of two phases in equilibrium* - *Alloy to a single solid solution* - *Two-solid solution alloy with a eutectic point* - *L->S cooling curve of an alloy* - *Cooling curve of a solid-state alloy* *Chapter 4: Iron-Carbon Balance Diagram* - *Introduction* - *Iron Structure* - *Cementite balance diagram* - *Study of cooling of steels and cast irons* *Tutorials*	*4.5*	*-Analyze equilibrium diagrams of binary alloys* *-Analyze the Iron-carbon diagram*
6-12	*Chapter 5: Modification of mechanical properties* - *Introduction* - *Hardening by work hardening* - *Hardening by grain size refinement* - *Solid solution hardening* - *Structural hardening*	*10.5*	*-Know in general the different methods of improving mechanical properties*
	Chapter 6: Heat treatment of steels - *Introduction* - *The main types of heat treatment* ***I- Austenization of steels*** - *Heating speed* - *Austenization temperature* - *Austenization duration* - *Grain size*		*-Know what heat treatment is autenization parameters anisothermal quenching process*

	II- Isothermal transformations of steels - *Introduction* - *The different types of austenite transformations* - *Reading TTT diagrams or Iso-austenitic curves* - *Industrial isothermal heat treatments of steels* ***III- Anisothermal transformations of steels*** - *Introduction* - *Analysis of TRC diagrams* - *Residual austenite problem* - *Critical quenching speed* ***IV- Steel income*** - *Introduction* - *Different types of income* - *Evolution of properties during income* ***V- Annealing of steels*** - *Introduction* - *Different types of annealing* ***VI – Hardenability of steels*** - *Introduction* - *Factor influencing hardenability* - *Method for determining hardenability* *Tutorials*		*-Know the purpose, stages and different types of steel income* *-Know the steps and different types of steel annealing.* *-Understand the factors influencing the hardenability of steels as well as these determination methods*
13-14	*Chapter 7: Surface treatments* - *Introduction* - *Mechanical treatment or work hardening* - *Quench hardening treatment after surface heating* - *Thermochemical treatment* *Tutorials*	*3*	- *Know the principle of some types of superficial treatments*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. _ HR	Goals
1-2	*Experimental determination of the austenitization temperature*	*3*	*- Know the austenitization parameters* *- Analyze the anisothermal quenching process* *- Detect the influence of tempering and annealing of steels*
3-6	*Material characterization and hardenability testing* - *Water quenching* - *Oil quenching* - *Air quenching*	*6*	

7-8	*Tempering test and recrystallization annealing*	*3*	
9-10	*Characterization of materials:* - *Traction* - *Hardness*	*3*	*Use of experimental techniques to characterize materials*
11-12	*Identification of the physicochemical properties of plastic materials*	*3*	
13-14	*practical exam,*	*3*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	☒ *Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☒ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☒ *Yes* ☐ *No*	*20%*

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- ***CI+TP material : Average = 20% DS + 20% EP + 60% EE***

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒ No*
- *Authorized search engine : ☐ Yes ☒ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- References:

1- Materials sciences: Mechanical metallurgy from microscopic to macroscopic. Alain CORNET, Françoise LAWKA Edition Ellipse 2010.

2- Metallurgy memory aid: Metals. Alloys. Properties. Guy Murry. New factory 2nd edition Paris 2010

***3-** Materials Sciences cheat sheet. Michel Dupeux.Edition DUNOD 2005 (new corrected edition).*

***4-** Metallurgy specifications: development, structure-properties and standardization. J. BARRALIS, G. MAEDER, 6th edition. AFNOR, NATHAN.*

***5-** IRSID collection.*

***6-** Theoretical and applied structural metallurgy. ALBERT DE SY, JULIEN VIDTS, 2nd editing. NICI, DUNOD.*

***7-** Metallurgy. J. NIARD collection. NATHAN TECHNIQUE.*

***8-** Treaty of materials. Wilfried Kurz, Jean P. Mercier and Gérald Zambelli. 2nd edition. French-speaking polytechnic and university presses.*

9- Metallurgy from ore to material. Jean Philibert, Alain Vignes, Yves Bréchet and Pierre Combrade, 2nd edition. DUNOD.

10- General metallurgy. J. Bénad, A. Michel, Philibert and J. Talbot. 2nd edition. MASSON.

11- Basic principles of thermal, thermomechanical and thermochemical treatments of steels. A. Constant, G. Henry and JC Charbonnier. PYC edition.

14- Materials volume 1: properties and applications. Mr. F. Ashby and HRD Jones. DUNOD.

15- Materials volume 2: Microstructure and implementation. Mr. F. Ashby and HRD Jones. DUNOD.

7- Working environment (Facilities necessary for learning)

- *None*

Course Specification

Thermal machines

1. General

Coded	Ind 3 2 10	Level/ Semester	*1/S2*	Coefficient	1.5	Credits	*2*
Course	*Industrial Engineering*					Volume. H. (CI)	*21h*
Responsible	*Nidhal HNAIEN*					Volume. H. (TP)	
Module	Thermal machines					Self-study (h)	*24h*

Course description (Course objective):
These thermal machines course mainly aims to familiarize students with the fundamental principles, the different thermodynamic cycles and the various practical applications of thermal machines.

Prerequisites:	*Keywords:*
Thermal transfer / Mathematical tools	*Thermodynamics, combustion engine, refrigeration machine, internal combustion, steam engine*

Specific objectives of the course (OBJ):
OBJ 1 : Know how to analyze the different thermodynamic cycles: Students will be able to describe, interpret and optimize the cycles of heat engines and refrigeration cycles. ***OBJ 2 :*** Design Thermal Systems: Students will be able to design thermal machine systems by exploiting theoretical knowledge. ***OBJ 3 :*** Evaluate the profitability of installations by calculating the efficiency of heat engines and the efficiency of refrigeration machines

Necessary material:
No hardware needed

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	**- Chapter 1:** Reminders of thermodynamics + Tutorials	*3 hours*	*-Reminder of the fundamental notions of thermodynamics*
3-4	**-Chapter 2:** Reversible transformations + Directed work	*3 hours*	*-Different types of thermodynamic transformations* *- Calculation of work and heat quantities*
5-6	**-Chapter 3:** Introduction to the study of thermal machines + Tutorials	*3 hours*	*-Trace Carnot cycles and calculate yield.* *- Calculation of the coefficient of performance (COP)*
7-8	**-Chapter 4:** Cycles of internal combustion engines + Directed work	*3 hours*	*-Know the operating principle of internal combustion engines* *- Differentiate between the cycle of a Gasoline and Diesel engine*
9-12	**-Continued Chapter 4:** Cycles of internal combustion engines + Directed work	*6 hours*	*-Trace the thermodynamic cycles of combustion engines and calculate efficiency*
13-14	**-Chapter 5:** Refrigerating machines + Directed work	*3 hours*	*-Know the refrigeration cycle* *-Identify the components of a refrigeration machine* *- Know the different types of refrigerants*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting

CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒ *Yes* ☐ *No*	*0%*
DS - Supervised Duty	☒ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒ *No*	*0%*

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒ No*
- *Authorized search engine : ☐ Yes ☒ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- The basics of thermodynamics, courses and exercises, 3rd edition DUNOD 2013
- Industrial water vapor, POSITELLO. R, Lavoisier edition 1969
- Energy conversion by turbomachines, Pluviose. M, Ellipse edition 2003
- Thermal machine VOLUME III, AFNOR edition
- Physical summary, Edition Bréal, 2004

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

PPE (supervised personal project)

1. General

Coded	*Ind 3 2 10*	Level/Semester	*1/S02*	Coefficient	*3*	Credits	*3*
Course	*Industrial ENGINEERING*					Volume. H. (Cl)	
Responsible	*educational manager*					Volume. H. (TP)	*42h*
Module	*PPE (supervised personal project)*					Self-study	*32h*

Course description (Course objective):
• *This project is an opportunity for the student to prepare themselves to know how to write a report, present their work, to highlight it and to improve their skills* • *The PPE (supervised personal project) Presents a research project which can be proposed by the student or by the supervisor.* • *PPE starts from the second semester and will end during the exam week of the second semester.* • *Each student is expected to contact one of these teachers for supervision* • *All 3rd year engineering students must be called to a meeting with their educational supervisors and the head of the internship service so that they are properly oriented respectively: Pedagogically and administratively.* • *The PPE must be validated at the end of a defense which follows the submission of a report.* • *The teacher (school tutor) helps the student to refine the end-of-year project. He provides educational support to the student (working methodology, definition of the problem or mission, establishment of the plan, writing of the report, etc.)*

Prerequisites:	*Keywords:*
…	…

Specific objectives of the course (OBJ $_i$):
OBJ 1 : *Solve a problem* ***OBJ 2 :*** *Write report* ***OBJ 3 :*** *Have a research mind* ***OBJ 4 :*** *Have a spirit of innovation*

Necessary material:
…

2- Content elements (Practical work)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	Identifying the research topic	*6*	Determine a topic that interests you and has academic or practical interest.

			Clearly define the research questions in the project.
3-4	Development of a theoretical framework	*6*	Identify relevant theories, models or concepts that will serve as the basis for your research
5	Development of a methodology	*3*	Develop a detailed plan for collecting and analyzing the data needed for the research
6-7	Collection of data	*6*	Implement your data collection plan following established procedures
8	Data analysis	*3*	Interpret results and analyze data using statistical techniques or qualitative analysis methods, as appropriate.
9-10	Writing of the report	*12*	Structure the research report by including an introduction, methodology, results and conclusions.
11-12	Review the report and provide perspective		Revise report content to correct grammatical errors and gaps.
13-14	Practical activity: presentation, discussions,	*6*	Summary of different projects and sharing of ideas

4- Evaluation methods & Marks Distribution

- ✧ The PPE (supervised personal project) must be validated at the end of a defense which follows the submission of a report.
- ✧ The student must submit a PPE report on time
- ✧ The evaluation is carried out by at least two members of the jury (Jury 1, jury 2)

5- Evaluation criteria

Criteria	***Points***
Written report	5pts
Oral presentation	5pts
Mastery of the subject	5pts
Objective of the project	5pts

6- Web references (useful links):

- *Author, Title, Year*
- *…*

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

DOA in engineering

1. General

Coded	Ind 4 1 03	Level/ Semester	*2/S3*	Coefficient	*1.5*	Credits	*2*
Course	*Industrial Engineering*					Volume. H. (CI)	
Responsible	*Safa EL HRAIECH*					Volume. H. (TP)	*21h*
Module	DOA in engineering					Self-study (h)	*26h*

Course description (Course objective):
The objective is to have a solid understanding of the basics of SOLIDWORKS software (understanding how to create 3D models and assemblies, how to apply dimensions and constraints, and how to create 2D drawings).

Prerequisites:	*Keywords:*
Mechanical skills	*Mechanical engineering*

Specific course objectives (OBJ):	
OBJ 1 :	*Creation of basic Part from a drawing*
OBJ 2 :	*Using equations to relate dimensions*
OBJ 3 :	*Making assembly with basic and advanced mates*
OBJ 4 :	*Mass property evaluation*

Necessary material:
SolidWorks Software

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals

1-2	…	…	…
3-4	…	…	…
…	…	…	…
11-12			

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
1-2	*Introduction and getting started with SolidWorks*	*3h*	*Sketch entities - lines, rectangles, circles, arcs, ellipses, centerlines.* *Boss and cut features – extruded.*
3-4	*Exploitation of commands and creation of revolution shapes*	*3h*	*Revolvers* *Fillets and chamfers* *Linear, circular, and fill patterns, Dimensions* *Sketch tools - Sketch relationships*
5-6	*Making an assembly*	*3h*	*Inserting components* *Standard mates - coincident, parallel, perpendicular, tangent, concentric, distance, angle*
7_8	*Creating drawings*	*3h*	*Drawing with several views and dimensions inserted*
9-10	*Preparation of CSWA certificate*	*3h*	*Using linked dimensions and equations to aid in modelling* *Using equations to relate dimensions* *Updating parameters and dimension sizes* *Creating an assembly* *Adding parts to an assembly*

			Basic mates
11-12	*Case Study*	*3h*	*Drawing with several views and dimensions inserted Evaluation*
13-14	*Practical exam*	*3h*	*Assessment*

4- Evaluation methods & Grade distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒Yes ☐ No	*20%*
DS - Supervised Duty	☐ Yes ☒*No*	
EE - Written test (Final exam)	☐ Yes ☒*No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☒Yes ☐ No	*80%*

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ Yes☒No
- *Authorized search engine* : ☐ Yes☒*No*
- *Criterion 1: Creating a part (5 points)*
- *Criterion 2: Using linked dimensions and equations (5 points)*
- *Criterion 3: Creating an assembly (4 points)*
- *Criterion 4: Inserting basic and advanced mates (6 points)*

6- Web references (useful links):

[1] TP - CAD-SolidWorks BTS, PDF, Design assisted by computer, Computer science And technologies of information (scribd.com)
[2] SolidWorks Help
[3] Fascicle-de-tp-cao-solidworks.pdf (technologuepro.com), *Mechanical Engineering Department TECHNOLOGY WORKSHOP PRACTICAL WORK BOOKLET3 C.A.O Level: 2nd License (CFM & MI)*
[4] Training academic SolidWorks (technologuepro.com), *Higher Institute of Technological Studies of Sousse DEPARTMENT OF MECHANICAL ENGINEERING 1st year Applied License in Mechanical Engineering EU: Technology 1 Design Workshop 1 (CAD) prepared by: Eltaief Maher Chouchene Adnene Ben Nejma Manel 2015/2016*
[5] TP1 - CAD Volume.pdf (univ-angers.fr)

7- Working environment (Facilities necessary for learning)

- *Solidworks Software, 2022.*

Course Specification

Machining manufacturing process

1. General

Coded	Ind 4 1 04	*Level/Semester*	*2/S3*	*Coefficient*	*2.25*	*Credits*	*3*
Course	*Industrial Engineering*					*Volume. H. (CI)*	*21h*
Responsible	*Mahdi HADJ SALAH*					*Volume. H. (TP)*	*10.5h*
Module	*Machining manufacturing processes*					Self-study (h)	*43.5h*

Course description (Course objective):
Machining by chip removal: *Filming; Milling; Drilling; Tapping; Boring (principle, operations, tools, fixtures, machines, choice of cutting conditions, etc.)*

Prerequisites:	*Keywords:*
General knowledge of the processes for obtaining mechanical parts	*Turning, milling, drilling*

Specific course objectives (OBJ):
General knowledge of the processes for obtaining mechanical parts *Machining by chip removal:* *Filming; Milling; Drilling; Tapping; Boring (principle, operations, tools, fixtures, machines, choice of cutting conditions, etc.) …* *AbNoneion machining:* *Plane and cylindrical grinding (principle, operations, tools, fixtures, machines, choice of cutting conditions, etc.) …*

Necessary material:
Round //; universal milling machine; sensitive drill

2- Content elements (Course)

Week(s)	*Chapters/Content Items*	*No. _ HR*	*Goals*
1	*General information on the processes for obtaining mechanical parts*	*01:30*	*General knowledge of the processes for obtaining mechanical parts*

2-3-4-5	*SHOOTING* • *Describe the filming process.* *Describe the basic turning operations.* *Describe turning tools.* • *Describe the main machining setups used in turning.* • *Define cutting parameters while turning.* • *Describe the main machines used in turning.* • Directed work.	*6:00 am*	General knowledge of the turning process
6-7-8	*MILLING* • *Describe the milling process.* • *Describe basic milling operations.* • *Describe milling tools.* • *Describe the main machining fixtures used in milling.* • *Define milling cutting parameters.* • *Describe the main machines used in milling.* • Directed work.	*04:30*	General knowledge of the milling process
9-10	*DRILLING* • *Describe the Drilling, Reaming and Tapping process.* • *Describe the basic operations of Drilling, Reaming and Tapping.* • *Describe Drilling, Reaming and Tapping tools.* • *Describe the main machining fixtures used in* drilling. • *Set cutting parameters.* • *Describe the main machines used.* • Directed work	*03:00*	General knowledge of the drilling process
11-12	*RECTIFICATION* • *Describe the rectification work process.* • *Describe the basic grinding operations.* • *Describe grinding tools.*	*03:00*	General knowledge of the grinding process
13-14	*RECTIFICATION* • *Set grinding cutting parameters.* • *Describe the main grinding machines used.* *Directed work*	*03:00*	rectification process

3- Content elements (Practical work)

Week(s)	*Activities/Content Elements*	*No. _ HR*	*Goals*
1-2	Knowledge of conventional machines in the mechanical workshop.	*1h30*	*TP*
3-4	This manipulation aims to familiarize the student with machining on a parallel lathe.	*1h30*	*TP*
5-6	This manipulation aims to familiarize the student with machining on a universal milling machine.	*1h30*	*TP*
7-8	This manipulation aims to familiarize the student with machining on a sensitive drill.	*1h30*	*TP*

9-10	This manipulation aims to familiarize the student with the welded assembly.	*1h30*	*TP*
11-12	*Practical exam, mini-project defense, …*	*1h30*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	*Yes No*	*Tx Weighting*
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	*0%*
DS - Supervised Duty	☒*Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*20%*
EP - Practical test (TP- TP exam / MP- Mini project)	☒*Yes* ☐ *No*	*60%*

Material 100% TP : Average = 20% CC + 80% EP

100% CI material : Average = 40% DS + 60% EE

CI+TP material : Average = 20% DS + 20% EP + 60% EE

5- Evaluation criteria *Authorized*

documents : ☐ *Yes* X *No Authorized search*

engine : ☐ *Yes* X *No*

- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Groover, M. P. (2019). Fundamentals of Modern Manufacturing: Materials, Processes, and Systems (7th Edition). Wiley.
- Kalpakjian, S., & Schmid, S. R. (2014). Manufacturing Engineering and Technology (7th Edition). Pearson.

7- Working environment (Facilities necessary for learning)

None

…

Course Specification

Operational research

1. General

Coded	Ind 4 1 05	Level/ Semester	*2/S3*	Coefficient	*3*	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*42h*
Responsible	*Saima DHOUIB*					Volume. H. (TP)	
Module	Operational research					Self-study (h)	*29h*

Course description (Course objective):
At the end of this course, the student must be able to: Understand, Formulate, solve and analyze industrial engineering linear programming problems by graphical method, by simplex algorithm and Duality and sensitivity analysis for various real problems transport, allocation, production, investment, etc.

Prerequisites:	*Keywords:*
- *Industrial engineering problems.* - *Concept of algebra.* - *Matrix form.* - *Resolution of a system with 2 unknown variables.* - *Graphic Representation*	*- Industrial engineering problems* *-Optimization _* *- Operational research* *- Linear programming* *- Simplex Algorithm* *- Duality and sensitivity analysis* *- Technical complementarity gap*

Specific objectives of the course (OBJ):
OBJ 1 : An ability to apply knowledge of mathematics, science, and engineering.
OBJ 2 : An ability to function on multidisciplinary teams.
OBJ 3 : An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
OBJ 4 : Acquire a methodology for modeling an optimization problem.

OBJ 5 : Understand, Formulate, solve and analyze the linear programming problems by graphical method, by simplex algorithm, Solving LP problems with Excel or Solvexo software and Lindo software. ***OBJ 6 :*** Analyze the duality and sensitivity and optimality of LP problems, study some LP Applications like; Marketing, Manufacturing, Employee scheduling, financial applications, Blending problems and Transportation applications. Solving LP problems with Excel or QM for Windows.

Necessary material:
- **Solvexo software** *for graphics resolution.* - **Odoo *software*** *for simplex resolution.* - **Lindo** software.

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	***Chapter 1:*** *formulation of industrial engineering linear programming problems.*	*6*	*- Understand industrial problems of transport, allocation, manufacturing, investment, etc.* *- build a system containing decision variables, objective function and constraints.*
3-6	***Chapter 2:*** *Graphical resolution of linear programming*	*9*	*Solve linear programming problems graphically:* *Single optimal solution.* *Solution reject*

			towards infinity. Solution not possible. Multiple solutions.
7-10	***Chapter 3:*** *Simplex algorithm resolution of linear programming*	*9*	*Solve linear programming problems using a simplex algorithm: Single optimal solution. Solution reject towards infinity. Solution not possible. Multiple solutions.*
11-12	***Chapter 4:*** *Duality*	*3*	*Formula of duality linear programming problems*
13	***Chapter 5:*** *Sensitivity* analysis	*3*	*Sensitivity analysis of linear programming problems*
14	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

3- Content elements (Practical work)

Week(s)	Chapters/Content Items	No. HR	Goals
…	…	…	…
…	…		…
…	…		…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒*Yes* ☐ *No*	*20%*
DS - Supervised Duty	☒*Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒*No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1. Operations Research: Hamdy A. Taha., John Wiley & Sons, Inc., 7th Edition, 2002.
2. Introduction to Operations Research, Hillier, FS, and Lieberman, GJ, Mc Graw Hill Company, 8th Edition, 2004.
3. Optimization and convex analysis HIRIART-URRUTY JB, Presses Universitaires de France, 1998.
4. Operational research summary FAURE LEMAIRE B. and PICOULEAU C., Dunod Paris, 2009.
5. Operational Research, Optimization Methods, Volume 1TEGHEM J., Ellipses, 2012.

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Information system management

1. General

Coded	Ind 4 1 06	Level/Semester	*2/S3*	Coefficient	*1.5*	Credits	*2*
Course	*Industrial Engineering*					Volume. H. (Cl)	*21h*
Responsible	*Yassine DALLEL*					Volume. H. (TP)	
Module	*Information system management*					Self-study (h)	*29h*

Course description (Course objective):
address aspects of planning, development, implementation and management of information systems within organizations

Prerequisites:	*Keywords:*
Industrial Management	*Information system, decision making, competitiveness.*

Specific objectives of the course (OBJ):
OBJ 1 : Understand the strategic role of information systems in organizations. ***OBJ 2 :*** Understand the key concepts of information systems management. ***OBJ 3 :*** Master the techniques of planning, implementation and management of information systems. ***OBJ 4 :*** Study the impacts of information systems on business performance and competitiveness.

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals

1-2	*Introduction to information systems:* - Definitions and fundamental concepts. - History and evolution of IS	*3*	*clarify theoretical concepts of IS* *provide a conceptual framework for understanding these systems*
3-4	Optimization of the company's supply chain and IS	*3*	*understand the relationship between supply chain and IS* *assimilate the advantages of implementing IS in the supply chain*
5-6	*MRP:* material requirement planning	*3*	*understand the concept of MRP and its advantages*
7-8	*DRP:* Distribution Resource Planning	*3*	*understand the concept of DRP and its advantages*
9-10	*APS: advanced planning system*	*3*	*understand the concept of APS and its advantages*
11-12	*SCE: supply chain execution*	*3*	*understand the concept of SCE and its advantages*
13-14	*ECR: efficient consumer response*	*3*	*understand the concept of ECR and its advantages*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒*Yes* ☐ *No*	*20%*
DS - Supervised Duty	☒*Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒*No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes ☒No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Laudon, KC, & Laudon, JP (Year). "Information system management".
- Turban, E., Leidner, D., McLean, E., & Wetherbe, J. (Year). "Information Technology for Management: Advancing Sustainable, Profitable Business Growth".
- Laudon, K. C., & Laudon, J. P. (2020). *Management Information Systems: Managing the Digital Firm* (15th Edition). Pearson.
- Brien, J. A., & Marakas, G. M. (2011). *Management Information Systems* (10th Edition). McGraw-Hill Education.

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Production management

1. General

Coded	Ind 4 1 07	Level/Semester	*2/S3*	Coefficient	*3*	Credits	*4*
Course	*Industrial Engineering*					Volume. H. (CI)	*42h*
Responsible	*Habib ABDENNEJI*					Volume. H. (TP)	
Module	*Production management*					Self-study (h)	*54h*

Course description (Course objective):
This course aims to improve the knowledge and skills of industrial engineering engineers in the field of production organization and management. Participants will learn the fundamentals of production management, including planning, scheduling, controlling and improving manufacturing processes. They will also gain an in-depth understanding of the methods and tools used to optimize production efficiency and productivity.

Prerequisites:	*Keywords:*
Industrialization course,	*Production management, Production scheduling, Planning, Scheduling*

Specific objectives of the course (OBJ):
OBJ 1 : Understand the basic principles of production management **OBJ 2 :** Master the methods of planning and scheduling manufacturing processes **OBJ 3 :** Learn to control and improve production performance **OBJ 4 :** Apply the concepts learned to real production cases

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. _ HR	Goals
1-2	Introduction to production management • Basic concepts of production management • Roles and responsibilities of the production manager	*6*	Understand the basic principles of production management

	• Principles of production optimization • Quiz on basic concepts of production management • Analysis of a production process and proposal for improvements		
3-4	Aggregated Planning • Industrial and commercial plan • Master Production Program • Developing a production plan for a given scenario	*6*	Master global planning methods
5-6-	Detailed Planning • Calculation of Net Needs (MRP0) • Capacity study and production regulation (MRP1)	*6*	Master manufacturing process planning methods
7-8	Production Management • Scheduling technique in functional workshop. • Task Scheduling Techniques	*6*	Master the methods of scheduling manufacturing processes
9-10	Pulled Stream • Kamban system operation • Kamban System Sizing • TOP analysis and dynamic scheduling	*6*	
11-12-13-14	Production control and improvement • Measuring and monitoring production performance • Continuous improvement methods (JIT) • Management of production problems • Analysis of production data and proposal of improvement solutions • Case study	*12*	Learn to control and improve production performance and apply the concepts learned to real cases.

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting

CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	☒ *Yes* ☐ *No*	
EE - Written test (Final exam)	☒ *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒ No*
- *Authorized search engine : ☐ Yes ☒ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Brissard, JL and Polizzi, M. Tools for industrial production management, Afnor-gestion;
- Zermati, P. Practice of inventory management. Dunod;
- Vallet, G. Project planning techniques. Dunod, Paris.
- Beranger, P. The new rules of production, Dunod;
- Milan, A. Jouve, M. Communication and business organization. Collection- Breal.
- Engineering Techniques, Safety / prevention of industrial risks, AG 4- April 2004;
- COURTOIS A., MARTIN-BONNEFOUS C., PILLET M. Production management Éditions d'organization – 4th edition – 2006
- GEORGES Javel, Organization and Management of Production, Dunod, Paris, 2004;
- Alain Courtois, Maurice Pillet, Chantal Martin- Bouneffous , Production Management, organizational edition 2003.
- Operations Management" by Jay Heizer, Barry Render (2016)
- Production and Operations Analysis" by Steven Nahmias (2015)

Course Specification

Supply and inventory management

1. General

Coded	Ind 4 1 08	Level/Semester	*2/S3*	Coefficient	*3*	Credits	*4*
Course	*Industrial Engineering*					Volume. H. (CI)	*42h*
Responsible	*Saima DHOUIB*					Volume. H. (TP)	
Module	Supply and inventory management					Self-study (h)	*52h*

Course description (Course objective):
This course allows the student, on the one hand, to carry out operational tasks linked to the process of acquiring goods and services and inventory management, and, on the other hand, to participate in making decisions. decision related to supply chain management. *At the end of the course, the student should be able to: understand the fundamental concepts of supply chain management inventory management, define and explain of supply and inventory management, Represent the procurement process of purchasing process, to know their methods, calculate inventory levels and Costs related to inventory management, …*

Prerequisites:	*Keywords:*
- *Inventory management* - *Management*	- *Inventory management* - *inventory levels* - *Process inventory management* - *Inventory management indicators* - *Physical inventory management* - *Costs related to inventory management*

Specific objectives of the course (OBJ):
OBJ 1 : *Understating the fundamental concepts of supply and inventory management.* ***OBJ 2 :*** *Define, explain and represent process of supply and inventory management.* ***OBJ 3 :*** *Know their methods of inventory.* ***OBJ 4 :*** *Calculate inventory levels.* ***OBJ 5 :*** *Calculate costs related to inventory management.*

Necessary material:
…

2 - Content elements (Course)

Week(s)	Activities/Content Elements	No. HR	Goals
1-2	***Chapter 1:*** *concepts, definitions and missions of supply and inventory management*	*3*	*-Define and explain of supply and inventory management.* *-Represent the Procurement Process* *Purchasing process*
3-4	***Chapter 2:*** *The inventory management methods*	*3*	- *Define and explain of Inventory management methods:* - *know the two fundamental parameters of inventory management models: the date and the quantity ordered (order on a fixed or variable date, and on a fixed or variable quantity).* - *know the 4 inventory management methods:* *replenishment or calendar method, we order a fixed quantity on a fixed date* *Point of order management method. variable date fixed quantity* *Replenishment method, fixed date variable quantity* *Replenishment method upon ordering, on a variable date a variable quantity is ordered*
5-6	***Chapter 3:*** *The Basics of Inventory Management*	*3*	*Define and explain of:* *Inventory management* *Inventory objectives and methods* *Advantages and disadvantages of an Inventory*

			Inventory management indicators
7-8	***Chapter 4:*** *Inventory levels*	*3*	*define and calculate inventory levels* *Minimum Inventory* *Safety Inventory* *Alert Inventory* *Maximum Inventory* *Tool Inventory* *Average Inventory* *Theoretical Inventory* *Current Inventory* *Virtual Inventory*
9-10	***Chapter 5:*** *Physical inventory management*	*3*	*explain of physical inventory management* *Shopping activities* *The layout of storage areas* *Reliability of data* *Stock inventories*
11-12	***Chapter 6:*** *Costs related to inventory management*	*3*	*The cost of carrying inventory* *The cost of launching or placing an order* *The acquisition cost* *The cost of stock shortages (opportunity cost-loss of profit)*
13-14	*Practical case study*	*3*	*physical inventory management and costs*

3- Content elements (Practical work)

Week(s)	Chapters/Content Items	No. _ HR	Goals
1-2	…	…	…
3-4		…	…
…	…	…	…
11-12			

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting

CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	x *Yes*	☐*No*	*20%*
DS - Supervised Duty	x *Yes*	☐*No*	*20%*
EE - Written test (Final exam)	x *Yes*	☐*No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes*	☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes☒ No*
- *Authorized search engine : ☐ Yes x No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- SUPPLY CHAIN MANAGEMENT: STRATEGY, PLANNING, AND OPERATION, 4th Ed, Sunil Chopra and Peter Meind, (2010), Prentice Hall. ISBN-10: 013609451-1 / ISBN-13: 978013609451-7.
- DESIGNING AND MANAGING THE SUPPLY CHAIN, Second Edition, David Simchi -Levi, Philip Kaminsky, and Edith Simchi - Levi, McGraw -Hill.
- Heizer, J., Render, B., & Munson, C. (2017). *Operations Management: Sustainability and Supply Chain Management* (12th Edition). Pearson.

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Maintenance management

1. General

Coded	Ind 4 1 09	Level/Semester	*2/S3*	Coefficient	*3*	Credits	*4*
Course	*Industrial Engineering*					Volume. H. (CI)	*42h*
Responsible	*Hichem HASSINE*					Volume. H. (TP)	*0*
Module	*Maintenance management*					Self-study (h)	*56h*

Course description (Course objective):
This course aims to treat different notions and tools of maintenance management.

Prerequisites:	*Keywords:*
Production management	*Maintenance- MTTR- MTBF- Pareto- FMEA- Cost*

Specific objectives of the course (OBJ):
OBJ 1 : *Present the principles of maintenance process management*
OBJ 2 : *Here different type of maintenance*
OBJ 3 : *Failure analysis*
OBJ 4 : *Maintenance Time and cost analysis*

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Chapter 1/ Maintenance: issues and strategies* *Maintenance history* *Maintenance definition* *Life cycle cost*	*06*	*-Presentation of the history of maintenance* *-Presentation of the utility of maintenance in society*

	Mission maintenance *Chapter 2/ Maintenance methods* *Failure concept*		
3-4	*Chapter 2/ - Maintenance methods* - *Maintenance levels* - *Choice of maintenance strategy*	*06*	*-Details the different methods of maintenance* *-Help decide to choose the adequate strategy of maintenance*
5-6	***Chapter 3** / Failure analysis* - *Quantitative analysis* - *20-80 methods* - *Correlation method* - *Case studies*	*06*	*-Present the 20-80 method and its application in maintenance* *-Presentation of correlation method and its application in maintenance context*
7-8	***Chapter 3** / -Qualitative analysis* *-Cause effect method* *-Ishikawa method* *-FMEA method* *Case studies*	*06*	*Presentation of different qualitative methods used to analyze failure in maintenance context*
9-10	***Chapter 4** / Documentation on maintenance* - *General documentation* - *Strategic documentation* - *Technical file of equipment* - *Maintenance plan of equipment* - *Historic file of equipment*	*06*	*-Presentation of different files used in maintenance process*
11-12	***Chapter 5** /Management of method service* - *Responsibilities* - *Analysis of maintenance times*	*03*	*Presentation of cost analysis in maintenance*
13-14	***Chapter 5** /Management of method service* - *Maintenance cost analysis* - *Preparation of interventions* *Case study*	*03*	*Presentation of cost analysis in maintenance*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* x ☐ *No*	
DS - Supervised Duty	x☐ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x☐ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* x ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes x ☐ No*
- *Authorized search engine : ☐ Yes x ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1. MÉMOTECH Industrial Maintenance – CASTELLAZZI, COGNIEL & GANGLOFF – EDUCALIVRE – 1998
2. Maintenance: methods and organization – F. MONCHY – DUNOD - 2000
3. Maintenance: automated production systems – JM BLEUX and JL FANCHON – Etapes Collection – NATHAN – 1997
4. Maintenance: mathematics and methods – P. LYONNET – 3rd Edition – Techniques and Documentation – 1998
5. Maintenance management – F. BOUCLY – AFNOR – 1998

6. Maintenance Engineering – Jean-Claude FRANCASTEL – DUNOD – 2003
7. Prevention of occupational risks – Nichan MARGOSSIAN – Dunod – 2003

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Electric machine

1. General

Coded	Ind 4 1 10	Level/Semester	*2/S3*	Coefficient	2.25	Credits	*2*
Course	*Industrial Engineering*					Volume. H. (CI)	*21h*
Responsible	*Imen KORTAS*					Volume. H. (TP)	*10.5h*
Module	*Electric machine*					Self-study (h)	*16h*

Course description (Course objective):
- Acquire and know how to apply basic knowledge on single-phase and three-phase balanced systems. - Acquire and know how to apply basic knowledge on single-phase and three-phase transformers.

Prerequisites:	*Keywords:*
Knowledge of some basic concepts about electrical networks.	*Single-phase regime, three-phase regime, balanced system, transformer, power*

Specific objectives of the course (OBJ):
1. Have to amplify the electrical circuits in order to calculate the different energies. 2. Structuring the energy balance, through the control of the different powers developed by the electrical circuits. 3. Understand the operating principle of transformers.

Necessary material:
Single-phase power supply, Three-phase power supply, measuring devices, RLC loads, single-phase transformer

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. _ HR	Goals

1-2	Chapter 1: The single-phase diet: 1. Reminders on the description of sinusoidal quantities. 2. Single-phase power	*3h*	- Establish the single-phase energy balance
3-4	3. reactivated energy compensation principle Tutorials	*3h*	- Physical interpretation of reactive power. - Reinforce acquired knowledge
5 -6	Chapter 2: the three-phase regime 1. Characteristics of the electrical distribution network 2. Study of balanced three-phase systems.	*3h*	- Establish the three-phase energy balance
7-8	3. Phase grouping modes. Tutorials	*3h*	- Establish the equivalent single-phase diagram - Reinforce acquired knowledge
9-10	Chapter 3: single-phase transformer 1. Presentation of magnetic circuits.	*3h*	- Become familiar with magnetic quantities
11-12	2. The perfect transformer. 3. The actual transformer.	*3h*	*Kapp model of the transformer*
13-14	Tutorials	*3h*	

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. _ HR	Goals
1-2	Single-phase power measurement (RLC load)	*3h*	Highlight the compensation of reactive energy in single phase
3-4	Three-phase power measurement (RLC load)	*3h*	Highlight three-phase reactive energy compensation
5-6	*Kapp model of the transformer*	*3h*	*Determine Transformer Parameters*

7	*Practical exam*	*1.5*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	*Yes* ☐ *No*	
DS - Supervised Duty	☒*Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☒*Yes* ☐ *No*	*20%*

- *Material 100% TP : Average = 20% CC + 80% EP*
- 100% CI material : Average = 40% DS + 60% EE
- ***CI+TP material : Average = 20% DS + 20% EP + 60% EE***

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links)

Nagarath, I. J., & Kothari, D. P. (2010). *Electrical Machines* (4th Edition). Tata McGraw-Hill Education.
Fitger, L. (2009). *Electric Machines and Drives: Principles, Control, and Application* (1st Edition). Pearson.

Course Specification

R&D and innovation management

1. General

Coded	Ind 4 2 03	Level/Semester	*2/S4*	Coefficient	*3*	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*42h*
Responsible	*Maissa CHAIBI*					Volume. H. (TP)	
Module	*Innovation management quality and audit*					Self-study (h)	*32h*

Course description (Course objective):
The innovation management course aims to provide students with a comprehensive understanding of concepts, strategies, and practices related to innovation management within an organization.

Prerequisites:	*Keywords:*
…	…

Specific objectives of the course (OBJ):
OBJ 1 : **Understanding the Innovation Process:** To provide students with a comprehensive understanding of the innovation process, from ideation to implementation. …
OBJ 2 : **Developing Creativity and Critical Thinking:** Cultivating creativity and critical thinking skills to enable students to generate innovative ideas and solutions.
OBJ 3 : **Studying Innovation Models:** Exploring different innovation models, methodologies, and frameworks to help students choose the most suitable approach for various contexts.
OBJ 4 : **Building Strategic Innovation Competencies:** Focusing on developing strategic thinking and innovation competencies that align with organizational goals.
OBJ 5 : **Measuring and Evaluating Innovation:** Introducing metrics and evaluation criteria for measuring the success of innovation initiatives and assessing their impact on the organization.

Necessary material:
Video projector

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. _ HR	Goals

1-2	***Chapter1. Introduction to Innovation Management.*** *Definition of innovation* *Types of innovation* *Innovation Life Cycle*	*6H*	*-Understanding Key Concepts: Gain a fundamental understanding of essential concepts related to innovation management.* *- Identifying Innovation Drivers: Identify factors that stimulate and drive innovation within different industries and sectors.*
3-4	***Chapter 2. Models of the Innovation Process*** *"Techno-Push" model* *"Demand – Pull" model* *"Hybrid" model* *"The fourth-generation innovation" model* *"The Kline and Rosenberg" Model* *"The fifth-generation innovation" model* ***"Open Innovation"***	*9h*	**Understanding Different Models:** Develop a clear understanding of various models that describe and explain the innovation process. **Analyzing Sequential Models:** Analyze sequential models that depict innovation as a step-by-step process, examining their strengths and limitations. **Exploring Iterative Models:** Explore iterative models that highlight the cyclical and dynamic nature of innovation, emphasizing continuous improvement. **Understanding Open Innovation Models:** Gain insights into open innovation models that emphasize collaboration, external partnerships, and idea sourcing from various channels.
5-6	***Chapter 3: Monitoring and Foresight*** *1. Internet Monitoring* *2. The 4 Types of Monitoring* *3. Benchmarking* *4. Purchasing Marketing* *5. Techno Push Market Pull Hybridization* *6. Blue Ocean Strategy*	*9H*	**Understand the Concept of Monitoring:** Gain a deep understanding of the concept of monitoring, its importance, and its role in the context of innovation. **Explain Monitoring Methods:** Examine and explain various methods and techniques for monitoring used to collect relevant information. **Identify Information Sources:** Learn to identify and leverage various information sources for monitoring, including internal and external sources. **Study Monitoring Tools:** Explore technology and software tools used to facilitate monitoring and information gathering. **Analyze Trends:** Develop the ability to analyze emerging trends in the field relevant to innovation. **Understand Foresight:** Understand the concept of foresight and its role in long-term strategic planning. **Explain Foresight Methods:** Examines different methods and approaches to foresight used to anticipate future developments.

			Study Possible Scenarios: Learn how to develop possible scenarios based on information gathered through monitoring and foresight. **Apply Monitoring and Foresight to Innovation:** Understand how to effectively integrate monitoring and foresight into the innovation process. **Evaluate Impact on Strategy:** Assess the impact of information gathered through monitoring and foresight on the organization's innovation strategy. **Foster a Learning Culture:** Promote an organizational culture that encourages continuous learning from the collected information. **Develop Action Plans:** Use monitoring and foresight information to develop concrete action plans aligned with innovation objectives.
7-8	***Chapter 4. Design thinking*** 1. *Empathize* 2. *Define* 3. *Ideate* 4. *Prototype* 5. *Test*	*6H*	*Understanding Design Thinking: Provides a thorough understanding of the fundamental principles of design thinking as a problem-solving approach.* *Design Thinking Process: Explain the different stages of the design thinking process, such as empathy, definition, ideation, prototyping, and testing, and detail how each of these stages contributes to the overall design.* *Development of Creative Skills: Foster the development of creative skills, including divergent thinking, convergent thinking, and the ability to think nonlinearly.* *Collaboration and Communication: Encourages collaboration among team members, highlighting the importance of communication and multidisciplinary collaboration in the design process.* *User-Centered Approach: Emphasize the importance of a user-centered approach in designing products, services, or experiences by understanding the needs and experiences of end-users.*

			Innovation Culture: Promote a culture of innovation within teams by illustrating how design thinking can foster creativity, adaptability, and proactive problem-solving.
9-10	**Chapter 5. Innovation Leadership:** *the 4 Ps of innovation, innovation pipeline, the milestone, the feasibility study, the innovation wheel*	*6H*	**Value Creation:** Innovation should contribute to the creation of new sources of value for the company, whether through the development of new products, services, processes, or business models. **Competitive Advantage:** Companies often seek to innovate to differentiate themselves from their competitors. The goal is to create sustainable competitive advantages that position the company as a leader in the market. **Adaptability and Agility:** Innovation can also aim to make the company more adaptable to changes in the market, technology, and the business environment. Agility becomes a key skill to respond quickly to evolving situations. **Process Optimization:** Innovation is not always limited to products or services. It can also involve optimizing internal processes, reducing costs, and improving operational efficiency.
11-12	**QUIZ and evaluation**	*3H*	Summative evaluation
13-14	**Case Study**	*3 H*	*Practical Application: Encourages students to apply design thinking concepts to real-world problems, emphasizing creative problem-solving.*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. _ HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒*Yes* ☐ *No*	*20%*
DS - Supervised Duty	☒*Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☒ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- ***100% CI material : Average = 20% DS + 20% CC + 60% EE***

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes ☒No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1. **"The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail"** by Clayton M. Christensen – This Courseic work examines the challenges businesses face when dealing with innovation in a disruptive way.
2. **"Blue Ocean Strategy: How to Create Undisputed Market Space and Make Competition Irrelevant"** by W. Chan Kim and Renée Mauborgne – This book offers innovative strategy concepts for creating new markets rather than simply competing in existing markets.
3. **"Design Thinking: Integrating Innovation, Customer Experience, and Brand Value"** by Thomas Lockwood – Explore the concept of design thinking as an innovative approach to solving complex problems and improving the customer experience.

7- Working environment (Facilities necessary for learning)

- *None*

Course Specification

GPAO

1. General

Coded	Ind 4 2 04	Level/Semester	*4th year /S8*	Coefficient	*3*	Credits	*4*
Course	*Industrial Engineering*					Volume. H. (CI)	
Responsible	*Saima DHOUIB*					Volume. H. (TP)	*42h*
Module	*GPAO*					Self-study (h)	*58h*

Course description (Course objective):
Computer-assisted production management is an IT tool for managing all activities linked to the production of an industrial company; optimize all production processes by controlling various costs.

Prerequisites:	*Keywords:*
Production management	*Technical data, PIC, PDP, Planning, Scheduling, Launch, Declaration, Production*

Specific objectives of the course (OBJ):
OBJ 1 : *Optimize entire production processes, from resource planning to inventory management, to increase operational efficiency.* ***OBJ 2 :*** *Planning and anticipation of manufacturing orders for better production traceability.* ***OBJ 3 :*** *Calculation and determination of costs for an in-depth definition of load distribution.*

Necessary material:
Computer Lab, CAPM Software (E- Prelude)

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. _ HR	Goals
1-2		*3*	…
…	…	…	…
11-12			

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. _ HR	Goals
1-2	*Management of technical data (Items, Nomenclatures)*	*6*	*Calculation and determination of costs for an in-depth definition of load distribution.*
3-4	*Management of technical data (cost items, ranges) and cost calculation*	*6*	
5-7	*Development of the PIC, breakdown of the PDPs and calculation of net needs*	*9*	*Optimize entire production processes, from resource planning to inventory management, to increase operational efficiency.*
8	*Supply Management and Stock Management*	*3*	
9-10	*Staking and Scheduling of Manufacturing Orders*	*6*	
11-12	*Launch and monitoring of production, declaration and measurement of indicators*	*9*	*Planning and anticipation of manufacturing orders for better production traceability.*
13- 14	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒ *Yes* ☐ *No*	*20%*
DS - Supervised Duty	☐ *Yes* ☐ *No*	
EE - Written test (Final exam)	☐ *Yes* ☐ *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☒ *Yes* ☐ *No*	*80%*

- ***Material 100% TP : Average = 20% CC + 80% EP***
- 100% CI material : Average = 40% DS + 60% EE
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☒ Yes ☐ No*
- *Authorized search engine : ☐ Yes ☒ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Brissard, JL and Polizzi, M. Tools for industrial production management, Afnor-gestion;
- Zermati, P. Practice of inventory management. Dunod;
- Vallet, G. Project planning techniques. Dunod, Paris.
- Beranger, P. The new rules of production, Dunod;
- Milan, A. Jouve, M. Communication and business organization. Collection- Breal.
- Engineering Techniques, Safety / prevention of industrial risks, AG 4- April 2004;
- COURTOIS A., MARTIN-BONNEFOUS C., PILLET M. Production management Éditions d'organization – 4th edition – 2006
- GEORGES Javel, Organization and Management of Production, Dunod, Paris, 2004;
- Alain Courtois, Maurice Pillet, Chantal Martin- Bouneffous, Production Management, organizational edition 2003.
- Anne Gratacap, Pierre Médan, Production Management : Concepts- Methods- Cases ; Dunod 2009

7- Working environment (Facilities necessary for learning)

- *Industry4.0 laboratory, computer laboratory*

Course Specification

GMAO

1. General

Coded	Ind 4 2 05	Level / Semester	*2/S4*	Coefficient	*3*	Credits	*4*
Course	*Industrial Engineering*					Volume. H. (CI)	
Responsible	*Rihem BEN NJIMA*					Volume. H. (TP)	*42h*
Module	GMAO					Self-study (h)	*58h*

Course description (Course objective):
A maintenance management computer system is a software package organized around a database making it possible to program and monitor under 3 aspects (technical, budgetary, organizational), all the activities of a maintenance service and the objects of this activity (services, workshop lines, machines, equipment, sub-assemblies, parts, etc.) from terminals located in technical offices, workshops, stores and supply offices.

Prerequisites:	*Keywords:*
- *availability, maintainability, reliability indicator*	- *work order* - *intervention voucher* - *preventive maintenance* - *operating range* - *Inventory*

Specific objectives of the course (OBJ):
OBJ 1 : *Reduce cost prices by reducing maintenance costs* ***OBJ 2 :*** *Teach students how to use Optimaint software* ***OBJ 3 :*** *reduction in maintenance costs (Allowing predictive management of maintenance* ***OBJ 4 :*** *Manage equipment fleets and spare parts (improve stock management)* ***OBJ 5 :*** *Facilitate the monitoring of maintenance activity and improve the management of maintenance documentation.* ***OBJ 6 :*** *Increase the quality of maintenance* ***OBJ 7 :*** *Extend the durability of equipment* ***OBJ 8 :*** *Facilitate the maintenance of complex systems*

Necessary material:

- *Optimaint software*

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
1-2	***Chapter 1:*** *Division of equipment fleet*	*6*	*creation of sectors* *creation of divisions* *creation of cost centers* *creation of equipment families*
3-4	***Chapter 2:*** *structural division of equipment*	*6*	*creation of equipment* *creation of an organ* *creation of a geographical tree of the company* *creation of articles*
5-6	***Chapter 3:*** *workforce management (stakeholder)*	*6*	*creation of profiles* *grant access authority*

7-8	***Chapter 4:*** *inventory*	*6*	*procurement management inventory management*
9-10	***Chapter 5:*** *supply management*	*6*	*Curative maintenance management, preventive maintenance management*
11-12	***Chapter 6:*** *management of maintenance work*	*6*	*preventive maintenance management*
13	*Case Study*	*3*	*workforce management*
14	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒*Yes* ☐ *No*	*20%*
DS - Supervised Duty	☐ *Yes* x *No*	
EE - Written test (Final exam)	☐ *Yes* x *No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☒ *Yes* *No*	*80%*

- ***Material 100% TP : Average = 20% CC + 80% EP***
- 100% CI material : Average = 40% DS + 60% EE
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ☒*No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1. Industrial Competitiveness (F. Dardy and C. Teixido)
2. **Blanchard, B. S., & Fabrycky, W. J. (2010).** ***System Engineering and Analysis*** **(5th Edition). Pearson.**
3. **Koumou, I., & Kaddour, R. (2015).** ***Maintenance Management and GMAO in Industry*****. Springer.**

7- Working environment (Facilities necessary for learning)

- *None*

Course Specification

Quality engineering

1. General

Coded	Ind 4 2 06	Level/Semester	2/S4	Coefficient	3	Credits	4
Course	*Industrial Engineering*					Volume. H. (CI)	*42h*
Responsible	*Hichem HASSINE*					Volume. H. (TP)	*0*
Module	*Quality engineering*					Self-study (h)	*53h*

Course description (Course objective):
This course aims to treat quality engineering in two complementary parts: quality management and statistical process control (SPC).

Prerequisites:	*Keywords:*
Production management- statistics	*SPC- Control card- Quality management- ISO*

Specific objectives of the course (OBJ):	
OBJ 1 :	*Present the principles of quality management*
OBJ 2 :	*Present the steps in implementing a quality management system according to ISO 9001*
OBJ 3 :	*Present and develop the different control cards*
OBJ 4 :	*Study of process capability and aptitude*
OBJ 5 :	*Study of the 6 sigma method and its implementation*

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Chapter 1/ Principles of quality management* *Introduction to certification body*	*06*	*-Presentation of the seven principles of quality management*

			-Presentation of different definition related to certification *-Presentation of the methodology of standards development*
3-4	*Chapter 1/ - Structure of ISO 9001 standard* - *Requirements of ISO 9001 standard*	*06*	*Details the requirements of ISO 9001 standard*
5-6	*Chapter 1/ - Solutions for implementing a quality management system* - *Case Study*	*06*	*-Develop a practical solution for each requirement* *-Drafting of complete version of a quality management system referring to ISO 9001 standard*
7-8	*Chapter 2/ -Statistical process control* *-Control cards for measurement* *-Control cards by attribute* *-Process capability* *Case studies*	*06*	*Presentation of different types of control card*
9-10	*Chapter 3/ Six sigma methodology* - *Presentation of the method* - *Process variability _* - *Define and measure steps*	*06*	*- Details the six-sigma methodology* *-Presentation of different tools used in this methodology (SIPOC, CTQ, Kano)*
11-12	*Chapter 3/- Analysis, Innovate and control steps* - *Case study* - *Presentation of groups works*	*03*	*Presentation of different tools used in this methodology: FMEA*
13-14	*Chapter 3/- Analysis, Innovate and control steps* - *Case study* *Presentation of groups works*	*03*	*Used in this methodology (POKA YOKE, Standardization)*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…

12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* x ☐ *No*	
DS - Supervised Duty	x *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* x ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes x ☐ No*
- *Authorized search engine : ☐ Yes x ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1. MEYER, Florent. The Lean Six Sigma Toc revolution in services: Understand, analyze and improve the performance of your service relationship. sl. : Lexitis, 2012 - 400p.

2. WOMACK, James. Lean system. sl . : Paris: Pearson France, 2012 - 464p.

3. DURET, Daniel. Quality in production: from ISO 9000 to Six Sigma - 3rd ed. sl . : Paris: Editions d'organization, 2005 - 34p.

4. PILLET, Maurice. Six Sigma: How to Apply It - 2nd ed . sl . : Paris: Editions d'organization, 2013 - 448p.

5. FOUQUE, Florent. Tool Sheet - Six Sigma DMAIC. Operational effectiveness. [Online] http://www.excellence-operationnelle.tv/17-fiches-outil-gratuites-en-avant-gout-dupremier-pack-de-fiches-deotv.php/.

6. JULES, Pauline. The Lean Six Sigma methodology at the service of quality in a production unit for dry and effervescent forms - 145p. Th. D.: Nantes: 2013.

7. GEORGE, Michael. The Lean Six Sigma Pocket Tool book: A Quick Reference Guide to 70 Tools for Improving Quality and Speed. sl: McGraw-Hill Professional, 2004 - 282p.

8. BELGRAND, Marie. Application of the DMAIC method to improving the manufacturing yield of a bilayer tablet - 110p. Th. D.: Nantes: 2013; 073.

9. Continuous improvement, Six Sigma tools, SIPOC. Marense. [Online] 2015. http://marense.com/conseil/index.php/amelioration-continue/six-sigma/outil-sixsigma/sipoc.

10. IAE Lille. Appendices: the FMEA HACCP method. Management, quality, project, examples of methods. 2004

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Embedded computing

1- Generalities

Code	Ind 4 2 07	Level/ Semester	*2/S4*	Coefficient	*3*	Credits	*3*
Course	*Industrial Engineering*					Vol. H. (CI)	
Responsible	*Saoussen BEN JABRA*					Vol. H. (TP)	*42h*
Module	Embedded computing (Python Programming)					Self-study (h)	*30h*

Course Description (Course Objective):
The aim of this course is to acquire the necessary knowledge for programming with the Python language. Specifically, the goal is to gNonep the fundamentals of the language and have a comprehensive understanding of various modules and different simple and structured types such as tuples, lists, and dictionaries.

Prerequisites:	*Keywords:*

Specific Course Objectives (OBJ):
1. *Master the fundamentals of the Python language.* 2. *Write Python scripts manipulating various non-mutable containers (strings and tuples) or mutable containers (dictionaries, lists, and sets).* 3. *Write functions and utilize predefined modules.* 4. *Manipulate files.*

2- Content Elements (Course)

Week(s)	Chapters/Content Elements	No. of Hours	Objectives
…	…	…	…

…	…	…	…
…	…	…	…

3- Content Elements (Practical work)

Weeks	Activities/ Content elements	Nbr. HR	Objectives
01	*Reminder of Problem-Solving Steps and Applications Using Algorithmics*	*3h*	*Recollection of Problem-Solving Steps and Study of Several Examples in Algorithmics*
01-02	*Introduction to the Python Language: Installation, Language Highlights, Variables, Inputs, and Outputs*	*3h*	*Getting Acquainted with the Python Environment and Testing Simple Scripts*
03-04	*Conditional and Multiple-Choice Structures, and Repetitive Structures*	*3h*	*Learning the Syntax of Simple and Compound "if," "match," "while," and "for"*
05-06	*Non-Mutable Structured Types: Strings and Tuples*	*3h*	*Manipulating Tuples and Strings and Learning Predefined Functions Dedicated to These Types*
07-08	*Mutable Structured Types: Lists*	*3h*	*Manipulating Lists,*
09-10	*Mutable Structured Types: Dictionaries*	*3h*	*Dictionaries, and Sets*
11-12	*Mutable Structured Types: Sets*	*3h*	*Learning Predefined Functions Dedicated to These Types*
13-14	*Case Study*	*3h*	*Getting Acquainted with the Python Environment and Testing Simple Scripts*

4- Evaluation methods and grade distribution

Evaluation Type	Yes /No	Tx Weighting

CC - Continuous Assessment (Test/Quiz, Presentation, Report, ...) Exam (Practical Session Exam / MP- Mini Project)	☒ *Yes*	☐ *No*	*20%*
DS - Supervised Exam	☐ *Yes*	☒ *No*	
EE - Written Exam (Final Exam) EP - Practical	☐ *Yes*	☒ *No*	
EP - Practical Exam (Practical Session Exam / Mini Project)	☒ *Yes (...)*	☐ *No*	*80%*

- ☒ ***Matière 100% Practical Work: Average = 20% Continuous Assessment (CC) + 80% Practical Exam (EP***
-)☒ Matière 100% CI : Average = 40% DS + 60% Written Exam (EE)
- ☐ *Matière CI+TP : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized Documents : ☐ Yes ☒ No*
- *Authorized Search Engine : ☐ Yes ☒ No*
- *Criteria 1: Examen TP (20 points)*

6- Web references (useful links):

- *https://docs.python.org/fr/3/tutorial/ , 2022*
- *Patrick Fuchs et Pierre Poulain, Cours de Python, Cours de Python (univ-paris-diderot.fr, 2020*
- *Gérard Swinen, Apprendre à programmer avec Python 3, chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://inforef.be/swi/download/apprendre_python3_5.pdf, 2010*

7- Working environment (Installations required for learning)

- *Python Interpreter, version 3.10.7,* https://www.python.org/downloads/.
- *Visual Studio Code Editor, version 1.73, https://code.visualstudio.com/download*

Course Specification

Ergonomics

1. General

Coded	Ind 4 2 08	Level/Semester	*2/S4*	Coefficient	*1.5*	Credits	*2*
Course	*Industrial Engineering*					Volume. H. (CI)	*21h*
Responsible	*Yassine DALLEL*					Volume. H. (TP)	*0*
Module	*ergonomics*					Self-study (h)	*28h*

Course description (Course objective):
Discover the principles of designing jobs, equipment, spaces and the work environment

Prerequisites:	*Keywords:*
Design of industrial systems	*Ergonomics, workstation, equipment, working environment*

Specific objectives of the course (OBJ):
OBJ 1 : Deepen knowledge of the physiological, cognitive and psychological capacities of individuals to design environments, products and tasks adapted to their abilities and limitations. ***OBJ 2 :*** Learn to evaluate and design ergonomic workstations taking into account factors such as posture, movement, physical and mental demands, to optimize worker comfort and productivity. ***OBJ 3 :*** Gain knowledge of ergonomic design principles applicable to products, user interfaces, tools and environments to reduce the risk of injury, fatigue and errors.

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals

1-2	*Introduction to ergonomics:* definition of ergonomics: study of the interaction between humans and their work environment. improve working conditions to promote health, comfort and efficiency.	*3*	*Understand the basic notions of ergonomics*
3-4	*Basic principles of ergonomics:* Adaptation of the environment to the worker Taking into account the capabilities of individuals Reduction of risks of musculoskeletal disorders, fatigue and work-related stress.	*3*	*Become aware of the usefulness of ergonomics*
5-6	*Areas of application of ergonomics:* Physical ergonomics: layout of workstations, design of tools and equipment to reduce physical constraints. Cognitive ergonomics: study of mental processes, cognitive load and interface design to facilitate the understanding and use of systems. Organizational ergonomics: optimization of work processes, time management, human resources and communication to improve overall performance.	*3*	*Master the different areas of application of ergonomics*
7-8	*Ergonomic methods and tools:* Ergonomic analysis Position and activity studies	*3*	*Understanding the different ergonomic tools*
9-10	*Impacts of ergonomics:* Improved productivity and quality of work. Reduction of work accidents and health problems linked to professional activity. Well-being of workers, increased motivation and job satisfaction.	*3*	*Present the different impacts of ergonomics*
11-12	*Evolutions and challenges in ergonomics:*	*3*	*Master the issues of ergonomics*

	Integrating ergonomics into the design of new workspaces. Adaptation to technological and digital developments (ergonomics of digital interfaces, teleworking).		
13-14	*Practical cases*	*3*	*Discover ergonomic situations*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒ *Yes* ☐ *No*	
DS - Supervised Duty	☒*Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes ☒No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Ergonomics at work: Principles and practices.2003. Pascal Reytier
- Karwowski, W. (2006). International Encyclopedia of Ergonomics and Human Factors (2nd Edition). CRC Press.
- Dul, J., & Neumann, W. P. (2009). Ergonomics: How to Design for Ease and Efficiency (2nd Edition). CRC Press.

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Implementation of workshops

1. General

Coded	Ind 4 2 09	Level / Semester	*2/S4*	Coefficient	*1.5*	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*21h*
Responsible	*Rihem BEN NJIMA*					Volume. H. (TP)	
Module	Implementation of workshops					Self-study (h)	*52h*

Course description (Course objective):
The objective of the workshop layout is the spatial organization of resources, of a production unit, to structure and shorten the flow of materials.

Prerequisites:	*Keywords:*
- *Graphic Representation*	- *Layout* - *range of manufacturing* - *Takt Time* - *Goulet* - *Job shop* - *Job shop*

Specific objectives of the course (OBJ):
OBJ 1 : *organization of resources, of a production unit, to structure and shorten the flow of materials.* ***OBJ 2 :*** *Job shop implementation* ***OBJ 3 :*** *Flow shop implementation*

Necessary material:
- ***O***

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-4	***Chapter 1:*** *Introduction and types of implementation*	*6*	• *Production flows* • *Organizational methods in production* • *The rules for designing a production unit*
5 -7	***Chapter 2:*** *Subdivision into production islets* *Job shop implementation*	*8*	*Method of Courseification and grouping of products* *Resolution methods* *Method chains*
8-11	***Chapter 3:*** *Implementation of a flow shop type workshop*	*8*	*encrypt service functions*
12-14	*Case Study*	*3*	*analyze service function values* *distinguish what is necessary from service functions*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒*Yes* ☐ *No*	*20%*

DS - Supervised Duty	☒*Yes*	☐ *No*	*20%*
EE - Written test (Final exam)	☒*Yes*	☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes*	☒*No*	

- ***100% CI material : Average = 20% DS + 20% CC + 60% EE***

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1. Production management – Alain COURTOIX
2. **Grieves, J. (2011). *Workshop Design and Implementation: A Practical Guide for Managers*. Routledge.**
3. **O'Neill, G., & McMahon, P. (2014). *Effective Workshops: A Guide to Running Successful Sessions*. Palgrave Macmillan.**

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Supply Chain Management

1. General

Coded	*Ind 5 1 04*	Level / Semester	*3/S5*	Coefficient	1.5	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*21h*
Responsible	*Ines BELKACEM*					Volume. H. (TP)	
Module	*Supply Chain Management*					Self-study (h)	*52h*

Course description (Course objective):
This course provides the basic tools for the SCM specialization in terms of strategy, industrial organization and decision-making using in-depth notions in the fields of operations research, operations management and economics.

Prerequisites:	*Keywords:*
Knowledge of the meaning of logistics, its scope and its approach. *knowledge of the business world,* *in-depth notions in the areas of operational research, operations management*	*SCM, value chain, planning, network theory, information system*

Specific objectives of the course (OBJ):
OBJ 1 : *Present a new reading of the notion of the logistics chain by referring to network theory.* ***OBJ 2 :*** *Explain the notion of SCM while emphasizing its fundamentals, facets and practices;* ***OBJ 3 :*** *Given more importance to the connection between SCM and value creation. Given the37 Practical SCM Tools* ***OBJ 4 :*** *Discuss the issue of SCM planning by presenting the different types of SCM problems, as well as the basic decision support tools. Given the importance of sustainable SCM*

Necessary material:

overhead projector and a computer

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. _ HR	Goals
1	*SC radiography*	*3H*	*KNOW THE BASIC CONCEPT OF SCM*
2-5 _	*the interdisciplinary nature of SCM*	*9H*	*Distinguish between the different types of SCM*
6-8	*SCM practice in 37 tools*	*9H*	*Explain the notion of SCM while emphasizing its fundamentals, facets and practices;* *Shown the37 Practical SCM Tools and its importance*
9-12	*Sustainable SCM*	*3H*	*Discuss the issue of SCM planning by presenting the different types of SCM problems, as well as the basic decision support tools. Reveals the importance of sustainable SCM*
13-14	*SCM practical case study*	*3H*	

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. _ HR	Goals
…		…	…

…		…	…
12	…	3h	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☒*No*	
DS - Supervised Duty	☒*Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒*No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes ☒No*
-
- *Criterion 1: race questions (5 points)*
- *Criterion 2: reflection questions (5 points)*
- *Criterion 3: case study (10 points)*

6- Web references (useful links):

- **Logistics strategy - Supply chain management: Foundations - Methods - Applications**
  by Alexandre Kamyab Samii

- The Supply Chain approach! Learning to manage through risks
by Cédric Stien

- ***Supply Chain Management: Creating networks with high added value***
  by Martin Christopher
- *https://www.academia.edu/search?2=&q=Pratiques%20du%20Supply%20Chain%20Management%20dossier%201*
- *https://www.isatech.fr/optimization-logistique/*
- *https://learn.microsoft.com/fr-fr/dynamics365/supply-chain/production-control/operations-resources*
- *Michel Fender , Yves Pimor . 2013. Supply Chain Logistics. DUNOD: 6th edition .*
- *Michel Fender , Franck Baron. 2012. Practice of Supply Chain Management. DUNOD.*
- *Martin Christopher. 2005. Supply Chain Management: creating high value-added networks.*
- *Akbari Jokar MR 2001. On the design of a supply chain: A global decision support approach. Doctoral thesis, National Polytechnic Institute of Grenoble.*
- *Tixier D., Mathe H. Colin J. 1996. Business logistics, towards more efficient management*

- *competitive: 2nd edition. Edition Dunod, Management sup.*
- *Cox, A. (1999), A research Agenda for supply chain thinking, Supply Chain Management: An international journal 41(4): 209-211*
- *Croom, S., Romano, P. & Giannakis, M. 2000. Supply chain management: an analytical framework for critical literature review, European Journal of Purchasing & Supply Management n°6: 67-83.*
- *Fabbe -Costes, N. 2002. Evaluating the value creation of Supply Chain Management, Logistics & Management, Vol.10 (1), pp. 29-36*
- *Thomas Zeroual, Corinne Blanquart, Valentina Carbone. 2011. Supply chain management: scope and limits - The contribution of network theories -. ESCE research notebooks,*

7- Working environment (Facilities necessary for learning)

- …

Course Specification

Project management

1. General

Coded	Ind 5 1 05	Level/Semester	*3/S5*	Coefficient	*3*	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*42h*
Responsible	*Yassine DALLEL*					Volume. H. (TP)	*0*
Module	*Project management*					Self-study (h)	*30h*

Course description (Course objective):
The project management course aims to provide students with an in-depth understanding of the principles, tools and techniques necessary for effective project management

Prerequisites:	*Keywords:*
Industrial management, information systems management	*Project, planning, scheduling, CPM, PERT, GANTT*

Specific objectives of the course (OBJ):
OBJ 1 : Introduce the fundamental concepts of project management
OBJ 2 : Familiarize students with the different methods, tools and techniques used for project management
OBJ 3 : Understand how to allocate and manage resources (human, financial, material) effectively to optimize project results.
OBJ 4 : Apply the knowledge acquired through real case studies or practical projects to enable a better understanding and integration of theoretical concepts.

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals

1-2	*Introduction to project management:* - definitions and key concepts - importance of project management	*6*	*Introduce the basic notions of project management*
3-4	*Phases of the project life cycle:* - initiation: Development of specifications, identification of stakeholders and definition of objectives. - planning: Establishment of the project plan, distribution of tasks, estimation of resources and deadlines. - execution: Implementation of the plan, coordination of teams, management of resources. - Monitoring and control: Monitoring progress, managing risks and making adjustments if necessary. - Closure: Evaluation of results, writing of reports, lessons learned.	*6*	*Understand the different phases of the project life cycle*
5-6	*Project scheduling tools and techniques:* - *Gantt chart* - *CPM method*	*6*	*Master and apply the different project scheduling methods*
7-8	*PERT method*	*6*	*Master and apply the different project scheduling methods*
9-10	*Stakeholder management:* Communication and relationships with the different parties involved in the project	*6*	*Understand the importance of communication in a project*
11-12	*Risk management:* identification, assessment and management of potential risks	*6*	*Assimilate the project risk management approach*
13-14	*Application exercises*	*6*	

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒*Yes* ☐ *No*	*20%*
DS - Supervised Duty	☒*Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒*No*	

- ***100% CI material : Average = 20% DS + 20% CC + 60% EE***

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes ☒No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- *"Project management: a systems approach to planning, scheduling and controlling"* by Harold Kerzner
- *"Effective project management: traditional, agile, extreme"* by Robert K. Wysocki
- *PMI (Project Management Institute). (2017). A Guide to the Project Management Body of Knowledge (PMBOK® Guide) (6th Edition). Project Management Institute.*
- *Kerzner, H. (2013). Project Management: A Systems Approach to Planning, Scheduling, and Controlling (11th Edition). Wiley.*

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Industry 4.0

1. General

Coded	Ind 5 1 06	Level/Semester	*3/S5*	Coefficient	1.5	Credits	3
Course	*Industrial Engineering*					Volume. H. (CI)	*21h*
Responsible	*Hamdi ABDELHADI*					Volume. H. (TP)	
Module	Industry 4.0					Self-study (h)	*52h*

Course description (Course objective):
In this course you will see a specialization overview, learn what Industry 4.0 is all about, learn about the enabling factors that made it, and become aware of what key skills to learn to be employed in the industry 4.0 market segment.

Prerequisites:	*Keywords:*
- Information system - The basics of production management - basic knowledge in electronics - basic knowledge in IT	

Specific objectives of the course (OBJ):	
OBJ 1 :	Describe the key concepts of Industry 4.0
OBJ 2 :	List the core elements of i4.0
OBJ 3 :	Being Able to Apply i4.0 concepts to a manufacturing environment

Necessary material:
- ***O***

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals

1-4	***Chapter 1:*** Overview industry 4.0	*8*	The Evolution of Industry from 1.0 to 4.0 Use cases: smart factory. Benefits of Adopting an Industry 4.0 Model Vertical and horizontal integration
5 -8	***Chapter 2:*** CPS & IT tools	6	Overview CPS IIOT & CLOUD MY ERP CRM
9-11	***Chapter 3:*** Management 4.0	*6*	Change Management for Industry 4.0
12-14	***Chapter 4:*** Competence for Industry 4.0	*6*	Lean 4.0 Worker 4.0

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals

…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☒*No*	*20%*
DS - Supervised Duty	☐ *Yes* ☒*No*	*20%*
EE - Written test (Final exam)	☐ *Yes* ☒*No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☒*Yes* ☐ *No*	

- ***100% CI material : Average = 20% DS + 20% CC + 60% EE***

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*
- *)*

6- Web references (useful links):

1. odoo.com
2. Lasi, H., et al. (2014). *Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries*. Journal of Industrial Engineering and Management, 7(3), 1-18.
3. Schwab, K. (2016). *The Fourth Industrial Revolution*. Crown Business.

7- Working environment (Facilities necessary for learning)

- *Industry 4.0 laboratory*

Course Specification

ERP Odoo

1. General

Coded	Ind 5 1 07	Level/Semester	*3/S5*	Coefficient	*3*	Credits	3
Course	*Industrial Engineering*					Volume. H. (CI)	
Responsible	*Rihem BEN NJIMA*					Volume. H. (TP)	*42h*
Module	ERP Odoo					Self-study (h)	*31h*

Course description (Course objective):
The objective of this part is the creation of a database of an industrial company with the ODOO software. To do this, you must first create a company, the different products and services offered, the customers and the suppliers.

Prerequisites:	*Keywords:*
- *availability, maintainability, reliability indicator*	- *work order* - *intervention voucher* - *preventive maintenance* - *operating range* - *stock*

Specific objectives of the course (OBJ):
OBJ 1 : *create a company's database, the different products and services offered, customers and suppliers.* ***OBJ 2 :*** *define the company's stock management rules and supply rules reduction in maintenance costs (Allowing predictive management of maintenance)* ***OBJ 3 :*** *capture, process and analyze information relating to customers and prospects, with the aim of retaining them by offering them the best service.* ***OBJ 4 :*** *manage personnel and bring together all the practices implemented to administer, recruit and develop human resources in an organization.*

Necessary material:
- Odoo *Software*

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
1-2	***TP 1:*** *Getting started, data ENTRY*	*6*	*Create a company's database, the different products and services offered, customers and suppliers.*
3 -4	***TP2:*** Inventory management	*6*	*Stock management rules and company supply rules*
5-6	***TP3:*** *Sales management*	*6*	• *Creating a quote* • *Confirmation of the quote by the customer* • *Preparation of the goods* • *Exit from stock* • *Delivery to the customer* • *Billing*
7-8	***TP4:*** *Sales process for an unavailable quantity*	*6*	*Study an example of a large quantity and urgent order*

			for a customer abroad. Available stock does not cover order quantities.
9-10	***TP 5:*** *Customer Relationship Management*	*6*	*pre-sales: this is marketing consisting of studying the market, that is to say the needs of customers or prospects, and canvassing prospects. After-sales: describes all the actions carried out with the aim of supporting customers after their purchasing actions (complaint management, satisfaction surveys, etc.).*
11-12	***TP6:*** *Human Resource Management*	*3*	*manage employees and their contracts, payroll, leave, time sheets, expense reports, recruitment , etc.*
13-14	***TP7:*** *Accounting and Financial Management*	*3*	*discover general accounting, fixed asset*

			management and budgetary management in Odoo.

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☒*No*	*20%*
DS - Supervised Duty	☐ *Yes* ☒*No*	
EE - Written test (Final exam)	☐ *Yes* ☒*No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☒*Yes* ☐ *No*	*80%*

- ***Material 100% TP : Average = 20% CC + 80% EP***
- 100% CI material : Average = 40% DS + 60% EE
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1. odoo.com
2. Chopra, A., & Kamble, P. (2018). Odoo 12 Development Essentials (2nd Edition). Packt Publishing.
3. Nobre, F., & Arantes, M. (2016). Odoo 10 Essentials (1st Edition). Packt Publishing.

7- Working environment (Facilities necessary for learning)

- *Industry 4.0 laboratory, computer laboratory*

Course Specification

Simulation of production systems

1. General

Coded	Ind 5 1 08	Level/Semester	*3/S5*	Coefficient	*3*	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*21h*
Responsible	*Faouzi MASMOUDI*					Volume. H. (TP)	*21h*
Module	*Simulation of production systems*					Self-study (h)	*29h*

Course description (Course objective):
…

Prerequisites:	*Keywords:*
Design and operation methods for production and service systems. Statistical *manufacturing tools and performance indicators*	*TRS; job shop, flow shop; inventory management; scheduling; Flow time; Waiting; delay; Statistical laws.*

Specific objectives of the course (OBJ):
OBJ 1 : *Define and calculate performance indicators for production systems* ***OBJ 2 :*** *Manual simulation of simple systems based on random numbers* ***OBJ 3 :*** *Master the modeling and simulation of industrial systems via ARENA software*

Necessary material:
Computers and "ARENA" simulation software

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Value stream mapping* *Definition of simulation and knowing when to simulate* *Reminder of performance indicator calculations*	*6*	*Know how to model and trace the flow of an industrial system*

3-4	*Advantages and limitations of simulation* *and examples of manual simulation* - Dynamics of buffer stocks - Blocking and starvation of machines - Production rate vs availability	*6*	*Have manual simulation skills with deterministic times and calculation of performance indicators*
5-6	*Definition and generation of random numbers* *Modeling and simulation project based on random numbers*	*6*	*Know how to use random numbers to manually simulate stochastic cases*
7	*Notions on Queuing Theory* *Presentations by students for simple cases*	*3*	*Bibliographic research and present practical cases*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
8-9	*Modeling and simulation of a simple and more complex queue with deterministic times on ARENA*	*6*	*Deterministic examples to be able to compare the results found*
10-11	*Modeling and simulation of a simple queue with probabilistic laws on ARENA*	*6*	*Multiple resource examples with variable flows and decision making*
12-13	*Modeling and simulation of a multi-stage queue and decision making with probabilistic laws on ARENA*	*6*	*Multi- resource examples with decision making and discussion of results*
14	*Modeling and simulation projects for evaluation of acquired knowledge*	*3*	*Face-to-face and remote projects and discussion of results*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	*20%*
DS - Supervised Duty	☒ *Yes* ☐ *No*	*20%*
EE – Final exam	☒ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☒ *Yes* ☐ *No*	

CI+TP material : Average = 20% DS + 20% EP + 60% EE

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes X No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- Bruno ANCELIN “THE SIMULATION OF PRODUCTION SYSTEMS”
French Journal of Industrial Management N° 1 - 1988
- Vincent GIARD “Simulation of production processes for goods and services”
(course version of October 16, 2015) Paris-Dauphine University
- P. CASTAGNA, N. MEBARKI & R. GAUDUEL “CONTENT OF SIMULATION AS A TOOL TO HELP MANAGE PRODUCTION SYSTEMS - APPLICATION EXAMPLES” MOSIM'01 – from April 25 to 27, 2001 - Troyes (France)
- Alexandre Dolgui, Jean-Marie Proth “Modern production systems” (2006)
Volume 1: design, management and optimization volume 2: tools and exercise corrections

7- Working environment (Facilities necessary for learning)

- *Installation of simulation software in computer rooms (example: ARENA)*

Course Specification

Lean Manufacturing

1. General

Coded	Ind 5 1 09	Level/ Semester	*3/S5*	Coefficient	1.5	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*21h*
Responsible	*Noureddine TOUMI*					Volume. H. (TP)	
Module	*Lean Manufacturing*					Self-study (h)	*51h*

Course description (Course objective):
Training on the different ''Lean Manufacturing '' tools

Prerequisites:	*Keywords:*
…	…

Specific objectives of the course (OBJ):
OBJ 1 : *Lean tools training* ***OBJ 2 :*** *Train students in good practices for using Lean tools* ***OBJ 3 :*** *Be able to use the right tools to identify waste, as well as waste elimination/reduction tools*

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. _ HR	Goals
1	*Introduction to Lean Manufacturing*	*1.5 hours*	- *History of Lean* - *Toyota Production System*

			- *JIT production*
2	*The different types of Waste (DOWNTIME)*	*1.5 hours*	- *Present the different types of Waste (DOWNTIME)* - *Impact of Waste on the increase in crossing time (Lean Time).* - *Helping students see waste*
3 *4* *5*	*Value Stream Mapping*	*4.5*	- *Product family choice* - *Mapping of the Current Value Chain (Current State Map)* - *Mapping (Design) of the future Value Chain (Future State Map)* - *Improvement plan (Kaizen Roadmap)*
6 *7*	*MRPG Group Problem Solving Methodology (8 Steps - Toyota Practical Problem-Solving Process)*	*3*	- *Definition of a Problem* - *Different problem handling methods (8D, DMAIC, A3)* - *Details of the A3 Problem Solving method (Toyota Practical Problem-Solving Process)*
8 *9*	*Toyota Improvement Kata*	*3*	- *Improvement Kata* - *Coaching Kata* - *Storyboard*
10 *11*	*SMED: Single Minutes Exchange of Dies*	*2*	- *History of SMED* - *Definition of tool change time* - *SMED as a tool for reducing this time* - *The 5 steps of the SMED approach*
12 *13* *14*	*The 5S*	*3*	- *5S numbers game* - *Presentation of 5S* - *Importance of 5S*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. _ HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☒*Yes* ☐ *No*	*20%*
DS - Supervised Duty	x *Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- ***100% CI material : Average = 20% DS + 20% CC + 60% EE***

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes ☒No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

J. Drew, B. McCallum & S. Roggenhofer, *Objectif Lean : réussir l'entreprise au plus juste*, Eyrolles - Éditions d'Organisation, Paris, 2004 (ISBN 978-2708131446)

J. P. Womack, D. T. Jones, M. Ballé & G. Beauvallet, *Système Lean : penser l'entreprise au plus juste*, Pearson Éducation, Paris, 2009 (ISBN 978-2744065552)

7- Working environment (Facilities necessary for learning)

- *Industry 4.0 laboratory, computer laboratory*

Major: Maintenance and diagnosis of industrial systems: S5

Course Specification

Reliability and operational safety

1. General

Coded	Ind -MDSI 5 1 10	Level/Semester	*3/S5*	Coefficient	*3*	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*42h*
Responsible	*Hichem HASSINE*					Volume. H. (TP)	*0*
Module	*Reliability and operational safety*					Self-study (h)	*31h*

Course description (Course objective):
This course aims to treat different tools related to reliability analysis and operational safety

Prerequisites:	*Keywords:*
Maintenance management	*Reliability- Weibull - Kelly- FMEA- operational safety*

Specific objectives of the course (OBJ):
OBJ 1 : *Present the different reliability laws*
OBJ 2 : *Study of optimization strategy based on "r, β" method*
OBJ 3 : *Presentation of different tools to ensure operational safety*

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1	*Chapter 1/ concept of reliability, maintainability and availability* *- Reliability concept* *- Maintainability concept* *- Availability concept*	*03*	*-Presentation of the three notions of: reliability, maintainability and availability* *-Presentation of indicators related to these three concepts*

2-3	*Chapter 2/ Reliability of systems* *-Approach to reliability through probabilities* *- Mathematical expressions* *- Expressions of the laws of reliability* *-Composition laws in reliability: equipment associations* *- Application*	*06*	*Presentation of reliability laws and association strategies*
4-5	*Chapter 3/ Reliability laws* - *Analysis of reliability using the exponential law* - *Analysis of reliability using Weibull's law* - *Application*	*06*	*-Presentation of methods and laws used to analyze reliability*
6-7	*Chapter 4/ Optimization of a systematic intervention period* - *Optimization with Kelly method* - *Rate of Occurrence of Failure* - *Nelson – Aalen method* - *Applications*	*06*	*-Presentation of different methods to optimize systematic intervention period*
8-9	*Chapter 5/ Operational safety* *-Concept of operational safety* *-FMEA method*	*06*	*Presentation of operational safety concept and introduction to the FEMA method*
10-11	*Chapter 5/* - *Fault tree method* - *Reliability Diagrams*	*06*	*-Presentation of fault tree method in order to aid in diagnosis*
12-13	*Chapter 5/ Operational safety* - *Reliability Diagrams* -	*06*	*Presentation of reliability analysis*
14	*Chapter 5/ Operational safety* - *Applications*	*03*	*Presentation of reliability analysis*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☒*No*	
DS - Supervised Duty	☒*Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☒*No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : ☐ *Yes x* ☐ *No*
- *Authorized search engine* : ☐ *Yes x* ☐ *No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1. Procaccia H., Aufort P., Arsenis S., The European Industry Reliability Data Bank (EIReDA), Third Edition, 1998.
2. Exida LLC, Electrical & Mechanical Component Reliability Handbook, 2005.
3. G. Thoquenne. Forecasts of bearing fatigue life. PhD Thesis. School Polytechnique, 2004.
4. Rausand M., Høyland A., System Reliability Theory, Models, Statistical Methods, and applications, Second Edition, New Jersey, Editions Wiley, 2004.
5. JH Horng, ML, and JS Lee. The contact characteristics of rough surfaces in line contact during running-in process Wear, (253), 2002, p. 899-913

6. DH Kelly, CG Barnes, RW. Freeman, and GW. Critchlow. Running in and the enchantment oh scuffing resistance. In Proc. IME Volume 206 p 425-429,
7. CC Chou and JF Lin. Tribological effects of roughness and running –in on the oil lubricated line contacts. In Proc. IME Volume 211, 2002, p.209-222, 1997.
8. P. Pawlus. A study on the functional properties of honed cylinders surface during running-in. Wear, (176): 1994, p. 247-254
9. Carroll KJ, "On the use and utility of the Weibull model in the analysis of survival data", Controlled Clinical Trials, vol. 24, 2003, p. 682-701.
10. Barger P. Evaluation and Validation of the Reliability and Availability of Distributed Intelligence Automation Systems, in the Dynamic Phase. Doctoral thesis from UHP Nancy 1, France, 2003
11. P. Lyonnet. Reliability Engineering. Edition Tec et Doc, Lavoisier, Paris 2006.
12. H. Langseth, L. Portinale, Bayesian networks in reliability, Reliability Engineering and System Safety 92 (2007) 92–108
13. XieM, Lai, CD. On the increase of the expected lifetime by parallel redundancy. Asia–Pac J Oper Res 1996; 13:171–9.
14. Guangbin Yang, Life Cycle Reliability Engineering. 2007 John Wiley & Sons, Inc. ISBN: 978-0-471-71529-0 106
15. Dragan Komljenovic, System structure and redundancy, Ecole de Technologie Superieure course , University of Quebec
16. Toshio Nakagawa, Advanced Reliability Models and Maintenance Policies, (Springer series in reliability engineering) 2008 Springer, London Limited ISBN-13: 9781848002937
17. Olivier Basile. Modeling the reliability of mechanical equipment. Final dissertation, Polytechnic Faculty of Mons, 2001.
18. P. Chapouille. Reliability. Maintainability. Engineering techniques, 6: T4300-T4305, 1980

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

Diagnosis of production systems

1. General

Coded	Ind -MDSI 5 1 11	Level/Semester	3/S5	Coefficient	3	Credits	3
Course	*Industrial Engineering*					Volume. H. (Cl)	*42h*
Responsible	*Saif MAMI*					Volume. H. (TP)	*0*
Module	*Diagnosis of production systems*					Self-study (h)	*29h*

Course description (Course objective):
Diagnosis of production systems

Prerequisites:	*Keywords:*
Basic knowledge of computers, Knowledge of industrial electrical, mechanical and pneumatic technologies, good mastery of reading electrical and mechanical diagrams.	*Diagnostic sheet, diagnostic software, sensor, control device, actuator; Type of maintenance (conditional, preventive), failure* *FMEA*

Specific objectives of the course (OBJ):
OBJ 1 : *Acquire a fault-finding methodology to optimize corrective maintenance interventions in different technologies (electrotechnics, pneumatics, hydraulics and automation.* ***OBJ 2 :*** *Know how to use diagnostic software*

Necessary material:
Diagnostic software

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. _ HR	Goals

1-2	*1- General information on the main methods of industrial maintenance management (curative maintenance* *- Progress of a troubleshooting intervention - Intervention report - Reporting to the historical file* *- Use of a historical file* *2- Preventive maintenance* *3- The challenges of maintenance* *- Failure costs, - repair costs, - production losses,*	*9h*	*Understand the types of maintenance, the progress of a repair intervention and how to write reports*
3-	*TD on types of maintenance, failure cost, maintenance cost, etc.*	*3h*	*Know how to calculate maintenance costs, failure costs, write a DI sheet*
4	*Hardware behavior* *-Learn about the origin of the breakdown: Analyzes of breakdowns and their issues* *-Failure modes: More implicit diagnosis through the collection of information*	*3h*	*Develop a diagnostic method enriched in advance with a description of the situation (pre-diagnose*
5	*Problem solving method* *1)Problem solving methods applied to fault diagnosis* *- the SORA method (Locate? Observe? Think? Act) - collection of information - the toolbox: QQOQCPC, The 5 whys, the tree of causes, the functional analysis, Pareto, the action plan, the report*	*3h*	*Understand fault finding and problem-solving methods such as Pareto, fault tree, etc.*
6-7	*Pareto method, fault tree, the 5 whys, FMEA system…*	*6h*	*Know how to apply fault finding methods (FMEA, ABC, fault tree, etc.) to resolve problems*
8-9	***Problem solving method*** *2)Technical approach*	*6h*	*Know how to use the multimeter, ohmmeter, oscilloscope to diagnose certain electrical*

	- GRAFCET as a sequential automation troubleshooting tool - Visualization - Measuring techniques: - Electrical troubleshooting methodology using a voltmeter *- Reminder on continuity measurements with the voltmeter under voltage (value of the ddp.) or with the ohmmeter without voltage (ohmic value with wire cut or not) - The untimely control of contactors, what redundancy and discordance consist of, how treat it* *- Safety during interventions*		*components such as contactors, circuit breakers, sensors…*
10-11-12	*TD (Situations on machine)* *-Methodology for electrical troubleshooting using a voltmeter or ohmmeter in a situation.* *-Practical troubleshooting exercises (on automated installations).* *-Fault diagnosis systems. Risks linked to installation failures.* *3 sessions will be devoted to this chapter where each session we study a different system:* *1- A mechanical system (variator + electric motor + reducer + plastic feed screw)* *2- An electrical system where we study an automatic temperature regulation system* *3- A pneumatic system where we study an automatic incrementing and cutting system*	*9*	*Know how to read industrial diagrams (electrical, mechanical, etc.) and how to isolate the faulty system then carry out a complete diagnosis on each element of this system in order to find the fault and propose the necessary repairs.* *Finally knowing how to write a diagnostic sheet.*
13	*Use of diagnostic software (AUTODATA example)*	*6h*	*Know how to use diagnostic software (access technical repair procedures, read diagnostic codes*
14	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

3- Content elements (Practical work)

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	x *Yes* ☐ *No*	*20%*
DS - Supervised Duty	x *Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- ***100% CI material : Average = 20% DS + 20% CC + 60% EE***

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☐ No*
- *Authorized search engine : ☐ Yes ☐ No*
  - *Criterion 1: Understanding of the content (4 points)*
  - *Criterion 2: Application of knowledge (10 points)*
  - *Criterion 3: Critical analysis (4 points)*
  - *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

- *Author, Title, Year*
  - Jean-Pierre Vernier, François Monchy, Maintenance : Methods and Organizations, 3rd edition Dunod, 2010.
  - Jean-Pierre Vernier, François Monchy, Maintenance: Methods and organizations for better productivity, 3rd edition Dunod, 2012
  - JM Bleux, JL Fanchon, Maintenance: Automated production systems Nathan edition, January 2000.
  - J.-P. Cassar and M. Staroswiecki: A structural approach for the design of failure detection and identification systems. Proc IFAC, IFIP, IMACS Conference on Control of Industrial Systems, 1997.
  - V. Cocquempot: Contribution to the monitoring of complex industrial processes - dissertation for authorization to direct research, 2004
  - J. Brunet, D. Jaume, M. Labarrère, A. Rault and M. Vergé: Fault detection and diagnosis. Hermes, 1990.
  -

7- Working environment (Facilities necessary for learning)

- *None*

Major: Quality and continuous improvement: S5

Course Specification

Quality audit

1. General

Coded	Ind -QAC 5 1 10	Level/ Semester	*3/S5*	Coefficient	*3*	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*42h*
Responsible	*Kamel GARFA*					Volume. H. (TP)	
Module	*Quality audit*					Self-study (h)	*31h*

Course description (Course objective):

- ***Training aims***

Train auditors capable of auditing a management system according to the principles and guidelines of the ISO 19011 v 2018 standard

- ***educational goals***

HAS At the end of the training, the candidate becomes able to identify the responsibilities of the auditor and the audit team

- ***Define audit objectives***
- ***Plan the audit and develop the audit guide***
- ***Lead opening and closing meetings***
- ***Interviewing (questioning strategy) and taking notes***
- ***Practice formalizing findings***
- ***Structuring an audit report***
- ***Assess the relevance and effectiveness of corrective actions***

Prerequisites:	*Keywords:*
Quality Management, standards and certification, implementation of management systems,	*Quality, audit, processes, standards, certification, compliance*

Specific objectives of the course (OBJ):

OBJ 4 : *Master the audit process*

OBJ 5 : *Mastery of the ISO 19011v2018 standard*

OBJ 6 : *Identify deviations, audit procedures, and corrective action plans*

Necessary material:
Video projection,

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Introductory chapter*	*6*	*Master some basic notions*
3-6	*Chapter I: Requirements of ISO 19011 version 2018 & Evidence-based audit approach*	*12*	*Mastery of the audit standard and assimilation of the different audit evidence*
7-9	*Section I: Requirements of the ISO 19011 version 2018 standard*	*9*	
10-11	*Section II Evidence-based audit approach with exercises*	*6*	*Audit evidence*
12	*Chapter II: Management & execution of an audit with application exercises*	*3*	*Audit process*
13	*Section I: Audit Program Management*	*3*	*Understand the stages and objectives of Audit Program Management*
14	*Section 2: Realization - PROCEDURES - AUDIT METHODOLOGY, with exercises and simulations*	*3*	*Understand the quality audit implementation process*

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	☒*Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒*Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☒Yes ☐ No*
- *Authorized search engine : ☐ Yes ☒No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

ISO 9001 V2015 standard…

ISO 19011:2018. *Guidelines for Auditing Management Systems*. International Organization for Standardization (ISO).

7- Working environment (Facilities necessary for learning)

- *None*

Course Specification

QHSE

1. General

Coded	Ind -QAC 5 1 11	Level/Semester	*3/S5*	Coefficient	*3*	Credits	*3*
Course	*Industrial Engineering*					Volume. H. (CI)	*42h*
Responsible	*Maissa CHaibi*					Volume. H. (TP)	
Module	*QHSE*					Self-study (h)	*29h*

Course description (Course objective):

The QHSE course refers to training focused on the areas of Quality, Health, Safety, and Environment within an organization. These four aspects are often grouped under the acronym QHSE to emphasize the importance of integrating them holistically into the management of an enterprise's activities.

*1. **Quality (Q): ** This aspect focuses on continuous improvement of processes, products, and services to meet established quality standards. Quality management systems, such as the ISO 9001 standard, are often addressed in the context of QHSE training.*

*2. **Health (H): ** This encompasses practices aimed at ensuring the cleanliness, health, and well-being of employees. It may include personal hygiene standards, waste management, infection control, etc.*

*3. **Safety (S): ** Workplace safety is a crucial aspect to minimize the risks of accidents and injuries. This can include training on safety procedures, the use of personal protective equipment (PPE), incident management, etc.*

*4. **Environment (E): ** This aspect focuses on reducing the environmental impact of the company's activities. It may include compliance with environmental regulations, waste management, energy consumption reduction, etc.*

In the context of the QHSE course, participants are typically exposed to the fundamental principles of each domain, associated standards and regulations, as well as best practices to effectively integrate these aspects into the organizational culture. The ultimate goal is to create a work environment that is safe, healthy,

environmentally friendly, and quality-oriented while meeting legal requirements and stakeholder expectations

Prerequisites:	*Keywords:*
Management, Organization of a Company	*ISO 9001, ISO 14001, ISO 45001, organization, quality, safety, environment, security,* Quality Management System

Specific objectives of the course (OBJ):
OBJ 1 : **Improve compliance rates with standards …**
OBJ 2 : **Reduce the number of workplace safety incidents**
OBJ 3 : **Achieve and maintain ISO 9001 certification**
OBJ 4 : **Reduce the company's carbon footprint**
OBJ 5 : **Improve customer satisfaction**
OBJ 6 : **Reduce hygiene-related accidents**
OBJ 7 : **Optimize the use of natural resources**

Necessary material:
Video projector

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	***Introduction,*** ***Chapter 1: Fundamentals of Quality Management*** *- The Quality Management System, what is quality, Quality management, Principles of QMS, Documentation of the Quality Management System, Standardization of Quality Management Systems.*	*6H*	The objectives of the "Fundamentals of Quality Management" typically encompass understanding and implementing key principles and practices to ensure the delivery of high-quality products or services within an organization.
3-4	*CHAPTER 2: ISO 9001:2015 Standard Requirements* *1. Introduction (Sections 0 to 3):* *- 0. Introduction*	*6H*	- Provide a list of references to documents that are essential for the understanding and implementation of the standard.

	- 1. Scope *- 2. Normative references* *- 3. Terms and definitions* *2. Organizational Context (Section 4):* *- 4.1 Understanding the organization and its context* *- 4.2 Understanding the needs and expectations of interested parties* *- 4.3 Determining the scope of the quality management system* *- 4.4 Quality management system and its processes*		-Establish an understanding of the organization and its context, identifying internal and external factors that can impact the EMS.
5-6	*3. Leadership (Section 5):* *- 5.1 Leadership and commitment* *- 5.2 Quality policy* *- 5.3 Roles, responsibilities, and authorities within the organization* *4. Planning (Section 6):* *- 6.1 Actions to address risks and opportunities* *- 6.2 Quality objectives and planning to achieve them*	*6H*	-Emphasize the importance of leadership and commitment from top management for the effectiveness of the EMS. - Detail the requirements for addressing risks and opportunities, establishing environmental objectives, and planning actions to achieve them.
7-8	*5. Support (Section 7):* *- 7.1 Resources* *- 7.2 Jurisdiction* *- 7.3 Awareness* *- 7.4 Communication* *- 7.5 Documented information* *6. Operational Activities (Section 8):* *- 8.1 Operational planning and control* *- 8.2 Determination of requirements for products and services*	*6H*	- Specify the resources, competence, awareness, communication, and documented information necessary to support the EMS. - Provide guidance on planning and controlling operational processes, determining environmental aspects and impacts, setting objectives, and controlling emergency situations. - Establish requirements for monitoring, measurement, analysis, and evaluation, including internal audits and management reviews. - Define the processes for handling nonconformities, implementing

	- 8.3 Design and development of products and services *- 8.4 Control of processes, products, and services provided by external providers* *- 8.5 Production and service provision* *- 8.6 Release of products and services* *7. Performance Evaluation (Section 9):* *- 9.1 Monitoring, measurement, analysis, and evaluation* *- 9.2 Internal audit* *- 9.3 Management review* *8. Improvement (Section 10):* *- 10.1 non-conformity and corrective action* *- 10.2 Continuous improvement*		corrective actions, and fostering continuous improvement of the EMS. - Define the processes for handling nonconformities, implementing corrective actions, and fostering continuous improvement of the EMS.
9-10-11	Chapter 3: ISO 14001:2015 Standard Requirements - Emphasis on Differences from ISO 9001	*4.5H*	The ISO 14001:2015 standard sets forth objectives aimed at helping organizations establish and maintain an effective Environmental Management System (EMS).
12-13-14	Chapter 4: ISO 45001:2015 Standard Requirements - Emphasis on Differences from ISO 9001	*4.5H*	he objectives of ISO 45001 are designed to help organizations establish a systematic approach to managing occupational health and safety risks and promoting a safe and healthy work environment.

3- Content elements (Practical work)

Week(s)	Activities/Content Elements	No. HR	Goals
3-4	case study: *Commencing the initial steps to establish a Quality Management System (QMS): conduct a SWOT analysis to identify internal and external issues of the company, determine stakeholders and their requirements,*	*3h*	To thoroughly understand the requirements and be capable of implementing them

	and finally, develop the process map along with their interactions.		
5	Draft the quality policy, allocate resources, and fill out job sheets according to the case study.	*1.5H*	Mastering the requirements
6	Drafting process and procedure sheets, writing minutes for the management review, and developing an improvement plan."	*1.5H*	Become familiar with the requirements.
7	Develop an emergency plan +QUIZ	*1.5H*	Become familiar with the requirements
8	Create a quiz on the three standards.	*1.5H*	*Assessment*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	☒ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒ *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : ☐ Yes ☒No*
- *Authorized search engine : ☐ Yes ☒No*
- *Criterion 1: Understanding of the content (4 points)*
- *Criterion 2: Application of knowledge (10 points)*
- *Criterion 3: Critical analysis (4 points)*
- *Criterion 4: Clarity and organization (2 points)*

6- Web references (useful links):

1. "ISO 9001:2015 - Quality management systems - Requirements" - International Organization for Standardization (ISO).

2. "ISO 14001:2015 - Environmental management systems - Requirements" - International Organization for Standardization (ISO).

3. "Occupational Health and Safety Management Systems - Requirements (ISO 45001:2018)" - International Organization for Standardization (ISO).

4. "Introduction to Health and Safety at Work" by Phil Hughes and Ed Ferrett.

5. "Safety and Health for Engineers" by Roger L. Brauer.

6. "Environmental Science: A Global Concern" by William P. Cunningham and Mary Ann Cunningham.

7. "Quality Management for Organizational Excellence: Introduction to Total Quality" by David L. Goetsch and Stanley Davis.

8. "Occupational Health and Safety" by Robert V. Sims.

7- Working environment (Facilities necessary for learning)

- *None*
- *…*
-

language module sheets

Process of test of placement LANGUAGES (English & French)

- ***New students :***

Registration & Admission

All the new students has their admission has the PI register in line via a platform dedicated to the passage of tests level of languages “MyEPIADMISSION”

They provide of the information personal such that their name, their address E-mail And their number of CIN ..

Planning & Passage of Test of level :

A times registered, THE students receive a confirmation registration And are scheduled For pass the tests in English And in French

THE tests are planned In THE labs of LANGUAGES .They pass THE test of language on PC (MCQ) Who evaluate their SKILLS linguistics

Fix of the Testing of level :

THE tests are corrected automatically by the software And the results are generated instantly once that THE test East finished.

THE results are analyzes For determine the level of language of each student .

Attribution of the levels of language :

THE levels are based on of the standards international such that THE frame European common of reference For the LANGUAGES (CEFR)

Ranking In the groups of LANGUAGES & Notification of the results :

In function of their level of language, THE students are assigned has of the groups of language appropriate.

These groups can be constituted in function of level :

1- Beginner =A
2- Intermediate =B
3- Advanced = C

Notification of the results ;

THE students receive their results via the app And Who understand their level of language And their assignment has A band specific

THE students are Next affected In their groups of language according to THE jobs of LANGUAGES displayed on the app

Follow up And assessment :

THE progress of the students are followed All At long of their course learning

Of the assessment periodicals are carried out such that (projects PPT , tests oral, exercises ..) For adjust their progression in function of their needs .

These process guarantee a assessment precise of level of language of the students And their assignment has of the course appropriate For to favor their learning linguistic

Former students:

Transition of former students from one level to another:

For language levels (former 23.24 => 24.25)

Initial level = A & Average 23.24 <13 ❼ Level A (24.25)
Initial level = A & Average 23.24>13 ❼ Level B (24.25)
** Initial level = B & Average 23.24 <13 ❼ Level B (24.25)
** Initial level = B & Average 23.24 >13 ❼ Level C (24.25)
**Level C =>15 ❼ Level C (24/25)

Course Specification

French (Level A)

1. General

Coded	*EN-ABC*	Level/Semester	*1-2*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21h*
Responsible	*Sami MZOUGHI*					Volume. H. (TP)	*0*
Module	*Languages & Communication*					Self-study (h)	*20h*

Course description (Course objective):
A -level French courses aim to develop the student's ability to understand the essential points of a message written in clear, standard language. The course materials are taken from Inspire 3, a DELF manual. They also aim to prepare the student to produce simple and coherent speeches on familiar subjects. Oral is

preferred in all sessions.

Prerequisites:	*Keywords:*
Understand simple, decontextualized sentences. Communicate in a simple way.	*Understand, listen, communicate, react*

Specific objectives of the course (OBJ):
OBJ 1 : *Understand the materials and respond to instructions.*
OBJ 2 : *Participate orally in debates around the proposed subject.*
OBJ 3 : *Form a personal opinion.*

Necessary material:
Sound recording / JBL

2- Content elements (Course)

Week(s)	Chapters/Content Items	#HR	Goals
1-2	*1st unit: Is it possible to be different and live together?*	*3 hours*	*- talking about oneself* *- understand others.* *- explain cultural differences.*
3-4	*2nd Unit: Are we all journalists?*	*3 hours*	*- talk about information professions.*

			- transmit information. *- question the information.*
5-6	*3rd Unit: Why do we travel?*	*3 hours*	*Tell about an experience.* *- talk about tourism* *- think about the trip.*
7-8	*4th Unit: Describing a profession*	*3 hours*	*- collect information about a profession.* *- talk about responsibilities.* *- the skills required for each profession.*
9-11	5th Unit: Organize a remote activity	4.5 hours	- discuss teleworking. - understand the advantages and challenges of managing remote activities.
12-14	6th Unit: Can we fight inequalities?	4.5 hours	- tell about a commitment. - to give his opinion. - talk about inequalities.

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No		Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes*	☒ *No*	-
DS - Supervised Duty	☒ *Yes*	☐ *No*	*40%*
EE - Written test (Final exam)	☒ *Yes*	☐ *No*	*60%*
EP - Practical test (TP- TP/MP exam- Mini project)	☐ *Yes*	☒ *No*	-

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria (of written production)

- *Authorized documents* : ☐*Yes*☐ *No*
- *Search engine allowed* : ☐*Yes*☐ *No*
- *Criterion 1: Understanding of the instructions: (8 points)*
- *Criterion 2: Relevance of ideas: (4 points)*
- *Criterion 3: Linguistic correction: (6 points)*
- *Criterion 4: Originality: (2 points)*

5- Web References (useful links):

- *Author, Title, Year*
- Learn.TV5Monde

6- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

French (Level B)

1. General

Coded	*EN-ABC*	Level/Semester	*3-4*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21*
Responsible	*Sami MZOUGHI*					Volume. H. (TP)	*0*
Module	*Languages & Communication*					Self-study (h)	*20h*

Course description (Course objective):
Level B courses set the objectives of understanding audio documents, understanding press articles and other authentic texts. Written production sessions are also on the program to introduce the student to the code of writing by inviting them to write various texts. The course materials are taken from Inspire 4, a DELF manual.

Prerequisites:	*Keywords:*
The student can understand isolated sentences and frequently used expressions. He can also communicate orally and describe his training using simple means, and address some subjects that concern him closely.	*Understand, communicate, describe, discuss subjects.*

Specific objectives of the course (OBJ):
OBJ 4 : *Understand the educational documents specific to each lesson.* ***OBJ 5 :*** *Take a position on the subjects or problems raised by the materials.* ***OBJ 6 :*** *Imagine other ways of acting.*

Necessary material:
Paper version documents / Sound recordings / JBL

2- Content elements (Course)

Week(s)	Chapters/Content Items	#HR	Goals
1-2	*Does work have the same meaning today?*	*3 hours*	*explain professional trends*

			analyze the workplace. *reveal professional taboos.*
3-4	*How is technology transforming our lives?*	*3 hours*	*- improve a living space.* *- take a position on virtual meetings.* *- imagine new worlds.*
5-6	*Can we still save the planet?*	*3 hours*	*- make an inventory of pollution.* *-alert the public to a risk.* *-propose solutions*
7-8	*Is politics everyone's business?*	*3 hours*	*- define rights and duties.* *- defend a commitment.* *- question the right to vote.*
9-11	*Are we prisoners of our appearance?*	*4.5 hours*	- tell of discrimination. -imagine the human of the future. - talk about your appearance.
12-14	Is happiness utopian?	4.5 hours	- give a definition of happiness. - analyze preconceived ideas. - envision happiness.

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting

CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes*	☒*No*	-
DS - Supervised Duty	☒*Yes*	☐*No*	*40%*
EE - Written test (Final exam)	☒*Yes*	☐*No*	*60%*
EP - Practical test (TP- TP/MP exam- Mini project)	☐ *Yes*	☒*No*	-

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria (of written production)

- *Authorized documents : ☐Yes☐ No*
- *Search engine allowed : ☐Yes☐ No*
- *Criterion 1: Understanding of the subject and organization of the text: (8 points)*
- *Criterion 2: Care given to expression (6 points)*
- *Criterion 3: Knowledge of the subject: (4 points)*
- *Criterion 4: Originality of ideas: (2 points)*

5- Web References (useful links):

- *Author, Title, Year*
- *Learn.TV5Monde*

6- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

French (Level C)

1. General

Coded	*EN-ABC*	Level/Semester	*5-6*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21*
Responsible	*Sami MZOUGHI*					Volume. H. (TP)	*0*
Module	*Languages & Communication*					Self-study (h)	*20h*

Course description (Course objective):
The French Communication Techniques course, at level C, aims to develop three skills in the student: Comprehension of writing (CE), Oral production (PO) and Written production (PE), with a view to preparing them for the DELF exam. The course material is generally a paper version document which offers various educational activities, relating to the materials. The role of the teacher is to provide the student with a certain autonomy in the search for answers. The supports are those of DELF B 2, 2nd Edition - 100% SUCCESS.

Prerequisites:	*Keywords:*
In principle, the student should have the following abilities: understand the essential points of a discussion, a text, a press article when the language used is clear and standard and when it concerns familiar subjects having relates to the daily life of the student.	*Understand, listen well, interact*

Specific objectives of the course (OBJ):
OBJ 7 : *Make reading hypotheses and generally understand the content of a document.* ***OBJ 8 :*** Enter message scopes. ***OBJ 9 :*** React to messages. ***OBJ 10 :*** For PE, acquire a methodology allowing successful written productions.

Necessary material:
Paper version documents - Sound recordings - JBL

2- Content elements (Course)

Week(s)	Chapters/Content Items	#HR	Goals

1-2	*CE: How to read a text? / A set of short texts.* *PE: Analysis of the instructions / Different statements of written production*	*3 hours*	*Help the student understand various texts.* *Understand what is required by the instructions.*
3-4	*CE: Analysis of positions/testimonies* *PE: Learn to present a situation, facts / Various texts.*	*3 hours*	*Identification of tone, point of view.* *Learn to identify a situation, facts*
5-6	*CE: Search for relevant information / Various texts.* *PE: Expression of personal opinion / PE topics.*	*3 hours*	*Identification of the content of a text.* *Help to formulate ideas, to qualify your comments, to formulate proposals*
7-8	*informative text: its content, its characteristics.* *PE: Text production / Writing workshop.*	*3 hours*	*Enter the content of a text and report it in writing.* *PE: Master the structure of the text to be produced.*
9-11	*CE: The argumentative text / Various texts* *PE: Writing a formal letter. / Written production instructions.*	*4.5 hours*	*CE: Learn to recognize an argumentative text and gNonep its specific features.* *PE: Learn the formal characteristics of the letter.*
12-14	*CE: Analysis of points of view / Written testimonies*	*4.5 hours*	*Recognize the different positions and their nuances.*

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No		Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes*	☒ *No*	-
DS - Supervised Duty	☒ *Yes*	☐ *No*	*40%*
EE - Written test (Final exam)	☒ *Yes*	☐ *No*	*60%*
EP - Practical test (TP- TP/MP exam- Mini project)	☐ *Yes*	☒ *No*	-

- *Material 100% TP : Average = 20% CC + 80% EP*
- *100% CI material : Average = 40% DS + 60% EE*
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria (of written production)

- *Authorized documents : ☐ Yes ☐ No*
- *Search engine allowed : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the subject structuring of the text: (8 points)*
- *Criterion 2: Relevance of the argument: (6 points)*
- *Criterion 3: Linguistic correction: (4 points)*
- *Criterion 4: Originality of ideas: (2 points)*

5- Web References (useful links):

- *Author, Title, Year*
- Learn.TV5Monde

6- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

English (A level)

1. General

Coded	*ENG-ABC*	Level/Semester	*1-2*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21*
Responsible	*Sawcen LAAMIRI*					Volume. H. (TP)	*0*
Module	*Languages & Communication*					Self-study (h)	*24h*

Course description (Course objective):
Whether you already have some basic English or are completely new to it, our English program is divided into three levels (A, B and C). At the start of the academic year, your teacher will define your objectives with you and test your level during an initial assessment in order to help you integrate one of the three levels. *- You will be able to acquire or strengthen your basics in business English as well as your self-confidence.* *- You will review and learn the grammatical, oral and written basics.* *- You will learn to communicate orally and in writing and you will enrich your vocabulary.* *- You will be able to respond orally and follow a conversation.*

Prerequisites:	*Keywords:*
Level A: *No specific knowledge necessary*	*Business English*

Specific course objectives (OBJ):
OBJ 11 : *Oral expression: acquisition of vocabulary relating to working English (Business English)* ***OBJ 12 :*** *Written expression: writing letters, messages, formats, references, abbreviations, etc.* ***OBJ 13 :*** *The fundamentals: tense, auxiliaries, adjectives, comparatives, pronouns*

Necessary material:
The printed course purchased from the printing, data show and baffles service

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*The working day*	*3h*	*Vocab: Company departments (ex: HR, PR, finance) and job titles (ex: production manager)* *Gr: present simple and present continuous*
3-4	*Corporate culture*	*3h*	*Vocab: corporate culture vocabulary and asking for information* *Gr: collocations*
5-6	*Developing contacts*	*3h*	*Networking vocabulary, present perfect and past simple tenses*
7-8	*Cultural issues*	*3h*	*Cultural awareness, marketing in China and business in Finland vocabulary*
9-10	*Teamwork*	*3h*	*Describing a team, slogans, team-building and verbs with their corresponding nouns and adjectives*
11-12	*Job applications*	*3h*	*How to write a CV, a letter of application and wait for an interview*
13-14	*Revision*	*3h*	*Tenses and vocabulary of all chapters*

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No		Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes*	☒ *No*	
DS - Supervised Duty	☒ *Yes*	☐ *No*	*40%*
EE - Written test (Final exam)	☒ *Yes*	☐ *No*	*60%*

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria (of written production)

- *Authorized documents : ☐ Yes ☐ No*
- *Search engine allowed : ☐ Yes ☐ No*
- *Criterion 1: Understanding of the subject structuring of the text: (8 points)*
- *Criterion 2: Relevance of the argument: (6 points)*
- *Criterion 3: Linguistic correction: (4 points)*
- *Criterion 4: Originality of ideas: (2 points)*

5- Web References (useful links):

- *TOIC; TOFEL*

6- Working environment (Facilities necessary for learning)

- *None*
- ...

Course Specification

English (level B)

1. General

Coded	*ENG-ABC*	Level/Semester	*3-4*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21h*
Responsible	*Sawcen LAAMIRI*					Volume. H. (TP)	*0*
Module	*Languages & Communication*					Self-study (h)	*24h*

Course description (Course objective):
Whether you already have some basic English or are completely new to it, our English program is divided into three levels (A, B and C). At the start of the academic year, your teacher will define your objectives with you and test your level during an initial assessment in order to help you integrate one of the three levels. *You will be able* ***to acquire or strengthen your basics in business English*** *as well as your self-confidence. You will review and learn the grammatical, oral and written basics. You will learn to communicate orally and in writing and you will enrich your vocabulary. You will be able to respond orally and follow a conversation.*

Prerequisites:	*Keywords:*
Level B: *No specific knowledge necessary*	*Business English*

Specific course objectives (OBJ):
OBJ 14 : *Oral expression: acquisition of vocabulary relating to working English (Business English)* ***OBJ 15 :*** *Written expression: writing letters, messages, formats, references, abbreviations, etc.* ***OBJ 16 :*** *The fundamentals: tense, auxiliaries, adjectives, comparatives, pronouns*

Necessary material:
The printed course purchased from the printing, data show and baffles service

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Job description and job satisfaction*	*3h*	*Vocab: Company departments, corporate culture vocabulary* *Gr: asking questions at a job interview*
3-4	*Letters of enquiry and applications*	*3h*	*Vocab: How to write a letter of enquiry and an email of application* *Gr: complex questions*
5-6	*Promotional activities and branding*	*3h*	*The 15 different promotional activies, the power of brands, supermarkets' own brands*
7-8	*Presenting your business idea*	*3h*	*Vocab: Structuring a presentation, signalling the parts of a presentation, making the most presentations* *Gr: modal verbs*
9	*Business meetings*	*1h30*	*Vocab: Why have meetings? purpose, benefits, importance of team discussions* *Gr: use of "too" and "enough"*
10-11	*Customer loyalty*	*3h*	*Vocab: the factors which make customers loyal to a company, words and definitions* *Gr: relative pronouns*
12-13-14	*Revision*	*4h30*	*Revision of the tenses and vocabulary of all chapters*

3- Methods evaluation & marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☐ *No*	
DS - Supervised Duty	☒ *Yes* ☒ *No*	*40%*
EE - Written test (Final exam)	☒ *Yes* ☐ *No*	*60%*

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria (of written production)

- *Authorized documents : ☐Yes☐ No*
- *Search engine allowed : ☐Yes☐ No*
- *Criterion 1: Understanding of the subject structuring of the text: (8 points)*
- *Criterion 2: Relevance of the argument: (6 points)*
- *Criterion 3: Linguistic correction: (4 points)*
- *Criterion 4: Originality of ideas: (2 points)*

5- Web References (useful links):

- *TOIC; TOFEL*

6- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

English (level C)

1. General

Coded	*ENG-ABC*	Level/Semester	*5-6*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21h*
Responsible	*Sawcen LAAMIRI*					Volume. H. (TP)	*0*
Module	*Languages & Communication*					Self-study (h)	*24h*

Course description (Course objective):
Improve your English to communicate in writing and orally in a professional Courseroom context, and prepare for the TOEIC test (Test of English for International Communication). Prepare to improve your TOEIC score in 18 hours of lessons. ***TOEIC teaching resources and methods:*** *Table, internet access. Interactivity with the teacher. Refresher, time management strategy, practical exercises, mini tests targeted to student needs, detailed corrections. Review of progress made. Tips and revision strategy before the exam.* ***Composition :*** *200 multiple choice questions (MCQ)* • *100 oral comprehension questions with audio support (4 exercises, duration 45 minutes)* • *100 written comprehension questions (3 exercises, duration 75 minutes)* ⇨ *The TOEIC is based on authentic examples taken from international professional situations (meetings, travel, telephone, etc.)* ***Results:*** *a distinct assessment of oral comprehension and written comprehension* • *a score of 5 to 495 points for each* • *a total score between 10 and 990 points*

Prerequisites:	*Keywords:*
Level C: *This course is intended for all students registered at level C in order to take the TOEIC exam*	*TOEIC, time management, oral and written*

Specific course objectives (OBJ):	
OBJ 17 :	*Prepare in the best conditions for taking the TOEIC*
OBJ 18 :	*Master the essential points of grammar and conjugation*

OBJ 19 :	*Enrich your vocabulary*
OBJ 20 :	*Improve your oral and written comprehension*

Necessary material:
The printed course purchased from the printing, data show and baffles service

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	***Detailed overview of the exam***	*3h*	• *General presentation of the test and its objectives.* • *Detailed breakdown of the test: written part/oral part.* ⇨ *Complete mock test in real time, complete and detailed correction*
3-4	***Assessment of student level and revisions***	*3h*	• *Review of current knowledge, strengths and areas for improvement.* • *Consolidation at the level of fundamental grammatical structures* ⇨ *Fill-in-the-blank exercises, multiple choice questions, reformulation exercises*
5-6-7	***Preparation for the oral comprehension part***	*4h30*	• *Listening and reconstitution of professional dialogues.* • *Improved oral comprehension.* • *Vocabulary recognition* • *Understand the story of a current event or a news item: know how to distinguish the main elements (date, place, actions, etc.).*
8-9-10	***Improvement of written comprehension***	*4h30*	• *Work on enriching everyday vocabulary* • *Work to enrich professional and commercial vocabulary.* • *Know how to read and analyze documents used in professional situations: e-mails, summaries, reports, notices, etc.*

11-12-13-14	***Final mock test***	*6h*	• *Real exam situation to evaluate and validate your progress. Detailed correction*

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☒ *No*	
DS – Supervised duty	☒ *Yes* ☐ *No*	*40%*
EE - Written test (Final exam)	☒ *Yes* ☐ *No*	*60%*

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

4- Evaluation criteria (of written production)

- *Authorized documents : ☐Yes☐ No*
- *Search engine allowed : ☐Yes☐ No*
- *Criterion 1: Understanding of the subject structuring of the text: (8 points)*
- *Criterion 2: Relevance of the argument: (6 points)*
- *Criterion 3: Linguistic correction: (4 points)*
- *Criterion 4: Originality of ideas: (2 points)*

5- Web References (useful links):

- *TOIC; TOFEL*

6- Working environment (Facilities necessary for learning)

- *None*
- *…*

Transversal module sheets

Course Specification

Preparing for MOS certification

1. General

Coded	**TV-401**	Level/Semester	2	Coefficient	1.5	Credits	2
Course	engineering					Volume. H. (CI)	
Responsible	Moez ZOUARI					Volumet. H. (TP)	21h
Module	Preparing for MOS certification					Self-study (h)	26h

Course description (Course objective):
Acquire the basic notions necessary to create simple tables and graphs.

Prerequisites:	*Keywords:*
Know the Windows environment, excel I	*If nested, date function, text, filter database, subtotals, TCD*

Specific objectives of the course (OBJ):
OBJ 1 : *Manage complex formulas*
OBJ 2 : *Filter and conditional formatting*
OBJ 3 : *Subtotals*
OBJ 4 : *Create a pivot table*

Necessary material:
PC, Excel software (2013,2016,2019)

2- Content elements (Practical work)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	Inserting complex functions • *If nested, logical (AND, OR)*	*3*	*Mastering logical IS*
3-4	Database and complex functions • Search, Search H,	*3*	*Database function*

	• index, equiv		
5-6	Functions • Date, date if, end. Month, day week, month, year • No., no. if, no. if together, sum. If, sum. If. together, reduced. Average, average. If	*3*	*Statistical function and date*
7-8	Filters • Automatic • Advance	*3*	*Query a database*
9-10	• Simple sort, combined sort • Subtotals	*3*	*Sort a database*
11-12	Pivot table	*3*	*Synthesize a database*
13-14	Practical Project and Synthesize	*3*	*Global evaluation*

3- Content elements (Course)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…
…	…	…	…

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☒*No*	
DS - Supervised Duty	☐ *Yes* ☒*No*	

EE - Written test (Final exam)	☐ *Yes* ☒*No*	
EP - Practical test (TP- TP exam / MP- Mini project)	☒ *Yes* ☐ *No*	*100%*

- ***Material 100% TP : Average = 100% EP***

5- Evaluation criteria

- *Authorized documents* : x *Yes* ☐ *No*
- *Authorized search engine* : ☐ *Yes* x *No*
  - *Criterion 1: Clarity of ideas (5 points)*
  - *Criterion 2: methodological approach (5 points)*
  - *Criterion 3: innovation (5 points)*
  - *Criterion 4: presentation and mastery (5 points)*

6- Web references (useful links):

- *https://excel.developpez.com/*

7- Working environment (Facilities necessary for learning)

- *None*
- *…*

Course Specification

PFA (end of year project)

1. General

Coded	*TV-402*	Level/Semester	*2/S4*	Coefficient	*3*	Credits	*3*
Course	*engineer*					Flight. H. (CI)	
Responsible	*educational manager*					Flight. H. (TP)	*42h*
Module	*PFA (end of year project)*					Self-study (h)	*32h*

Course description (Course objective):
• The PFA (End of Year Project) is a project which lasts one semester, which resolves a problem and which must be defended in front of a jury. • This project is an opportunity for the student to prepare themselves to know how to write a report, present their work, to highlight it and to improve their skills • PFAs start from the second semester and will end on the exam week of the second semester. • Each student is expected to contact one of these teachers for supervision • All 4th year engineering students must be called to a meeting with their educational supervisors and the head of the internship service so that they are properly oriented respectively: Pedagogically and administratively. • PFA internships must be validated at the end of a defense which is carried out following the submission of a report and an internship certificate duly completed by the company supervisor. • The teacher (school tutor) helps the student to refine the end-of-year project. He provides educational support to the student (working methodology, definition of the problem or mission, establishment of the plan, writing of the report, etc.)

Prerequisites:	*Keywords:*
…	…

Specific objectives of the course (OBJ):
OBJ 1 : *Discover the industrial world* ***OBJ 2 :*** *Solve a problem* ***OBJ 3 :*** *Writing of the report* ***OBJ 4 :***

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Discover society (observation and learning)*	*6h*	Read all documents relevant to the internship related to the company and the project Learn the tools and software used in the business. Meeting with the team and supervisor Introduction to projects and internship objectives
2-4	*Define the problem and objectives*	*9h*	identification of the tasks to be accomplished. Taking inventory of all the missions to be carried out is necessary to be sure of achieving your objective on time. Observe operations in the field Make a project schedule
5-8	*The realization of the project*	*9h*	all tasks will be accomplished and the project will come to life. You have to ensure that everything goes as planned and that the objectives are achieved.
	Autonomy and responsibility		Take more responsibility in the project Work more independently Regularly take into account the progress of tasks Work collaboratively with other team members
9-11	*Evaluation of the achievement and proposal of improvement actions*	*9h*	*Study of the effectiveness of the achievement and compare with the objective* *Check the work accomplished with the supervisor*
12-14	*Close the work and propose forecasts*	*9h*	*Prepare an internship report*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…
14	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

- *The student must submit a PFA report with a monitoring sheet signed by their educational supervisor in order to validate authorization for submission on time.*

- *In the absence of an internship certificate on the day of the defense, the jury will not accept the student and consequently the student will have a zero (unless the student brings back an authorization signed by the internship service)*
- *The evaluation is carried out by at least two members of the jury (supervisor, jury 1)*
-
- *The evaluation is also done by assigning grades on a well-detailed report which is validated by the department head and the director.*
- *Among the evaluation criteria: Oral Expression, Rigor of the approach, content of the presentation, Discussion, Behavior and attendance, structure and content of the report, etc.*

5- Evaluation criteria

Written report (5pts)
Oral Presentation (5pts)
Mastery of the subject (5pts)
Project objective (5pts)

6- Web references (useful links):

- *NONE*
- *…*

7- Working environment (Facilities necessary for learning)

- *NONE*
- *…*

Course Specification

Human Resource Management

1. General

Coded	TV-501	Level/Semester	3/S5	Coefficient	1.5	Credits	3
Course						Volume. H. (CI)	21h
Responsible	Ati Abderraouf					Volume. H. (TP)	
Module	HRM					Self-study (h)	24h

Course description (Course objective):
At the end of this module, the engineering student must be introduced to the main concepts, methods and most common practices of HRM. Know the practices – which vary depending on the company – by which an engineer employee is recruited, evaluated, paid, etc..; Identify the "shared" role of human resources manager that an engineer who supervises a few employees quickly has; Develop critical thinking skills in relation to themes and discussions relating to the human resources function.

Prerequisites:	*Keywords:*
…	…

Specific objectives of the course (OBJ):
OBJ 3 : *Identify key human resources activities and decision-making*
OBJ 4 : *Identify key human resources activities and decision-making*
OBJ 5 : *Identify the information needed to resolve certain problems.*

Necessary material:
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Chapter I: Rise of HRM*	*3 hours*	*Identify the transition from personnel management to HRM as well as the objectives of the latter*
3-4	*Chapter II: Study and analysis of positions within the company*	*3 hours*	*Role and importance of job analysis and its link with other HRM activities, describe the methods for collecting information on positions, write a description of the required profile*
5-6	*Chapter III: Recruitment and integration*	*3 hours*	*Presentation of the recruitment process, selection and integration*
7-8	*Chapter IV: Forecast Management of Jobs and Skills*	*3 hours*	*Understand the importance and purpose of GPEC, distinguish it from workforce management, successfully manage workforce and skills*
9-10	*Chapter V: Training*	*3 hours*	*Know the links between training and other HRM activities, know the different training methods, evaluate the effectiveness of a training program*
11-12	*Chapter VI: Remuneration*	*3 hours*	*Definition and importance for employees and for the company, present remuneration systems*
13-14	*Study of practical cases*	*3 hours*	*Evaluate students' level of learning with practical cases*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…
13-14	*Mini-project support, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting

CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	x *Yes* ☐ *No*	*20%*
DS - Supervised Duty	☐ *Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents : x No*
- *Authorized search engine : ☐ Yes x No*
- *Criterion 1: Clarity of ideas (5 points)*
- *Criterion 2: methodological approach (5 points)*
- *Criterion 3: innovation (5 points)*
- *Criterion 4: presentation and mastery (5 points)*

6- Web references (useful links):

- *HR's role in turning around a company - Daniel Cohen and Ivan Maltcheff*
- *Henri De Camargo: General and industrial administration (1917)*
- *François Stankiewicz and François Geuze, HR Manager. Concepts for action, 2007*
- *Dave Ulrich, Human Resource Champions. The Next Agenda for Adding Value and Delivering Results, 1999*
- *Tania Saba, Simon L. Dolan, Susan E. Jackson and Randall S. Schuler, Human Resource Management, Compagon Web, edition 4, 2008, p. 71-72*

7- Working environment (Facilities necessary for learning)

NONE

Course Specification

labor law

1. General

Coded	TV-502	Level/Semester	3/S5	Coefficient	1.5	Credits	2
Course						Volume. H. (CI)	21h
Responsible	Walid Chriaa					Volume. H. (TP)	
Module	labor law					Self-study (h)	24h

Course description (Course objective):
Acquisition of knowledge in Labor Law (Social Law), in relation to the engineering profession and the functioning of the company. The labor contract: legal environment; hiring, working time; execution, conclusion, breach of contract; salary representation in the company

Prerequisites:	*Keywords:*
Management, business, organizational chart	*Termination, contract…*

Specific objectives of the course (OBJ):
OBJ 1 : Sources of labor law OBJ 2 : Labor inspection OBJ 3 : Determination of the employment contract OBJ 4 : Conclusion of the employment contract OBJ 5 : End of employment contract OBJ 6 : Understand the principles of international construction law. OBJ 7 : Analyze FIDIC standards and their application in construction projects. OBJ 8: Develop skills in drafting and managing international construction contracts. OBJ 9: Learn the mechanisms of arbitration and dispute resolution in an international context. OBJ 10: Apply knowledge through practical case studies and simulations.
Necessary material :
NONE

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1	*Chapter I: 1. General* *Definition* *The historical development of labor law in Tunisia* *Civil Code* *Labor Code* *Collective agreements* *Characteristics of labor law*	*1h30*	*The different official sources of Tunisian labor law*
2-3	*Chapter II: 2. Sources of labor law* *Common Sources* *International Sources* *Universal conventions* *Regional sources* *National sources* *The Constitution* *The law (labor code)* *Decrees and orders* *Doctrine* *Jurisprudence* *Clean Sources* *Spontaneous clean sources* *Own voluntary sources:* *Collective agreements* *The internal regulations* *The contract*	*3 hours*	*How to establish an employment contract that complies with different official sources*

4-5	*Chapter III: 3. LABOR INSPECTION* *Definition* *Missions* *Control* *Power of decision* *Advice* *Conciliation* *Powers of intervention of the labor inspector* *The finding of the labor inspector and its consequences* *The observations* *The notice* *The verbal procedure* *Temporary cessation of activity*	*3 hours*	*Understand the role of the work inspection as well as the types of findings and discrepancies*
6-7	*Chapter IV: 4. Determination of an employment contract* *Definition* *The distinctive criteria of the employment contract* *Work performance* *The link of subordination* *Compensation* *Distinction of employment contract from other contracts* *The mandate contract* *The company contract* *The business contract* *Types of employment contract* *The fixed-term contract (CDD)* *The permanent contract (CDI)*	*3 hours*	*The different types of employment contracts as well as the specific clauses*

8-9	*Chapter V: 5. Conclusion of the employment contract* *Obligations of the parties* *Employee obligations* *Employer obligations* *Conditions of validity of employment contract* *The basic conditions* *The defects of consent* *The capacity* *The object* *The cause* *Formal conditions* *Mandatory information* *Sanction of the rules for forming contracts* *Negotiable elements* *End of the employment contract*	*3 hours*	*Know the obligations of a contract and the elements of negotiation* *Understand the different types of end of an employment contract, the obligations and the sanctions*
10-12	**FIDIC Standards:** Analysis of key clauses in FIDIC contracts: general conditions, parties' obligations, and risk management **International Contracts**: Characteristics of contracts in the context of international construction **Arbitration and Dispute Resolution**: Introduction to international arbitration: principles, benefits, and procedures.	*4h30*	*Understand the principles of international construction law.* *Analyze FIDIC standards and their application in construction projects.* *Develop skills in drafting and managing international construction contracts.* *Learn the mechanisms of arbitration and dispute resolution in an international context.*

13-14	*Study of practical cases and presentation of personal projects*	*3 hours*	*Evaluate students' level of learning with practical cases*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	*…*	*…*	*…*
…	*…*	*…*	*…*
13-14	*Mini-project support, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	x *Yes* ☐ *No*	*20%*
DS - Supervised Duty	x *Yes* ☐ *No*	*20%*
EE - Written test (Final exam)	x *Yes* ☐ *No*	*60%*
EP - Practical test (TP- TP exam / MP- Mini project)	☐ *Yes* ☐ *No*	

- *Material 100% TP : Average = 20% CC + 80% EP*
- ***100% CI material : Average = 40% DS + 60% EE***
- *CI+TP material : Average = 20% DS + 20% EP + 60% EE*

5- Evaluation criteria

- *Authorized documents* : x *No*
- *Authorized search engine* : ☐ *Yes* x *No*
- *Criterion 1: Clarity of ideas (5 points)*
- *Criterion 2: methodological approach (5 points)*
- *Criterion 3: innovation (5 points)*
- *Criterion 4: presentation and mastery (5 points)*

6- Web references (useful links):

Civil Code
Labor Code
Collective agreements
FIDIC Contracts: Law and Practice"Ellis Baker, Ben Mellors, Scott Chalmers, Anthony Lavers.
"International Construction Contracts: A Handbook" William Godwin
"The Guide to Construction Arbitration" Global Arbitration Review

7- Working environment (Facilities necessary for learning)

- *NONE*

Course Specification

ESB Entrepreneurship and Small Business

1. General

Coded	*TV-503*	Level	*3/S5*	Coefficient	*1.5*	Credits	*2*
Course	*Engineering*					Volume. H. (CI)	*21*
Option	*Moez ZOUARI*					Volume. H. (TP)	*0*
Module	*ESB*					Self-study (h)	*28h*

Course description (Course objective):
The objective of the course is to master small business entrepreneurial skills and understand its different functions. *The ESB certification is designed to test and validate fundamental concepts and knowledge in entrepreneurship and small business management. These fundamental concepts include* - *Entrepreneurship;* - *Recognize and evaluate opportunities;* - *Plan, start and operate a business;* - *Marketing and sales;* - *and finance and business financing.*

Prerequisites:	*Keywords :*
None	*Entrepreneurship, management, business environment, accounting, commerce, finance*

Specific objectives of the course (OBJ):
OBJ 1 : *Identify the characteristics of entrepreneurs and as well as the risks, benefits, opportunities and disadvantages of being an entrepreneur* ***OBJ 2 :*** *Identify the advantages and disadvantages of different types of opportunities* ***OBJ 3 :*** *Identify the objectives, value of a business plan and the appropriate legal structure*

OBJ 4 : *Identify the advantages and disadvantages of various sources of startup financing* ***OBJ 5 :*** *Identify business operations: human capital needs, intellectual property issues, standard operating procedures, etc.* ***OBJ 6 :*** *Develop a sales strategy, identify and analyze the costs/benefits of finding customers, identify how to retain customers, and determine the value and methods of communication.* ***OBJ 7 :*** *Interpret basic financial statements, identify and analyze cash flows, and identify the company's break-even point.*

Necessary material :
None

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1.2	***The entrepreneur:*** - *Identify the characteristics of entrepreneurs* - *Given a scenario including a self-assessment result, identify the strengths, weaknesses, and risk tolerance the self-assessment identifies and how to compensate with services* - *Given a scenario, recognize a business opportunity* - *Identify the risks, benefits, opportunities and disadvantages of being an entrepreneur*	*3h*	*OBJ 1*
3.4	***Opportunity recognition :*** - *Identify the advantages and disadvantages of different types of opportunities (for example, starting a new business, purchasing an existing business, and purchasing a franchise)* - *Given a scenario, analyze the demand for the good or service and opportunities in an environment* - *Given a scenario, identify customers or potential customers for a business* - *Given a scenario, recognize a value proposition*	*3h*	*OBJ 2*

5.6	***Start a business :*** - *Identify the objectives and value of a business plan* - *Identify the appropriate legal structure, advantages and disadvantages for different legal structures for a business* - *Given a scenario, identify different types of licenses and regulations needed* - *Identify the pros and cons of various sources of startup funding: equity (friends/family, angel investors, venture capital), debt (bank, credit cards, personal loans), and grants (government, foundation, business)* - *In a given scenario, identify the support available to the business at the local, state, and federal levels* - *Identify ethical practices and social responsibilities of a company* - *Identify potential exit strategies for a business*	*3h*	*OBJ 3* *OBJ 4*
7.8	***Commercial operations :*** - *Based on a scenario, identify key positions and human capital needs (including compensation and benefits)* - *Given a scenario, determine if the work can be done by the owner or if employees or service providers are needed* - *In a given scenario, identify the required taxes* - *Using a scenario, identify intellectual property issues related to trademarks, copyrights and patents.* - *In a given scenario, identify standard operating procedures (e.g., setup, conduct, internal controls, segregation of duties)* - *Based on a scenario, identify the factors that led to sustainability*	*3h*	*OBJ 5*
9.10	***Marketing and sales:*** - *Based on a scenario, develop a sales strategy and identify the characteristics of a successful sale* - *Given a scenario, identify and analyze the costs/benefits of finding customers* - *Based on a scenario, identify how to retain customers and develop a relationship with loyal customers* - *Based on a scenario, determine the value and methods of communication, including: websites, brochures, social media and advertising.*	*3h*	*OBJ 6*
11.14	***Financial management :***	*6h*	*OBJ 7*

	- *Given a scenario, interpret basic financial statements such as income statements and balance sheets* - *Using a scenario, identify the factors that influence credit ratings and the importance of a positive credit rating* - *From a list of expenses, identify which ones are fixed or variable* - *Given a scenario, identify the factors that impact the price for the customer* - *Given a scenario, identify and analyze cash flows, including accounts receivable, accounts payable, inventory and debt.* - *Given a scenario, create a cash budget* - *Given a scenario, identify the company's break-even point*		

3- Evaluation methods & Marks Distribution

Type of assessment	Yes No	Tx Weighting
CC - Continuous assessment (Test/Quiz, Presentation, Report, etc.)	☐ *Yes* ☒ *No*	-
DS - Supervised Duty	☐ *Yes* ☒ *No*	-
EE - Written test	☒ *Yes* ☐ *No*	*50%*
EC – Certification Exam	☒ *Yes* ☐ *No*	*50%*

4- Evaluation criteria

- *Authorized documents* : ☐ *Yes* ☒ *No*
- *Authorized search engine* : ☐ *Yes* ☒ *No*

- *Criterion 1: The entrepreneur (4 points)*
- *Criterion 2: Recognition of opportunities (3 points)*
- *Criterion 3: Start a business (4 points)*
- *Criterion 4: Commercial operations (3 points)*
- *Criterion 5: Marketing and sales (3 points)*
- *Criterion 6: Financial management (3 points)*

5- Web references (useful links):

- *ESB overview, https://certiport.pearsonvue.com/Certifications/ESB/Certification/Overview*
- *Exam Objectives for ESB, C:\Users\LENOVO\Downloads\ESB OD Original 0221.pdf*

6- Working environment (Facilities necessary for learning)

- *None*

subject Sheets Projects and internships

Course of Internships at EPI

Importance of Internships:

Internships in companies are an integral part of the EPI Group's training.

These internships in companies are mandatory for obtaining the diploma.

Also, the EPI Group pays particular attention to their progress.

During these internships, students develop their personal qualities, learn to work in a team and carry out projects.

Professional internships must be validated at the end of a defense.

Types of Internships:

Internships in companies are of three types:

- **Introductory Internship**: they concern 3rd year students

  Objective: To give students the opportunity to discover the professional world and join the company.
  Minimum duration: 1 month

- **Professional internships** (design and/or implementation of projects linked to the specialty): they concern 4th year students

  Objective: The student is expected to carry out the design and/or implementation of projects related to his specialty
  Minimum duration: 1 month

- **PFE internships**: they concern 5th year students

  Objective: Implementation of all the skills acquired during schooling to carry out a project allowing one to project oneself into the professional world
  Minimum duration: 16 weeks

The EPI Group supports its students during these internships and provides them with the Internship Service for coordination with the different departments and host companies (choice, validation, etc.).

Evaluation of the Internships:

The internship results in the writing of a report, which must be presented before a jury. This jury must be composed of at least two members:

- A president who must be a teacher from the EPI Group.
- An examiner: who must be a teacher from the EPI Group.
- The university supervisor who must be a teacher from the EPI Group.
- An internship tutor who must represent the host structure.

All internships must be validated at the end of a defense.

For this, each student is required to submit to the internship service:

- A connection form (to download from the “Internship forms” menu on our website episup.com)
- An internship certificate obtained from the company and duly completed and signed.
- Supervision monitoring sheet duly completed by the educational supervisor
- Company appreciation form: duly completed by the professional supervisor
- The internship report bearing the EPI Group cover page (to be downloaded from the “Internship forms” menu) in at least two copies (depending on the number of jury members) and one scanned copy.

Course Specification

Projects and internships (PFE, Professional internships, Introductory Internship)

* PFE

1. General

Coded	Pro- 5 2 03	Level/Semester	*3/S6*	Coefficient	*10*	Credits	*24*
Course	*Engineering course*					Volume. H.	
responsible	Internships department					Volume. H. (TP)	
Module	*PFE*					Self-study (h)	700h

Course description (Course objective):
This involves the implementation of all the skills acquired during schooling to carry out a project, generally proposed by a company, allowing one to project oneself into the professional world. The student works full-time within the company and is supervised by a teacher. During an End of Study Project (PFE), the student is led to develop a problem based on a specific professional situation. The main objective of this last internship is to affirm the skills of our future engineers and to prepare them effectively for their entry into professional life. The subject of the PFE internship generally leads the future engineer to encounter challenges and allows him to learn to act accordingly.

Prerequisites:	*Keywords :*
…	…

Specific objectives of the course (OBJ):
OBJ 1 : The PFE ideally allows the intern to carry out a project from A to Z… **OBJ 2 :** Go through all the stages necessary for its realization, from the study of specifications to final delivery **OBJ 3 :** Participate in technical studies: definition of problems, acquisition, compilation and analysis of data, formulation of hypotheses and recommendations; **OBJ 4 :** Put the student in the position of an engineer, **OBJ 5 :** Refine their first career orientations, **OBJ 6 :** Measure the role of the company's different engineers, **OBJ 7 :** Discover the different functions and their relationships, **OBJ 8 :** Write an end-of-studies report.

Necessary material :
…

2- Content elements (Course)

Week(s)	Chapters/Content Items	No. HR	Goals
1-2	*Discover society (observation and learning)*		Read all documents relevant to the internship related to the company and the project Learn the tools and software used in the business. Meeting with the team and supervisor Introduction to projects and internship objectives
3-4	Establishing project objectives	…	Clearly define the objectives to be achieved with the project. Observe operations in the field Make a project schedule Establish a Problem
4-5	Project planning and design	…	project delivery , including specific steps to follow and resources required. Design potential solutions to meet project objectives
5-7	Data collection and situation analysis		Collect relevant data necessary to carry out the project. Analyze data to understand the causes of the problem using analytics tools
7-8	Project implementation		Implement the solutions designed within the project framework .
8-9	*Autonomy and responsibility*		Take more responsibility in the project Work more independently Regularly take into account the progress of tasks Work collaboratively with other team members
9-12	Testing and validation		Test the developed solutions and ensure that they meet the specifications and needs of the project. Validate the results obtained with the internship supervisor or the team responsible for the project in the company.
12-14	*Close the work and propose forecasts*		*Prepare an internship report*

3- Content elements (Practical work)

Week(s)	Activities/Content Items	No. HR	Goals
…	…	…	…
…	…	…	…
12	*Practical exam, mini-project defense, …*	*3h*	*Summative evaluation*

4- Evaluation methods & Marks Distribution

- *The student must submit a PFE report with a monitoring sheet signed by their educational supervisor in order to validate authorization for submission on time.*
- *In the absence of an internship certificate on the day of the defense, the jury will not accept the student and consequently the student will have a zero (unless the student brings back an authorization signed by the internship service)*
- *The evaluation is carried out by at least three members of the jury (supervisor, president of the jury and rapporteur)*
- *The evaluation is also done by assigning grades on a well-detailed report which is validated by the department head and the director.*
- *Among the evaluation criteria: Oral Expression, Rigor of the approach, content of the presentation, Discussion, Behavior and attendance, structure and content of the report, etc.*

5- Evaluation criteria

Criteria	
Oral Expression: - Ability to keep the audience attentive - Judicious use and quality of transparencies. - Vocabulary, use of appropriate technical terms - Respect the planned time.	/04
Steps : - Rigor of the approach: choice, tools, method and synthesis	/04
Content of the presentation: - Level of know-how, technicality... - Personal work carried out. - Presentation of objectives achieved	/08
Discussion : - Mastery of aspects related to the subject, justifications, etc.	/04
Behavior, Attendance, Punctuality and Motivation	.. /04
Personal contribution and initiative	.. /06
Scientific and technological knowledge	.. /05
Level of know-how , technicality, creativity and functionality	.. /05
Report Structure -Acknowledgements, summary, introduction, presentation of the company, specifications, technical content, conclusion - Balanced ratio (Volume) - Clear and progressive presentation of information - Reasonable use and definition of technical terms, standardization	.. /06
Content of the Report - Presentation of the work requested (specifications) then of the entire made work. - Technical content - Meets standards -Importance of personal work (volume and level) - Justification for the choice of solutions adopted. - Comparison of the objectives achieved with the content of the specifications - Appendices, Bibliographies	.. /08
Presentation of the report -Pagination, layout -Spelling, grammar, style. - Clarity and quality of figures, diagrams, etc.	.. /06

6- Web references (useful links):

- *Author, Title, URL, Year*
- *…*

7- Working environment (Facilities necessary for learning)

- *None*

* Professional internships

Coded	Pro- 5 2 02	Level/Semester	*3/S6*	Coefficient	*10*	Credits	*3*
Course	*Engineering course*					Volume. H.	
responsible	Internships department					Volume. H. (TP)	
Module	Professional internships					Self-study (h)	*75h*

Course description (Course objective):
During his professional internship, the student, who has achieved his 4th year succesfully, must complete a practical case whose theme depends on his specialization The student works full-time within the company but is not supervised by a teacher. It's a period of practical training or work experience undertaken by a student in a professional setting relevant to his field of study and career goals. It provides the intern with the opportunity to apply theoretical knowledge gained in academic settings to real-world scenarios, gaining practical skills and insights into their chosen profession. Interns may also have the opportunity to network with professionals in their field, build valuable connections, and sometimes even secure PFE opportunities upon completion of the internship.

Prerequisites:	*Keywords :*
…	…

Specific objectives of the course (OBJ):
OBJ 1 : Providing students with practical, real-world experience in their field of study or desired career path. **OBJ 2 :** Develop and refine technical skills, soft skills, and industry-specific competencies necessary for future success in the profession. **OBJ 3 :** Receive constructive feedback from supervisors and mentors to identify strengths, areas for improvement, and opportunities for further growth. **OBJ 4 :** Gain insights into the expectations and realities of the workforce, facilitating a smoother transition from student life to professional employment post-graduation. **OBJ 5 :** Write a professional internship report.

Evaluation methods & Marks Distribution

- *The student must submit a professional internship report with a Internship certificate and Company appreciation form duly completed and signed in order to validate authorization for submission on time.*

- *In the absence of an internship certificate on the day of the defense, the jury will not accept the student and consequently the student will have a zero (unless the student brings back an authorization signed by the internship service)*
- *The evaluation is carried out by at two members of the jury.*
- *The evaluation is also done by assigning grades on a well-detailed report which is validated by the department head and the director.*
- *Among the evaluation criteria: Oral Expression, Rigor of the approach, content of the presentation, Discussion, Behavior and attendance, structure and content of the report, etc.*

* Introductory Internship

Coded	Pro- 5 2 01	Level/Semester	*3/S6*	Coefficient	*10*	Credits	*3*
Course	*Engineering course*					Volume. H.	
responsible	Internships department					Volume. H. (TP)	
Module	*Introductory Internship*					Self-study (h)	*75h*

Course description (Course objective):
It is an internship for discovering the company the student spend time observing and shadowing experienced professionals within various departments or teams. This allows them to gain insights into different aspects of the organization's operations and understand the roles and responsibilities of various team members. As the internship progresses, the student is gradually given more opportunities to participate in hands-on tasks and projects under the guidance and supervision of mentors or supervisors. These tasks may be relatively simple or routine at first but gradually increase in complexity as the student gains confidence and demonstrates competence.

Prerequisites:	*Keywords :*
…	…

Specific objectives of the course (OBJ):
OBJ 1 : Help students explore different career paths within their field of study or industry by exposing them to various departments, roles, and responsibilities ***OBJ 2 :*** Provide students with opportunities to develop fundamental skills relevant to their field, such as communication, teamwork, problem-solving, and time management **OBJ 3 :** Offer students practical, hands-on experience through tasks, projects, and assignments that contribute to the organization's goals and objectives. **OBJ 4 :** Facilitate networking opportunities for students to connect with professionals in their field, **OBJ 5 :** Prepare students for future internships or employment opportunities by equipping them with essential skills, experiences, and insights into the professional world.