APPENDIX A2

Geomatics and Topography Engineering Cycle

Curriculum Handbook

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A2.1 Study Guide and Credits	
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A2.1 Study Guide & Credits

Table 1.Total ECTS Credits per Semester

Semester	In Class hours /week	Self Study hours/week	Total workload/week	Total workload/semester	ECTS Credits
	Preparatory Cycle				
S1	30.5 H	23 H	53.5 H	749 H	**29.96**
S2	30.5 H	23 H	53.5 H	749 H	**29.96**
S3	30.5 H	23 H	53.5 H	749 H	**29.96**
S4	30.5 H	23.5 H	54 H	756 H	**30.24**
	Engineering Cycle				
S1	29 H	21 H	50 H	700 H	**28**
S2	33.5 H	23.5 H	57 H	798 H	**31.92**
S3	31 H	20 H	51 H	714 H	**28.56**
S4	34 H	25 H	59 H	826 H	**33.04**
S5	27.5 H	21.5H	49 H	686 H	**27.44**
S6	0 H	57.14 H	57.14 H	800 H	**32**
Total ECTS Credits					**301.08**
Note: An average of 60 ECTS credits is required to complete the studies of one academic year.					

Table 2. Workload distribution in the 1st year of the Engineering Cycle

Code	Module/Course	Coeff.		1st Semester (S1)		2nd Semester (S2)		Workload's Hours	Workload's ECTS Credits
		S1	S2	In Class Hours	Self Study Hours	In Class Hours	Self Study Hours		
GTE101	Applied Mathematics	3	3	42	28	42	28	140	5,6
GTE102	Applied mathematics Labwork			28	21	28	21	98	3,92
GTE103	Cartography	3	3	42	28	42	28	140	5,6
GTE104	Geographic Information Systems (GIS)	3	3	42	28	42	28	140	5,6
GTE105	Technical English 1	2	2	21	21	21	14	77	3,08
GTE106	Geodesy	3	3	28	21	42	28	119	4,76
GTE107	Object Oriented Programming	2	2	42	28	28	21	119	4,76
GTE108	General Topography	3	-	42	28	0	0	70	2,8
GTE109	Photogrammetry 1	3	-	42	28	0	0	70	2,8
GTE110	Errors' Theory and Instrumentation	2	-	28	21	0	0	49	1,96
GTE111	Data Base Management Systems (DBMS)	2	-	28	21	0	0	49	1,96
GTE112	Economy and Management	1	-	21	21	0	0	42	1,68
GTE113	Computer Aided Design (CAD)	-	2	0	0	28	21	49	1,96
GTE114	Applied Topography	-	3	0	0	42	28	70	2,8
GTE115	Spatial Data Base Management Systems (SDBMS)	-	3	0	0	42	28	70	2,8
GTE116	Remote Sensing	-	3	0	0	42	28	70	2,8
GTE117	Probability and Statistics	-	2	0	0	42	28	70	2,8
GTE118	Field School 1	-	3	0	0	28	28	56	2,24
Coefficients' Total		**27**	**32**						
		59							
Total of workload				***406 H***	***294 H***	***469 H***	***329 H***	***1498 H***	***59,92***

Table 3. Workload distribution in the 2nd year of the Engineering Cycle

Code	Module/Course	Coeff.		1st Semester (S1)		2nd Semester (S2)		Workload's Hours	Workload's ECTS Credits
		S1	S2	In Class Hours	Self Study Hours	In Class Hours	Self Study Hours		
GTE201	Unified Modeling Language (UML)	3	-	42	28	0	0	70	2,8
GTE202	Python	2	-	42	28	0	0	70	2,8
GTE203	Urban Hydraulic Systems	2	-	28	14	0	0	42	1,68
GTE204	Geostatistics	2	-	28	14	0	0	42	1,68
GTE205	Topography Project	3	-	42	28	0	0	70	2,8
GTE206	Photogrammetry 2	3	-	42	28	0	0	70	2,8
GTE207	Thematic Cartography	3	-	42	28	0	0	70	2,8
GTE208	Mobile GIS	2	-	42	28	0	0	70	2,8
GTE209	Communication Skills	1	-	21	14	0	0	35	1,4
GTE210	WEB Development	3	3	42	28	42	28	140	5,6
GTE211	Technical English 2	2	2	21	14	21	14	70	2,8
GTE212	Remote Sensing 2	3	-	42	28	0	0	70	2,8
GTE213	Geostatistics Project	-	2	0	0	28	14	42	1,68
GTE214	Urban and Rural Space Layout	-	1	0	0	21	14	35	1,4
GTE215	RADAR Remote Sensing	-	2	0	0	42	28	70	2,8
GTE216	Spatial Data Base Management Systems 2 (SDBMS 2)	-	3	0	0	42	28	70	2,8
GTE217	Advanced Cartography	-	2	0	0	42	28	70	2,8
GTE218	Spatial Analysis	-	2	0	0	42	28	70	2,8
GTE219	Field School 2	-	2	0	0	28	28	56	2,24
GTE220	Micro Geodesy	-	2	0	0	28	14	42	1,68
GTE221	WEB Mapping	-	2	0	0	42	28	70	2,8
GTE222	Bathymetry	-	1	0	0	21	14	35	1,4
GTE223	Land and Cadastral Information Systems (LIS/CIS)	-	2	0	0	28	14	42	1,68
GTE224	Computer Programming for GIS Applications	-	2	0	0	28	14	42	1,68
GTE225	Personal Development	-	1	0	0	21	14	35	1,4
GTE226	End of year Project	-	2	0	0	0	42	42	1,68
Coefficients' Total		**29**	**31**						
		60							
Total of workload				***434 H***	***280 H***	***476 H***	***350 H***	***1540 H***	***61,6***

Table 4. Workload distribution in the 3rd year of the Engineering Cycle

Code	Module/Course	Coeff.		1st Semester (S1)		2nd Semester (S2)		Workload's Hours	Workload's ECTS Credits
		S1	S2	In Class Hours	Self Study Hours	In Class Hours	Self Study Hours		
GTE301	Lasergrammetry	2	-	42	28	0	0	70	2,8
GTE302	Building Information Modeling (BIM)	2	-	42	28	0	0	70	2,8
GTE303	Ground and condominium subdivision	2	-	42	28	0	0	70	2,8
GTE304	Artificial Intelligence in GIS	2	-	42	28	0	0	70	2,8
GTE305	Implantation Techniques	2	-	21	14	0	0	35	1,4
GTE306	Entrepreneurship and Business Creation	1	-	21	14	0	0	35	1,4
GTE307	Agile Software Development Method	1	-	21	14	0	0	35	1,4
GTE308	GIS Quality Control	3	-	42	28	0	0	70	2,8
GTE309	Quality Control in Topographic Projects	3	-	42	28	0	0	70	2,8
GTE310	English/TOEIC Preparation	2	-	21	14	0	0	35	1,4
GTE311	Land and Cadastral Laws	2	-	28	21	0	0	49	1,96
GTE312	Expert Surveyor/Geometer Profession	1	-	21	14	0	0	35	1,4
GTE313	Synthesis Project	2	-	0	42	0	0	42	1,68
GTE314	End of studies Dissertation / Graduation Research Project	-	5	0	0	0	800	800	32
Coefficients' Total		**25**	**5**						
		30							
Total of workload				***385 H***	***301 H***	***0***	***800 H***	***1479 H***	***59,44***

A2.2 Semester 1 Modules' Handbook

Applied Mathematics Module Handbook

Module designation	*Applied Mathematics*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE101 and GTE102*
Subtitle, if applicable	*Applied Mathematics*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Zrelli Nawel*
Lecturer	*Dr. Zrelli Nawel*
Language	*French*
Relation to curriculum	*This module aims to give students the knowledge in Applied Mathematics such as Numerical Analysis, Scientific Calculation and Optimization. This allows them to apply Mathematics by using numerical methods and then to develop practical methods in Numerical Analysis.*
Type of teaching, contact hours	*Lecture: 3 hours per group (15 students) per week.* *Laboratory session: 2h per group (15 students) per week.*
Workload	70 contact hours 49Hours of Self Study
ECTS Credits/Points	4.76
Weight Factor/Coefficient	3
Requirements according to the examination regulations	Authorized calculator, and unauthorized documents and internet access.
Recommended prerequisites	*Some basics knowledge of basic mathematics, basic calculus, and linear algebra.*

Module objectives/intended learning outcomes	***Knowledge:*** - *Students understand how to approximate patterns using linear and non-linear interpolations (Lagrange Polynomial and Newton Polynomial).* - *They are familiar with solving nonlinear equations by using Fixed Point Method, Bisection Method and Newton's Method.* - *Students understand how to calculate error of the numerical solutions.* - *Students understand how to approximate the solution of linear functions.* - *Students understand how to approximate the solution of nonlinear functions.* - *The students understand how using Direct Methods for solving linear equations systems such as Gaussian elimination, Gaussian transformation, LU factorization and Cholesky factorisation.* - *The students also understand how using Iterative Methods for solving linear equations systems such as Jacobi method and Gauss-Seidel method.* - *They understand Numerical Differentiation (first derivative and second derivative).* - *They are familiar with Numerical Integration by studying Rectangle method, Trapezoid method and Simpson's method.* - *Students learn numerical solutions of ordinary differential equations by using Euler's method and Runge-Kitta method.* - *Students understand how to approximate the differential equations.* - *Students understand the concept of differential equation and Taylor series.* - *They study the finite element method, that is, they establish Lax-Milgram Theorem, Galerking's method and finite element method.* ***Skills:*** - *Students use Numerical Analysis to calculate and program some numerical methods.* - *Students use Scientific Calculation for manipulation of matrices in Numerical Calculation.* - *Students use their skills in Linear algebra and programming.* ***Competences:*** - *Students are able to program, and to develop some useful methods in Applied Mathematics.* - *Students are able to use Numerical Analysis in their field of study work.* - *They are able to solve complex problems.* - *They are able to communicate more confidently.*

Content	*CHAP 1: POLYNOMIAL INTERPOLATION* *2.1. Interpolation of Lagrange* *2.2. Newton's Interpolation* *2.3. Estimation of the Error* *CHAP 2: SOLVING NONLINEAR EQUATIONS* *2.1. Motivation* *2.2. Fixed point Method* *2.1.1. Principle of the Method* *2.1.2. Convergence* *2.3. Dichotomy Method* *2.3.1. Principle of the Method* *2.3.2. Stopping Criteria* *2.3.3. Convergence* *2.4. Newton's Method* *2.4.1. Principle of the Method* *2.4.2. Convergence* *2.4.3. Applications and Examples* *CHAP 3: RESOLUTION OF LINEAR SYSTEMS* *3.1. Reminder on Linear Algebra* *3.1.1. Positive Definite Matrix* *3.1.2. Normal Matrix* *3.1.3. Orthogonal Matrix* *3.1.4. Spectrum* *3.1.5. Matrix Standards* *3.1.6. The Conditioning of a Matrix* *3.2. Direct Methods for Solving Linear Equations Systems* *3.2.1. Cramer's Method* *3.2.2. Gauss Method (Gaussian Pivot)* *3.2.3. Gauss Jordan's Method* *3.2.4 LU Decomposition Method* *3.2.5. Cholesky Decomposition Method* *3.3. Iterative or Indirect Methods for Solving Linear Equations Systems* *3.3.1. Fixed point method* *3.3.2. Jacobi Method* *3.3.4. Gauss-Seidel Method* *3.3.5. Relaxation Method*

	CHAP 4: NUMERICAL DIFFERENTIATION *4.1. First Derivative* *4.2. Second Derivative* *4.3. Estimation of the error* *CHAP 5: NUMERICAL INTEGRATION* *5.1. Rectangle Method:* *5.1.1. Rectangle on the Left* *5.1.2. Rectangle on the Right* *5.1.3. Rectangle Midpoint* *5.1.4. Estimation of the error* *5.2. Trapezoidal Method* *5.2.1. Simple Trapezoidal Method* *5.1.2. Composite Trapezoid Method* *5.1.3. Estimation of the error* *5.3. Simpson's Method* *5.3.1. Simple Simpson's Method* *5.3.2. Compound Simpson's Method* *5.3.3. Estimation of the Error* *5.4. Quadrature Formula* *5.4.1. Gaussian Quadrature Formula* *5.4.2. Degree of Precision* *5.4.3. Estimation of the Error* *CHAP 6: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS* *6.1. Reminder on Differential Equations* *6.1.1. Linear Differential Equation of Order 1* *6.1.2. Differential Equation with Constant Coefficients of Order 2* *6.2. Euler Method* *6.3. Runge-Kutta Method* *6.3.1. Second-Order Runge-Kutta Method* *6.3.2. Runge-Kutta Method at Order 3 and 4* *6.3.3. Consistency Convergence and Stability* *6.3.4. Estimation of the Error* *CHAP 7: INTRODUCTION TO THE FINITE ELEMENT METHOD* *7.1. Functional Analysis Tools* *7.1.1. Standards and Scalar Products* *7.1.2. Functional Spaces* *7.1.3. Test Functions* *7.1.4. Space H1*

Content	*7.2. Variational Formulation* *7.2.1. Example 1-D* *7.2.2. Existence and Uniqueness of the Solution* *7.2.3. The Lax-Milgram Theorem* *7.3. Calculation of Approximate Solutions by the Finite Element Method* *7.3.1. Galerkin's Method* *7.3.2. The finite element method P1* *7.3.3. Example 1 (Equation of Heat)* *7.3.4. Example 2 (Equation of the Convection Diffusion)* *7.3.5. Approximation Error and* *Convergence of the Method* *7.3.6. Examples*
Study and examination requirements and forms of examination	Continuous Evaluation A midterm exam. A final exam.
	Lab Assignments Lab Exam
Final grade Calculation	Continuous Evaluation and Midterm Exam 40% Final Exam 60%
	Lab Assignments 40% Lab Exam 60%
Media employed	*Booklets for theoretical exercise* *whiteboard*
Reading list	*M. Atteia, M. Pradel, Éléments d'Analyse Numérique, CEPAD, 1990.* *J. Bastien, Introduction à l'Analyse Numérique : Applications sous Matlab, Dunod, 2003.* *K. Chen, P. Giblin, A. Irving, Mathematical Explorations with Matlab, Cambrige University Press, 1999.* *E. Süli, D. Mayers, An Introduction to Numerical Analysis, Cambridge Univ. Press, 2003.* *K. Yosida, Functional Analysis, Springer-Verlag, 1980, 6e ed.* *J. Rappaz, M. Picasso, Introduction à l'Analyse Numérique, Presses Polytechniques et Universitaires Romandes, 1998.*

Cartography Module Handbook

Module designation	*Cartography*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE103*
Subtitle, if applicable	*Mapping*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Adnène KASSEBI*
Lecturer	*Adnène KASSEBI*
Language	*French*
Relation to curriculum	The Cartography module is fundamental for the creation of maps and topographic plans (paper or digital). This module is a preparation for the thematic cartography module. Online mapping (WEB Mapping) is a continuation of this module.
Type of teaching, contact hours	3 hours / week Theoretical and supervised works Classes of 30 students
Workload	42 contact hours 28 Hours of Self Study
ECTS Credits/Points	2.8
Weight Factor/Coefficient	3
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra) is required.*
Module objectives/intended learning outcomes	*This course provides participants with a comprehensive overview of cartography.* *Each notion is accompanied by theoretical and practical applications.* ***Knowledge:*** *- Understanding the role of Cartography in Geomatics and Topography.* *- Students become familiar with the concepts of cartography and learn how to read a map.*

Module objectives/intended learning outcomes	*- Demonstrate the importance of topographic maps and their various uses.* *- Students understand the basic knowledge of collecting and creating geographic data for mapping.* *- Students understand the basic knowledge of cartographic presentation.* ***Skills:*** *- Master the strict rules of graphic semiology.* *- Master the cartographic language.* *- Dress up maps and topographic plans.* *- Learn how to represent absolute and relative quantitative variables.* *- Students can perform the processing necessary for cartographic definition and writing.* ***Competences:*** *At the end of this module, the student should be able to:* *- Create and analyse a map or plan,* *- Construct a cartographic language,* *- Understand and use graphic semiology,* *- Construct, study and standardise conventional signs relating to maps and topographic plans.*
Content	***Chapter I: Presentation of the cartography*** *I.1. History and development* *I.2. Major cartographic families* *I.3. Boundaries* ***Chapter II: Urban and Landscape Scales*** *II.1. Scales and occupations* *II.2. Plans and legends* *II.3. Paper map vs. Digital map* *II.4. Map and scale* *II.5. Definition of cities* ***Chapter III: Geographical reference system*** *III.1. The terrestrial reference system* *III.2. Map projection* ***Chapter IV: Basic elements of a topographic map*** *IV.1. Why?* *IV.2. What is a topographic map?* *IV.3. What information can be found on a topographic map?* *IV.4. Is a topographic map similar to a road map?* *IV.5. What do the colours used mean?* *IV.6. What is a contour line?* *IV.7. What is a scale?* *IV.8. How can I measure distance on a map?* *IV.9. What is a grid?* *IV.10. How do I find or mark a position on a map?*

Content	*IV.11. How can I find my position on a map using a GPS receiver?* *IV.12. How can I find my position on a map without using a GPS receiver?* *IV.13. How can I navigate using a compass and a topographic map?* *IV.14. How do I cut maps?* *IV.15. Terminology of topography* ***Chapter V: Construction of the cartographic language*** *V.1. How variables are implemented* *V.2. Organisation of the image*
Study and examination requirements and forms of examination	Continuous Evaluation A midterm exam. A practical Exam A final exam.
Final Grade Calculation	Continuous Evaluation and Midterm Exam 40% Practical Exam and Final Exam 60%
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*Khallef Boubaker (2022). Cartographie assistée par ordinateur. Université de Ferhat Abbas -Sétif 1.* *Bitaisha Shukuru (2022). Notes de cours Cours de Topographie et Cartographie I. B.N. Shukuru, MSc. Candidate in Plant Pathology, SAGR, LPU, India.* *Nicolai, Roel (2014) : A critical review of the hypothesis of a medieval origin of portolan charts. Thèse. Université d'Utrecht, Pays-Bas.* *ZANIN C. & TREMELO M.-L. (2003), « Savoir-faire une carte : aide à la conception et à la réalisation d'une carte thématique univariées », Imp. CHIRAT (France), 199 p.*

GIS Module Handbook

Module designation	*GIS*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE104*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Mohamed Khaled Bouzid*
Lecturer	*Dr. Mohamed Khaled Bouzid*
Language	*French*
Relation to curriculum	Learning GIS basics and start using GIS software application will be used in the others module of geomatics such as cartography, web mapping
Type of teaching, contact hours	3 hours / week Theoretical and supervised works Classes of 30 students
Workload	42 contact hours 28 Hours of Self Study
ECTS Credits/Points	2.8
Weight Factor/Coefficient	3
Requirements according to the examination regulations	Neither documents nor internet access permitted. Authorized calculator
Recommended prerequisites	*Prerequisites in computer science may be useful.* *Some basics knowledge of geographic are required.*
Module objectives/intended learning outcomes	***Knowledge:*** *- this course allows students to learn the basics of geographic information system (GIS)* - *Study how to creates, manages, analyzes, and maps all types of data.* - *GIS course helps students to understand patterns, relationships, and geographic context.* - *Student learns the difference between Maps and Layers* - *Studying the processes to managing content, and creating and using metadata*

Module objectives/intended learning outcomes	- *explain different formats and coordinate systems that are used for geographic data* - *give an account of different practical application fields for GIS in earth sciences and environmental sciences* - *give an account of different GIS methods and how these can be applied on relevant problems.* - *Students Understanding topology in vector data* ***Skills:*** - *Working with Maps and Layers: Searching for, opening, and saving maps, basemaps, layers; managing content, and creating and using metadata.* - *Creating and Sharing Map Content* - *Changing scale and map projection, finding locations and places* - *Changing symbology (style), classifying, clustering, filtering, rendering imagery.* - *Working with tabular data: Selecting, creating fields and tables, sorting, summarizing, creating charts, and creating and using popups* - *Collecting and mapping field data from field data collection* - *Drawing and Sketching* ***Competences:*** - *Students are able to create a geographic data set* - Understanding geographic concept - *Analyse spatial information* - *use advanced GIS functionality in a standard GIS software as well as by means own programming for spatial analysis* - *apply advanced analytical methods in GIS to solve real world based environmental problems and to support decision making.*

Content	***Chapter 1: GIS Introduction*** *I. GIS definition* *II. GIS components* *III. GIS process* ***Chapter 2: GIS data*** *I. Data organization and structure* *II. Spatial data* *III. reality modeling* ***Chapter 3: Database management systems*** *I. Representation the reality in GIS* *II. Territory modeling* *III. Creating the database* *IV. Structure of the database* *V. Structure of the database* *VI. Entity-relationship modeling* ***Chapter 4: GIS data representation (Raster and vector representations data)*** *I. Raster mode and vector mode* *II. Data vector models* *III. The matrix models* Chapter 5: Data Techniques and procedures: I. Capturing II. Transformation
Study and examination requirements and forms of examination	Continuous Evaluation A midterm exam. A practical Exam A final exam.
Final Grade Calculation	Continuous Evaluation and Midterm Exam 40% Practical Exam and Final Exam 60%
Media employed	Data show Booklets for theoretical sessions, Booklets for practical sessions Computers Internet

Reading list	Title: GIS and the 2020 census : modernizing official statistics / Amor Laaribi, Linda Peters. Chang, K.T. (2016) Introduction to geographic information systems. Huitième édition. NewYork: McGraw-Hill Education ESRI (2018) Tout savoir sur les Systèmes d'Information Géographique. Longley, P. (2005) Geographical Information Systems: Principles, Techniques, Management and Applications. Deuxième édition. Wiley

Technical English 1 Module Handbook

Module designation	*Technical English 1*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE105*
Subtitle, if applicable	*Business Result (Upper-intermediate) + Cambridge English for Engineering*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester1*
Person responsible for the module	*Amira Gara*
Lecturer	*Amira Gara*
Language	*English*
Relation to curriculum	*Teach students how to communicate in their professional lives/ it provides real world business: it addresses the language and communication needs of employees at all levels of an organisation who need to use English at work in a global environment the whole book focuses primarily on shaping effectively students'* **soft skills**. *The second book, however, focuses on the technical terms used in the domain of Engineering.*
Type of teaching, contact hours	1.5 hours / week Theoretical and supervised works Classes of 30 students
Workload	21 contact hours 21 Hours of Self Study
ECTS Credits/Points	1.68
Weight Factor/Coefficient	2
Requirements according to the examination regulations	*Oral exams: check students' ability and skills in terms of communicating easily in work life* *Written exams: evaluate students' writing skills and grammar mainly technical engineering writing.* *Neither documents nor internet access permitted.*
Recommended prerequisites	*E.g. existing competences in speaking and writing technically in the field.*

Module objectives/intended learning outcomes	*-Help students communicate in English in real-life work situation to acquire the key communication skills they will need in their future working life.* *-All units are about helping students communicate in English real life work situations. The priority is enabling them to do so more effectively and with confidence.* *-The course recognizes that, with so many businesses now being staffed by people of different nationalities there is an increasing trend towards using English as the language of internal communication in many organisations.as well as learning appropriate language for communicating externally. With clients, suppliers; colleagues….* *-The main emphasis is o the students speaking and trying out the target language in meaningful and authentic ways to activate students' interest and encouraging them to talk spontaneously.* *- Shaping soft skills through speaking activities/ video reviews/ listening/ communicative / interactive approach/ case studies*

Content	*Chapter 1: First impressions* *-Arranging a meeting* *-Exchanging contact details* *Technical English: Chapter 1 Technology in use* *Chapter 2: Motivation* *-Encouraging conversation* *-Ending and leaving a conversation* *Technical English: Chapter 2 Materials technology* *Chapter 3: On schedule* *-Managing projects* *-Running an update meeting* *-Questioning a decision* *Technical English: Chapter 3 Components and assemblies* *Chapter 4: New ideas* *-Presenting a product or a service* *-Referring to evidence* *Technical English: Chapter 4 Engineering design* *Chapter 5: Ethical business* *-Planning arrangements* *-Responding to invitations* *Technical English: Chapter 5 Breaking point* *Chapter 6: Making decisions* *-Personality and decision making* *-Talking about social plans* *Chapter 7: Outsourcing* *-Presenting factual information* *-Asking questions after presentations* *Chapter 8: Employees:* *-Negotiating with colleagues* *-Making quick requests*
Study and examination requirements and forms of examination	Continuous Evaluation A midterm exam. A final exam.
Final Grade Calculation	Continuous Evaluation and Midterm Exam 40% Practical Exam and Final Exam 60%
Media employed	*Videos: data show/ JBL/smart phones*
Reading list	*Business results teacher's book/ student book*

Geodesy Module Handbook

Module designation	*Geodesy*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE106*
Subtitle, if applicable	*Geodetic Systems, GPS, GNSS*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Zouhaier FATNASSI*
Lecturer	*Zouhaier FATNASSI*
Language	*French*
Relation to curriculum	*Basic mathematical and physical knowledge is fundamental for the understanding of the Geodesy module.* *This module is a preparation for the Applied Topography and Computer-Aided Drafting (CAD) modules. Layout technics, Ground and condominium subdivision, Topographic Projects and Quality control of topographic works is a continuation of this module.*
Type of teaching, contact hours	1.5 hours / week Theoretical and supervised works Classes of 30 students
Workload	21 contact hours 21 Hours of Self Study
ECTS Credits Points	*1.96*
Weight Factor	*3*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra) is required.*
Module objectives/intended learning outcomes	*Geodesy is a scientific and technical discipline that is the fundamental basis for positioning and locating all geographic information. It is the study of the shape of the Earth, the calculation of its dimensions and the measurement of its gravity field. It therefore determines the precise shape of the Earth called the "Geoid".* *Each notion is accompanied by theoretical and practical applications.*

	Knowledge: - *Understand the role of geodesy in defining reference frames for expressing the coordinates of objects and provide the tools and methods used to determine coordinates at both local (Topometry) and global (spatial geodesy) scales.* - *The basic concepts of reference frame definition and the means to achieve geolocation of objects in these frames.* - *Understand the uses of reference systems in many applications such as: geolocation, geophysics, space and atmospheric sciences, observation of climate and ocean changes, knowledge of continental drift, etc.* - *Understand the contribution of the tools to the simulation, prevention and study of natural hazards.* ***Skills:*** *The students learn to define the basic of:* - *Spherical Trigonometry.* - *The notions of Positional Astronomy.* - *Geometry of the Ellipse and the Ellipsoid.* - *Geodetic Systems and Tunisian Geodesy.* - *Plane representations (Lambert and UTM).* - *Transformations between geodetic systems.* - *Notion on the Motion of an Artificial Earth Satellite.* - *General information on satellite positioning systems.* - *Signals and measurements.* - *Errors in GNSS measurements.* - *Use of GNSS for positioning.* ***Competences:*** - *The student masters the notion of geodetic reference frame and will be able to define the reference frames and provide the tools and methods used to determine coordinates at the local scale (Topometry) and at the global scale (spatial geodesy).* - *Be able to use or design topometric or geodetic reference frames.* - *Choose the appropriate reference frames when integrating and processing data in Geographic Information Systems (GIS).* - *Operate or design automatic survey, metrology (monitoring) or GNSS observation systems.* - *The student will be able to make precise measurements of GNSS station coordinates in real time, monitor sea levels or observe variations in gravity (thus ensuring qualitative and quantitative monitoring of various geophysical phenomena (tectonics, volcanics, seismics, etc.)).* - *Exploit, process and edit the acquired data to derive the expected products, or even develop future processing tools.* - *Learn about research in the field of geodesy.* - *Restitute and analyse/critique results.*

Content	***Chapter I: Introduction*** ***Chapter II: Spherical Trigonometry*** *II.1. The spherical triangle* *II.2. The supplementary trihedron - the polar spherical triangle* *II.3. The formulas of spherical trigonometry* *II.4. The spherical excess* *II.5. Exercises and problems* ***Chapter III: Notions of Positional Astronomy*** *III.1. Historical background* *III.2. Objectives of Astronomy* *III.3. Reference systems* *III.4. Notions of positional astronomy* *III.5. Exercises and problems* ***Chapter IV: Curves and surfaces*** *IV.1. Plane Curves - Curvature* *IV.2. Left-handed Curves* *IV.3. Surfaces* *IV.4. The first fundamental form* *IV.5. The second fundamental form* *IV.6. Exercises and problems* ***Chapter V: Geometry of the Ellipse and the Ellipsoid*** *V.1. Geometry of the Ellipse* *V.2. Parametric Equations of the Ellipse* *V.3. Calculation of the great normal* *V.4. Geometry of the ellipsoid of revolution* *V.5. Calculation of the geodesic lines of the ellipsoid of revolution* *V.6. Applications to the direct and inverse problems of calculating geodesic lines* *V.7. Exercises and problems* ***Chapter VI: Geodetic Systems*** *VI.1. Definition of a geodetic system* *VI.2. The geoid* *VI.3. Coordinate systems* *VI.4. Geodetic systems in North Africa* *VI.5. Characteristics of geodetic ellipsoids* *VI.6. Exercises and problems* ***Chapter VII: Geodetic Networks*** *VII.1. Introduction* *VII.2. Classical geodetic networks* *VII.3. Space geodesy* *VII.4. Densification of the basic GPS geodetic network* *VII.5. Densification of a terrestrial geodetic network* *VII.6. Exercises and problems*

	Chapter VIII: Distance Reduction *VIII.1. Introduction* *VIII.2. Distance Corrections* *VIII.3. Rigorous formula for passing from dp to d0* *VIII.4. Exercises and problems* ***Chapter IX: Attitude Systems*** ***Chapter X: Tunisian Geodesy*** *X.1. Introduction* *X.2. History* *X.3. Geodetic systems in Tunisia X.4. Plane representations* *X.5. Why a new geodetic system* *X.6. Modernization of the Tunisian geodetic networks* *X.7. The upgrading of Tunisian geodesy* *X.8. The decree of 10 February 2009* *X.9. Conclusions*
Study and examination requirements and forms of examination	*Continuous Evaluation* *A Midterm Exam* *A Final Exam*
Final Grade Calculation	Continuous Evaluation and Midterm Exam 40%
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*Jean-Baptiste HENRY (2005). Cours de Topographie et Topométrie Générale « Notions géodésiques de base ». Ecole et Observatoire des Sciences de la Terre (EOST). 65p.* *Françoise et Henri DUQUENNE (2002). COURS DE GÉODÉSIE "Généralités sur la Géodésie". ÉCOLE SUPÉRIEURE DES GÉOMÈTRES ET TOPOGRAPHES. 257p.*

Object Oriented Programming (OOP) Module Handbook

Module designation	*Object Oriented Programming (*OOP*)*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE107*
Subtitle, if applicable	*JAVA programming*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Asma BEN AHMED*
Lecturer	*Dr. Asma BEN AHMED*
Language	*French*
Relation to curriculum	*Object Oriented Programming is of great interest since it introduces object-oriented design techniques as well as problem solving. This module will be useful to better understand others programming languages (Python programming). Besides, it serves to help understanding modelling and designing problems and projects.*
Type of teaching, contact hours	*3 hours / week* *Theoretical and practical works* *Classes of 30 students*
Workload	*Workload:* *42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.*
Recommended prerequisites	*Prerequisites in algorithms are helpful but not mandatory.*

Module objectives/intended learning outcomes	*This course presents an overview of simple and some advances programming utilities provided by JAVA language. Both theoretical and practical studies are offered at this course.*
	At the end of this training, participants will be able to deepen their knowledge in complete autonomy.
	Among the expected outcomes of this course, those listed below:
	- ***Knowledge:*** *the students learn to:*
	  ○ *Manipulate basic primitive types (int, double, etc.) and operations in JAVA*
	  ○ *Understand conditional and choice structures*

	○ *Understand problems where iterative structures are needed and distinguish between different loops (for, while, do...while)* ○ *Understand the object-oriented programming concepts: class, object, attributes, methods, encapsulation, inheritance and polymorphism* - ***Skills:*** ○ *They learn how to translate algorithms into JAVA syntax and how to correctly write them* ○ *Use logic analysis to solve problems using conditional and choice structures* ○ *They understand how to read different types from scanner and how to print a message using text, variable values, punctuation…* ○ *Students learn how to implement new classes to solve a specific problem* ○ *They learn how to access and use existing methods for each class* ○ *They are able to connect to databases through java application.* - ***Competences:*** ○ *Students will be able to design, code and solve simple and complex problems using JAVA programming language.* ○ *Students are able to develop useful software projects* ○ *Know how to decompose a complex program into classes and implement each one in JAVA* ○ *Demonstrate problem solving skills by analysing problems, modelling it as a system of objects, and implementing algorithms in an object-oriented language.* ○ *They become able to implement new classes and use it to solve practical real-world problems.*

Content	- *CHAP 1: Introduction to JAVA programming language*
	  ○ Historical review
	  ○ JAVA characteristics
	  ○ JDK, JRE and Development Environment (IDE) Installation and configuration
	  ○ JAVA program structure
	- *CHAP 2: Basic components of JAVA*
	  ○ Variables VS Constants: Declaration and initialisation
	  ○ Primitive types
	  ○ Basic operations: addition, concatenation, division …
	  ○ JAVA Input and output
	- *Workshop 1*

Content	- *CHAP 3: Conditional Structures*
	  ○ If... else statement
	  ○ Switch
	- *Workshop 2*
	- *CHAP 4: Iterative Structures*
	  ○ For
	  ○ While
	  ○ Do…While
	- *Workshop 3*
	- *CHAP 5: Structured data*
	  ○ Manipulating files
	  ○ Manipulating arrays
	- *Workshop 4*
	- *CHAP 6: Introduction to OOP*
	  ○ Advantages of OOP
	  ○ OOP Concepts
	- *Workshop 5*

Study and examination requirements and forms of examination	*Continuous Evaluation* *A Midterm Exam* *A Final Practical Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam 60%*
Media employed	*Computer, NetBeans IDE, JDK, JDBC, internet access*

Reading list	*Programmer en Java, 7th Edition, Claude Delannoy, Eyrolles, 2011* *Java World Site : http://www.javaworld.com* *Java tutorial : http://java.sun.com/developer/onlineTraining*

General Topography Module Handbook

Module designation	*General Topography*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE108*
Subtitle, if applicable	*Surveying, Topography*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Magtouf REZGUI*
Lecturer	*Magtouf REZGUI*
Language	*French*
Relation to curriculum	*The Topography module is fundamental for the creation of maps and topographic plans (paper or digital).* *This module is a preparation for the Applied Topography and Computer-Aided Drafting (CAD) modules. Layout technics, Ground and condominium subdivision, Topographic Projects and Quality control of topographic projets are a continuation of this module.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*3*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator*
Recommended prerequisites	*Some basic knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra) is required.*
Module objectives/intended learning outcomes	*The determination of coordinates and various characteristics of points in the space is an important part of most environmental studies. The objective of these determinations is generally the study of the geographical aspect of the interrelations between the various parameters or indicators recorded.*

Module objectives/intended learning outcomes	*Each notion is accompanied by theoretical and practical applications.* ***Knowledge:*** *- The student must understand the basic notions of:* • *Measuring heights,* • *Topometric calculations,* • *Angle measurements,* • *Topometric calculations.* *- Students become familiar with the concepts of Topography and the skills for reading a plan.* *- Demonstrate the value of topographic maps and their various uses.* *- Students understand the basic knowledge of collecting and creating geographic data for surveying plans.* *- Students understand the basic knowledge of topographic presentation.* ***Skills:*** *- Master the topographic language.* *- Dress up topographic plans.* *- Learn how to represent absolute and relative quantitative variables.* *- Students can perform the processing necessary for Topographic definition and writing.* ***Competences:*** *At the end of this module, the student should be able to:* *- Understand a map or plan,* *- Construct a topographic language,* *- Understand and use graphic semiology,* *- Construct, study and standardise conventional signs relating to topographic plans.*

Content	***Chapter I: General introduction*** *I.1 A map, a plan for what?* *I.2 Basic geodetic concepts* ***Chapter II: Measuring heights*** *II.1 Definitions* *II.2 Indirect or trigonometric levelling* *II.3 Materials used in direct levelling* *II.4 Errors in direct levelling* *II.5. Preparations and adjustments* ***Chapter III: Topometric calculations*** *III.1 Bearing of a direction* *III.2 Bearing and distance between 2 points* *III.3 Intersection* *III.4. Bearing* *III.5. Off-centre station* *III.6. Polygonal path*

Content	***Chapter IV: Angle measurements*** *IV.1 Definitions* *IV.2 Horizontal angle* *IV.3. Vertical angle* *IV.4 Measuring instruments* ***Chapter V: Measurement of distances*** *V.1 Definitions* *V.2 Direct measurements* *V.3 Indirect measurements* ***Chapter VI. Construction topometry*** *VI.1. Introduction* *VI.2. Precision* *VI.3. Construction markers* *VI.4. The layout of a building* *VI.5. The layout of the sewage system (layout of a profile, layout according to the slope)* ***Chapter VII. Underground Topometry*** *VII.1. Introduction* *VII.2. Preliminary works (It is necessary to proceed to a topographic survey on the surface).* *VII.3. Tutorials and application exercises* *Chapter VIII. Road topography* *VIII.1. General* *VIII.2. Preliminary considerations* *VIII.3. Classification of roads* *VIII.4. Location of the roads* *VIII.5. The simple circular curve* *VIII.6. The compound circular curve* *VIII.7. The Inverted Circular Curve* *VIII.8. Parallel circular curves* *VIII.9. The layout of the curve (by polar or cartesian coordinates)* *VIII.10. The choice of the radius of curvature* *VIII.11. The theoretical spiral* *VIII.12. The practical spiral* *VIII.13. The slope and the minimum radius* *VIII.14. The longitudinal profile* *VIII.15. The vertical curve* *VIII.16. The property of the parabola* *VIII.17. The length of the curve* *VIII.18. The general equation of the parabola* *VIII.19. The low and high points of the curve* *VIII.20. The rate of change of slope* *VIII.21. The vertical curve with unequal tangents*

Content	*VIII.22. The system of chords applied to a road project* *VIII.23. Cross-sectional profile* *VIII.24. Determination of quantities* *VIII.25. Tutorials and application exercises*
Study and examination requirements and forms of examination	*Continuous Evaluation* *A Midterm Exam* *A Final Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*Khallef Boubaker (2022). Cartographie assistée par ordinateur. Université de Ferhat Abbas -Sétif 1.* *Bitaisha Shukuru (2022). Notes de cours Cours de Topographie et Cartographie I. B.N. Shukuru, MSc. Candidate in Plant Pathology, SAGR, LPU, India.* *Nicolai, Roel (2014) : A critical review of the hypothesis of a medieval origin of portolan charts. Thèse. Université d'Utrecht, Pays-Bas.* *ZANIN C. & TREMELO M.-L. (2003), « Savoir-faire une carte : aide à la conception et à la réalisation d'une carte thématique univariées », Imp. CHIRAT (France), 199 p.*

Photogrammetry 1 Module Handbook

Module designation	*Photogrammetry 1*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE109*
Subtitle, if applicable	*Aerial photography missions, processing of airborne aerial photos*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Adnène KASSEBI*
Lecturer	*Adnène KASSEBI*
Language	*French*
Relation to curriculum	*Photogrammetry is based on the mathematical and physical concepts of image and camera.* *The photogrammetry I module is basic for the creation of topographic maps and plans. It also allows the creation of digital terrain models and digital surface modules, for spatial analysis and geohazard studies.* *Stereoplotting is a support for the creation of spatial components of geographic databases.* *This module is a preparation for the Photogrammetry II module.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*3*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra) and physics (Mechanics & optics), are required.*
Module objectives/intended learning outcomes	*This course allows participants to have a complete overview of photogrammetry, favourable conditions for aerial photography, tools and materials for the smooth running of the mission and the processing and corrections necessary for production and generation photogrammetry products (DEM, DTM, Orthophotos, Orthomosaic and Photogrammetric Block etc...)*

Module objectives/intended learning outcomes	*Each notion is accompanied by theoretical and practical applications.* ***Knowledge:*** *- Students understand the basic knowledge for the preparation of an aerial photography mission.* *- Students understand the basic knowledge of photogrammetry:* • *Variations in scale between photographs,* • *Tilt of the shot associated with aircraft movements,* • *Displacement due to terrain.* *- Students understand the basic knowledge for DEM, DSM and DTM,* *- Students understand the basic knowledge for Analogical, Analytical and Digital plotting.* ***Skills:*** *- The students learn to define the basic elements for the preparation of an aerial photography mission and the knowledge of the parameters for the smooth running of this mission.* *- The students become familiar with the problems of photogrammetry and the know-how to solve them.* *- Students can make the necessary processing and corrections for the production and generation of photogrammetry products.* *- Master the use of the geometric corrections to be made to the image,* *- Master the use of the steps involved in making a basic map,* *- Master the use of the methods of producing a DTM,* *- Master the use of the steps involved in producing an orthoimage.* ***Competences:*** *At the end of this module, the student should be able to:* *- The student becomes capable of carrying out a photogrammetric study and preparing the relative aerial photographic mission.* *- Situate photogrammetry in relation to other data acquisition techniques.* *- The student becomes capable of choosing between different types of cameras and images, according to the requirements of the specifications.*

Content	***Introduction*** ***Chapter I: Terminology: Vocabulary and general principle*** *I.1. Photogrammetry* *I.2. Geometry of aerial photography* *I.3 Principle of stereoscopy* ***Chapter II: Preliminary Project: Preparation of the Aerial Photography Mission*** *II.1. Time of the photogrammetric flight* *II.2. Coverage* *II.3. Requirements* ***Chapter III: Orientations and block creation*** *III.1. Causes of corrections* *III.2. Photogrammetric processing* *III.3. Presentation of the software* *III.4. Creation of a Block* ***Chapter IV: Digital Models*** *IV.1. Difference between DEM, DSM and DTM* *IV.2. Usage* *IV.3. Construction* *IV.4. Operation* *IV.5. Availability* *IV.6. Validity comparison* ***Chapter V: Orthophotography*** *V.1. Principle* *V.2. Uses of orthophotography* *V.3. Manufacturing steps* *V.4. Generation of the Orthomosaic* ***Chapter VI: Photogrammetric plotting*** *VI.1. Plotting* *VI.2. Stereoplotting* *VI.3. Stereoscopic measurements* *VI.4. Analogical* *VI.5. Analytical* *VI.6. Digital*
Study and examination requirements and forms of examination	*Continous Evaluation* *A Midterm Exam* *A Final practical exam* *A Final Written exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam and Final Written Exam 60%*

Media employed	*Booklets for theoretical exercises,* *Booklets for laboratory sessions* *Whiteboard* *Computer* *Data show*
Reading list	*Université LAVAL, 2022. Photogrammétrie fondamentale (GMT-7034). Faculté de foresterie, de géographie et de géomatique Département des sciences géomatiques.* *Arnadi Dhestaratri Murtiyoso, (2016). 'Protocoles d'acquisition d'images et de traitement des données par Drone. Modélisation 3D de bâtiments remarquables par photogrammétrie'.* *Pierre GRUSSENMEYER, (2016). 'Photogrammétrie : bilan et perspectives de 150 années d'histoires'.* *Stéphane LHOMME, (2015). 'HEXAGON GEOSPATIAL WORLD TOUR'.* *Raphaële Héno – Dias, (2008). 'Photogrammétrie numérique'.* *Thibaut Dudka, (2015). 'Photogrammétrie et Modélisation 3D à partir d'images Drone au sein de TPLM 3D'.* *http://cours-fad-public.ensg.eu/course/view.php?id=90#section-1*

Errors' theory and instrumentation in Topography
Module Handbook

Module designation	*Erroros' theory and instrumentation in surveying*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE110*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Mohamed Ali El YAHMADI*
Lecturer	*Mohamed Ali El YAHMADI*
Language	*French*
Relation to curriculum	*The Cartography module is fundamental for the creation of maps and topographic plans (paper or digital).* *This module is a preparation for the thematic cartography module. Online mapping (WEB Mapping) is a continuation of this module.*
Type of teaching, contact hours	*2 hours / week* *Classes of 30 students*
Workload	*28 contact hours* *21 Hours of Self Study*
ECTS Credits/Points	*1.96*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra) is required.*

Module objectives/intended learning outcomes	*This course provides participants with a comprehensive overview of Error Theory and Instrumentation in Surveying.* ***Knowledge:*** *- Understand the concept of errors related to the different instruments used in the field of surveying.* *- Understand the importance of error theory and instrumentation in surveying.* *- Students will become familiar with the concepts of surveying errors.* *- Demonstrate the value of error propagation and least squares compensation technics.* *- Students understand the basic knowledge of accuracy and reliability indicators for geographic data collection and processing.*
	Skills: *- Master the strict rules of error definition related to the different instruments used in surveying.* *- To master the tools of propagation of the errors and the techniques of compensation by least squares.* *- The students can define the accuracy and reliability indicators for the collection and processing of geographical data.* ***Competences:*** *At the end of this module, the student should be able to:* *- Understand the concept of errors related to the different instruments used in the field of topography.* *- Define the accuracy and reliability indicators for the collection and processing of geographical data.* *- Be able to manage a surveying project and make the necessary corrections related to instrumental errors to give a product of sufficient accuracy.*

Content	***Chapter I: General introduction*** *I.1 Systematic errors, accidental errors, mistakes* *I.2 Accidental errors in direct measurements* *I.3. Law of composition of the standard deviation* *I.4 Evaluation of the overall systematic error of a measurement* ***Chapter II: Statistical reminders*** *II.1 Introduction* *II.2 Notion of random variable (RV)* *II.3. Distribution and density* *II.4 Expectation and variance of a random variable* *II.5 Independence and correlation* *II.6. Notion of estimator* ***Chapter III: Error propagation*** *III.1 Introduction* *III.2 Preliminary remarks, notation* *III.3. Propagation of true errors* *III.4. Propagation of variance* *III.5 Exercise* ***Chapter IV: Least Squares Compensation*** *IV.1 Notion of weights and cofactors* *IV.2 Conditional, parametric and Gauss-Helmert compensation* *IV.3 Miscellaneous remarks* *IV.4 Summary table* ***Chapter V: Accuracy and reliability indicators*** *V.1 Introduction* *V.2 Confidence interval and ellipse* *V.3 Reliability indicators*
Study and examination requirements and forms of examination	*Continuous Evaluation* *A Midterm Exam* *A Final Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*

Reading list	*Khallef Boubaker (2022). Cartographie assistée par ordinateur. Université de Ferhat Abbas -Sétif 1.* *Bitaisha Shukuru (2022). Notes de cours Cours de Topographie et Cartographie I. B.N. Shukuru, MSc. Candidate in Plant Pathology, SAGR, LPU, India.* *Nicolai, Roel (2014) : A critical review of the hypothesis of a medieval origin of portolan charts. Thèse. Université d'Utrecht, Pays-Bas.* *ZANIN C. & TREMELO M.-L. (2003), « Savoir-faire une carte : aide à la conception et à la réalisation d'une carte thématique univariées », Imp. CHIRAT (France), 199 p.*

Database Management Systems (DBMS) Module Handbook

Module designation	*Database management system*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE111*
Subtitle, if applicable	*DBMS*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Asma BEN AHMED*
Lecturer	*Dr. Asma BEN AHMED*
Language	*French*
Relation to curriculum	*This module introduces database concepts and relational database management system software. It enables students to design, implement and query a relational database. This module is mandatory to better understand spatial databases.*
Type of teaching, contact hours	*2 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 1h00 per week.* *Classes of 30 students*
Workload	*28 contact hours* *21 Hours of Self Study*
Credit points	*1.96*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.*
Recommended prerequisites	*There is no prerequisite for this module.*

Module objectives/intended learning outcomes	*This course presents an overview of basics in relational database management systems.* *Both theoretical and practical studies are offered at this course.* *At the end of this training, participants will be able to deepen their knowledge in complete autonomy.* *Among the expected outcomes of this course, those listed below:* ***Knowledge:** the students learn to:* - *Understand the fundamentals of relational database and database manipulation* - *Understand the role and nature of relational database management systems (RDBMS) in today's IT environment* - *Translate written business requirements into conceptual entity-relationship data models.*
	- *Query and manipulate databases using the SQL* ***Skills:*** - *Describe the conceptual schema of a database* - *Describe the physical schema of a database* - *Use formal design techniques to produce a database* - *Apply normalization techniques* - *Learn how to explain an Entity Relationship Diagram design and implement a relational database for a specific use case.* - *the ability to build databases using DBMS products such as postrgreSql* - *Be familiar with management database systems* - *Master SQL* ***Competences:*** - *The students are able to design and implement a relational database of a real case study* - *Produces an Entity-Relationship model from a realistic problem specification.* - *The students are able to query a database using SQL commands and then analyse and interpret the results.*

Content	***CHAP1: Introduction to DBMS, basic concepts*** *Definition of a database* *History of Database Management Systems* *Database Approach* *Roles in the Database Environment* *Advantages and Disadvantages of DBMSs* ***CHAP2: Entity-Relationship Model*** *User requirement analysis* *ER diagrams* ***CHAP3: Relational model*** *Translation of entities* *Translation of associations* *1. Translation of binary associations* *2. Translation of unary associations* *Translation of the generalization link* ***CHAP4: Normalization of a relational database*** *Normalization definition* *Normal Forms* *Normalization and Database Design* ***CHAP5: Relational Algebra*** *Unary operations* *Cross products and joins* *Set operations* *Division* *Queries* ***CHAP6: SQL*** *Structured Query Language (SQL)* *Data Types and Constraints in MySQL* *SQL for Data Definition* *SQL for Data Manipulation* *SQL for Data Query* *Data Updating and Deletion* ***Workshops***
Study and examination requirements and forms of examination	*Continous Evaluation* *A Midterm Exam* *A Final practical exam* *A Final Written exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam and Final Written Exam 60%*

Media employed	*Data show* *Booklets for theoretical sessions, workshops for practical sessions* *Computer,* *PostgreSQL,* *internet access*
Reading list	*Database Systems, fourth Edition, Thomas Connolly, Carolyn Begg, Eyrolles, 2005.* *PostgreSQL, fourth Edition, Sébastien Lardière, Eni, 2020* *PostgreSQL tutorial : https://www.postgresqltutorial.com/*

Economy and Management Module Handbook

Module designation	***Economy & Management***
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE112*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Dziri Monji*
Lecturer	*Dr. Dziri Monji*
Language	*French*
Relation to curriculum	*Ensure the opening of engineering students on economic problems*
Type of teaching, contact hours	*1.5 hours / week* *Classes of 30 students*
Workload	*21 contact hours* *21 Hours of Self Study*
ECTS Credits/Points	*1.68*
Weight Factor/Coefficient	*1*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.*
Recommended prerequisites	*Management course*
Module objectives/intended learning outcomes	***Knowledge:*** - *Know the basic economic vocabulary* - *know the methods of analysis in Management* ***Skills:*** - *Train engineering students on the economic and social environment* ***Competences:*** - *Students are able to apply their economic knowledge on business use cases.* - *They can evaluate demand and plan strategies to gain competitive advantages in the market* - *They are able to Conduct and Interpret Economic Analysis on a specific context.*

Content	*CHAP 1. INTRODUCTION TO ECONOMICS* *1.1. Definitions of economics* *1.2. Founding elements of the economy* *1.3. Economic analysis methods* *1.4. The economic model*
	CHAP 2. THE MAIN CURRENTS OF ECONOMIC THOUGHT *2.1. The preclassicals* *2.2. The classic current* *2.3. The Keynesian Current* *2.4. Neoclassicals* *2.5. The contemporaries* *CHAP 3. ECONOMIC FUNCTIONS* *3.1. The consumption functions* *3.2. The savings function* *3.3. The investment functions* *CHAP 4. MECHANISMS OF PRODUCTION AND DISTRIBUTION* *4.1. The production curves* *4.2. Average and marginal productivities* *4.3. Marginal utility* *CHAP 5. METHODS OF ANALYSIS IN MANAGEMENT* *5.1. Cost, volume, profit (break-even point)* *5.2. Introduction to financial analysis* *5.3. The ratios (solvency, profitability, liquidity, etc.)*
Study and examination requirements and forms of examination	*Continous Evaluation* *A Midterm Exam* *A Final Written exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Whiteboard, data show, laptop computer.*
Reading list	*1- Gregory N. Mankiw • Mark P. Taylor, Principes de l'économie. Traduction de la 3e édition anglaise par Élise Tosi. 4e édition, Ouvertures Economiques. Deboeck supérieur.* *2- Nouri CHTOUROU, Courses of principles of economy, Faculty of Economics and Management of Sfax.* *3- Mme Kamoun Rym et Mme Ben Ammar Salima. Introduction générale à la gestion. Université Libre de Tunis.*

A2.3 Semester 2 Modules' Handbook

Applied Mathematics Module Handbook Module Handbook

Module designation	*Applied Mathematics*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE101 and GTE102*
Subtitle, if applicable	*Applied Mathematics*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr. Zrelli Nawel*
Lecturer	*Dr. Zrelli Nawel*
Language	*French*
Relation to curriculum	*This module aims to give students the knowledge in Applied Mathematics such as Numerical Analysis, Scientific Calculation and Optimization. This allows them to apply Mathematics by using numerical methods and then to develop practical methods in Numerical Analysis.*
Type of teaching, contact hours	*Lecture: 3 hours per group (15 students) per week.* *Laboratory session: 2h per group (15 students) per week.*
Workload	70 contact hours 49Hours of Self Study
ECTS Credits/Points	4.76
Weight Factor/Coefficient	3
Requirements according to the examination regulations	*Authorized calculator, and unauthorized documents and internet access.*
Recommended prerequisites	*Some basics knowledge of basic mathematics, basic calculus, and linear algebra.*

Module objectives/intended learning outcomes	***Knowledge:*** - *Students understand how to approximate patterns using linear and non-linear interpolations (Lagrange Polynomial and Newton Polynomial).* - *They are familiar with solving nonlinear equations by using Fixed Point Method, Bisection Method and Newton's Method.* - *Students understand how to calculate error of the numerical solutions.*

	- *Students understand how to approximate the solution of linear functions.* - *Students understand how to approximate the solution of nonlinear functions.* - *The students understand how using Direct Methods for solving linear equations systems such as Gaussian elimination, Gaussian transformation, LU factorization and Cholesky factorisation.* - *The students also understand how using Iterative Methods for solving linear equations systems such as Jacobi method and Gauss-Seidel method.* - *They understand Numerical Differentiation (first derivative and second derivative).* - *They are familiar with Numerical Integration by studying Rectangle method, Trapezoid method and Simpson's method.* - *Students learn numerical solutions of ordinary differential equations by using Euler's method and Runge-Kitta method.* - *Students understand how to approximate the differential equations.* - *Students understand the concept of differential equation and Taylor series.* - *They study the finite element method, that is, they establish Lax-Milgram Theorem, Galerking's method and finite element method.* ***Skills:*** - *Students use Numerical Analysis to calculate and program some numerical methods.* - *Students use Scientific Calculation for manipulation of matrices in Numerical Calculation.* - *Students use their skills in Linear algebra and programming.* ***Competences:*** - *Students are able to program, and to develop some useful methods in Applied Mathematics.* - *Students are able to use Numerical Analysis in their field of study work.* - *They are able to solve complex problems.* - *They are able to communicate more confidently.*

Content	*CHAP 1: POLYNOMIAL INTERPOLATION* *2.1. Interpolation of Lagrange* *2.1.1. Applications and Examples* *2.2. Newton's Interpolation* *2.2.4. Applications and Examples* *2.3. Estimation of the Error*

	CHAP 2: SOLVING NONLINEAR EQUATIONS *2.1. Motivation* *2.2. Fixed point Method* *2.1.1. Principle of the Method* *2.1.2. Convergence* *2.3. Dichotomy Method* *2.3.1. Principle of the Method* *2.3.2. Stopping Criteria* *2.3.3. Convergence* *2.4. Newton's Method* *2.4.1. Principle of the Method* *2.4.2. Convergence* *CHAP 3: RESOLUTION OF LINEAR SYSTEMS* *3.1. Reminder on Linear Algebra* *3.1.1. Positive Definite Matrix* *3.1.2. Normal Matrix* *3.1.3. Orthogonal Matrix* *3.1.4. Spectrum* *3.1.5. Matrix Standards* *3.1.6. The Conditioning of a Matrix* *3.2. Direct Methods for Solving Linear Equations Systems* *3.2.1. Cramer's Method* *3.2.2. Gauss Method (Gaussian Pivot)* *3.2.3. Gauss Jordan's Method* *3.2.4 LU Decomposition Method* *3.2.5. Cholesky Decomposition Method* *3.3. Iterative or Indirect Methods for Solving Linear Equations Systems* *3.3.1. Fixed point method* *3.3.2. Jacobi Method* *3.3.4. Gauss-Seidel Method* *3.3.5. Relaxation Method* *CHAP 4: NUMERICAL DIFFERENTIATION* *4.1. First Derivative* *4.2. Second Derivative* *4.3. Estimation of the error* *CHAP 5: NUMERICAL INTEGRATION* *5.1. Rectangle Method:* *5.1.1. Rectangle on the Left* *5.1.2. Rectangle on the Right* *5.1.3. Rectangle Midpoint* *5.1.4. Estimation of the error*

	5.2. Trapezoidal Method *5.2.1. Simple Trapezoidal Method* *5.1.2. Composite Trapezoid Method* *5.1.3. Estimation of the error* *5.3. Simpson's Method* *5.3.1. Simple Simpson's Method* *5.3.2. Compound Simpson's Method* *5.3.3. Estimation of the Error* *5.4. Quadrature Formula* *5.4.1. Gaussian Quadrature Formula* *5.4.2. Degree of Precision* *5.4.3. Estimation of the Error* *CHAP 6: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS* *6.1. Reminder on Differential Equations* *6.1.1. Linear Differential Equation of Order 1* *6.1.2. Differential Equation with Constant Coefficients of Order 2* *6.2. Euler Method* *6.3. Runge-Kutta Method* *6.3.1. Second-Order Runge-Kutta Method* *6.3.2. Runge-Kutta Method at Order 3 and 4* *6.3.3. Consistency Convergence and Stability* *6.3.4. Estimation of the Error* *CHAP 7: INTRODUCTION TO THE FINITE ELEMENT METHOD* *7.1. Functional Analysis Tools* *7.1.1. Standards and Scalar Products* *7.1.2. Functional Spaces* *7.1.3. Test Functions* *7.1.4. Space H1* *7.2. Variational Formulation* *7.2.1. Example 1-D* *7.2.2. Existence and Uniqueness of the Solution* *7.2.3. The Lax-Milgram Theorem* *7.3. Calculation of Approximate Solutions by the Finite Element Method* *7.3.1. Galerkin's Method* *7.3.2. The finite element method P1* *7.3.3. Example 1 (Equation of Heat)* *7.3.4. Example 2 (Equation of the Convection Diffusion)* *7.3.5. Approximation Error and Convergence of the Method* *7.3.6. Examples*

Study and examination requirements and forms of examination	Continuous Evaluation A midterm exam. A final exam.
	Lab Assignments Lab Exam
Final grade Calculation	Continuous Evaluation and Midterm Exam 40% Final Exam 60%
	Lab Assignments 40% Lab Exam 60%
Media employed	*Booklets for theoretical exercise* *whiteboard*
Reading list	*M. Atteia, M. Pradel, Éléments d'Analyse Numérique, CEPAD, 1990.* *J. Bastien, Introduction à l'Analyse Numérique: Applications sous Matlab, Dunod, 2003.* *K. Chen, P. Giblin, A. Irving, Mathematical Explorations with Matlab, Cambrige University Press, 1999.* *E. Süli, D. Mayers, An Introduction to Numerical Analysis, Cambridge Univ. Press, 2003.* *K. Yosida, Functional Analysis, Springer-Verlag, 1980, 6e ed.* *J. Rappaz, M. Picasso, Introduction à l'Analyse Numérique, Presses Polytechniques et Universitaires Romandes, 1998.*

Cartography Module Handbook

Module designation	*Cartography*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE103*
Subtitle, if applicable	*Mapping*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Adnène KASSEBI*
Lecturer	*Adnène KASSEBI*
Language	*French*
Relation to curriculum	*The Cartography module is fundamental for the creation of maps and topographic plans (paper or digital).* *This module is a preparation for the thematic cartography module. Online mapping (WEB Mapping) is a continuation of this module.*
Type of teaching, contact hours	3 hours / week Theoretical and supervised works Classes of 30 students
Workload	42 contact hours 28 Hours of Self Study
ECTS Credits/Points	2.8
Weight Factor/Coefficient	3
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra) is required.*
Module objectives/intended learning outcomes	*This course provides participants with a comprehensive overview of cartography.* *Each notion is accompanied by theoretical and practical applications.* ***Knowledge:*** *- Understanding the role of Cartography in Geomatics and Topography.* *- Students become familiar with the concepts of cartography and learn how to read a map.* *- Demonstrate the importance of topographic maps and their various uses.*

	- Students understand the basic knowledge of collecting and creating geographic data for mapping. *- Students understand the basic knowledge of cartographic presentation.* ***Skills:*** *- Master the strict rules of graphic semiology.* *- Master the cartographic language.* *- Dress up maps and topographic plans.* *- Learn how to represent absolute and relative quantitative variables.* *- Students can perform the processing necessary for cartographic definition and writing.* ***Competences:*** *At the end of this module, the student should be able to:* *- Create and analyse a map or plan,* *- Construct a cartographic language,* *- Understand and use graphic semiology,* *- Construct, study and standardise conventional signs relating to maps and topographic plans.*

Content	***Chapter VI: Graphic Semiotics*** *VI.1. Concepts of Graphic Language* *VI.2. Construction of cartographic language* ***Chapter VII: Colour and Aesthetics*** *VII.1. Colour* *VII.2. Colour circle* *VII.3. Complementarity circle* *VII.4. Contrasts* *VII.5. Subjectivity of the coloured perception* *VII.6. Characteristics of the writings* *VII.7. Setting up a writing table* ***Chapter VIII: Dressing*** *VIII.1. Frame* *VIII.2. Between the frame and the orle* *VIII.3. Inside the frame* *VIII.4. Formatting of the Cover* *VIII.5. Final layout* *VIII.6. Critique of a design* ***Chapter VII: Colour and Aesthetics*** *VII.1. Colour* *VII.2. Colour circle* *VII.3. Complementarity circle* *VII.4. Contrasts* *VII.5. Subjectivity of the coloured perception* *VII.6. Characteristics of the writings* *VII.7. Setting up a writing table*
	Chapter VIII: Dressing *VIII.1. Frame* *VIII.2. Between the frame and the orle* *VIII.3. Inside the frame* *VIII.4. Formatting of the Cover* *VIII.5. Final layout* *VIII.6. Critique of a design* ***Chapter IX: Topographic Map Language*** *IX.1. Constitution of conventional signs* *IX.2 Studies of conventional signs* *IX.3. Table of conventional signs* *IX.4. Standardisation of conventional signs* *IX.5. Development of conventional signs*

Study and examination requirements and forms of examination	*Continuous Evaluation* *A Midterm Exam* *A final practical exam* *A final Written exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam anf Final Written Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*Khallef Boubaker (2022). Cartographie assistée par ordinateur. Université de Ferhat Abbas -Sétif 1.* *Bitaisha Shukuru (2022). Notes de cours Cours de Topographie et Cartographie I. B.N. Shukuru, MSc. Candidate in Plant Pathology, SAGR, LPU, India.* *Nicolai, Roel (2014) : A critical review of the hypothesis of a medieval origin of portolan charts. Thèse. Université d'Utrecht, Pays-Bas.* *ZANIN C. & TREMELO M.-L. (2003), « Savoir-faire une carte : aide à la conception et à la réalisation d'une carte thématique univariées », Imp. CHIRAT (France), 199 p.*

GIS Module Handbook

Module designation	*GIS*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE104*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr. Mohamed Khaled Bouzid*
Lecturer	*Dr. Mohamed Khaled Bouzid*
Language	*French*
Relation to curriculum	*Learning GIS basics and start using GIS software application will be used in the others module of geomatics such as cartography, web mapping*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*3*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*
Recommended prerequisites	*Prerequisites in computer science may be useful.* *Some basics knowledge of geographic are required.*
Module objectives/intended learning outcomes	***Knowledge:** - this course allows students to learn the basics of geographic information system (GIS)* - *Study how to creates, manages, analyzes, and maps all types of data.* - *GIS course helps students to understand patterns, relationships, and geographic context.* - *Student learns the difference between Maps and Layers* - *Studying the processes to managing content, and creating and using metadata* - *explain different formats and coordinate systems that are used for geographic data* - *give an account of different practical application fields for GIS in earth sciences and environmental sciences.*

	- *give an account of different GIS methods and how these can be applied on relevant problems.* - *Students Understanding topology in vector data* ***Skills:*** - *Working with Maps and Layers: Searching for, opening, and saving maps, basemaps, layers; managing content, and creating and using metadata.* - *Creating and Sharing Map Content* - *Changing scale and map projection, finding locations and places* - *Changing symbology (style), classifying, clustering, filtering, rendering imagery.* - *Working with tabular data: Selecting, creating fields and tables, sorting, summarizing, creating charts, and creating and using popups* - *Collecting and mapping field data from field data collection* - *Drawing and Sketching* ***Competences:*** - *Students are able to create a geographic data set* - Understanding geographic concept - *Analyse spatial information* - *use advanced GIS functionality in a standard GIS software as well as by means own programming for spatial analysis* - *apply advanced analytical methods in GIS to solve real world based environmental problems and to support decision making.*

Content	Chapter 6: Mathematical Approach, buffering, Spatial data Quality: I. Components of Data Quality II. Micro Level Components III. Macro Level Components IV. Accuracy Chapter 7: Visualization of spatial data I. Layers and Projections II. Mapping III. Charting IV. Animation Chapter 8: Map Design and graphic Variable I. Symbols to Portray Points, Lines and Polygons. II. Visual Hierarchy III. Data Classification Graphic Approach Chapter 9: Topology Concepts I. Definition II. Neighborhood and proximity relations III. The connectivity relationship
	IV. Adjacency and contiguity relationships V. Intersection relationships VI. The operators of combinatorial analysis VII. Composition and inclusion relations
Study and examination requirements and forms of examination	*Continuous Evaluation* *A Midterm Exam* *A final practical exam* *A final Written exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam anf Final Written Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*

Reading list	Title: GIS and the 2020 census : modernizing official statistics / Amor Laaribi, Linda Peters. Chang, K.T. (2016) Introduction to geographic information systems. Huitième édition. NewYork: McGraw-Hill Education ESRI (2018) Tout savoir sur les Systèmes d'Information Géographique. Longley, P. (2005) Geographical Information Systems: Principles, Techniques, Management and Applications. Deuxième édition. Wiley

Technical English 1 Module Handbook

Module designation	*Technical English 1*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE105*
Subtitle, if applicable	*Business result (upper-intermediate) + Cambridge English for Engineering*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Amira Gara*
Lecturer	*Amira Gara*
Language	*English*
Relation to curriculum	*Teach students how to communicate in their professional lives/ it provides real world business: it addresses the language and communication needs of employees at all levels of an organisation who need to use English at work in a global environment the whole book focuses primarily on shaping effectively students'* **soft skills** *The second book, however, focuses on the technical terms used in the domain of Engineering.*
Type of teaching, contact hours	*Contact hours: 1h 30/ week* ***class size**: it should be no more than 30 students **teaching method**: speaking/ listening/ writing/ reading/ oral presentations/ role plays/ brainstorming's/ interactions and communication/ case studies* ***total:*** *in class sessions: 1h 30*
Workload	*21 contact hours* *21Hours of Self Study*
ECTS Credits/Points	*1.4*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Oral exams: check students' ability and skills in terms of communicating easily in work life* *Written exams: evaluate students' writing skills and grammar mainly technical engineering writing.* *Neither documents nor internet access permitted.*
Recommended prerequisites	*E.g. existing competences in speaking and writing technically in the field.*

Module objectives/intended learning outcomes	*Help students communicate in English in real-life work situation to acquire the key communication skills they will need in their future working life.* *-All units are about helping students communicate in English real life work situations. The priority is enabling them to do so more effectively and with confidence.* *-The course recognizes that, with so many businesses now being staffed by people of different nationalities there is an increasing trend towards using English as the language of internal communication in many organisations.as well as learning appropriate language for communicating externally. With clients, suppliers; colleagues….* *-The main emphasis is o the students speaking and trying out the target language in meaningful and authentic ways to activate students' interest and encouraging them to talk spontaneously.*
Content	*Chapter 9: New business* *-Starting up a new business* *-Maintaining contacts* *Technical English: Chapter 6 Technical development* *Chapter 10: Communications* *-Communications technology* *-Dealing with information on the phone* *Technical English : Chapter 7: Procedures and precautions* *Chapter 11: Change* *-Presenting future plans* *-Giving both sides of the argument* *Technical English: Chapter 8: Monitoring and control* *Chapter 12: Data* *- Discussing data* *-Describing trends* *-Reports* *Technical English: Chapter 9: Theory and practice* *Chapter 13: Culture* *-Cultural differences* *-Talking about news and gossip* *Chapter 14: Performance* *-Staff appraisals* *-Evaluating performance* *Chapter 15: Career breaks:* *-Putting forward a case* *-Taking time off*

Study and examination requirements and forms of examination	*Assess students' acquisition in terms of:* *Speaking/ listening* *Communicating/ interacting* *Reading/ understanding* *Writing* *Evaluation done via non-conventional tests.* *At least two tests of about 30 minutes* *A mid-semester written exam of at least 1h00* *A final written exam of at least 2h00*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Videos: data show/ JBL/smart phones*
Reading list	*Business results teacher's book/ student book*

Geodesy Module Handbook

Module designation	*Geodesy*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE106*
Subtitle, if applicable	*Geodetic Systems, GPS, GNSS*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Zouhaier FATNASSI*
Lecturer	*Zouhaier FATNASSI*
Language	*French*
Relation to curriculum	*Basic mathematical and physical knowledge is fundamental for the understanding of the Geodesy module.* *This module is a preparation for the Applied Topography and Computer-Aided Drafting (CAD) modules. Layout technics, Ground and condominium subdivision, Topographic Projects and Quality control of topographic works is a continuation of this module.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h30 per week.* *Laboratory session: 1h30 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*3*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.* *A student must have attended at least 75% of the lectures to sit in the exams.*
Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra) is required.*

Module objectives/intended learning outcomes	*Geodesy is a scientific and technical discipline that is the fundamental basis for positioning and locating all geographic information. It is the study of the shape of the Earth, the calculation of its dimensions and the measurement of its gravity field. It therefore determines the precise shape of the Earth called the "Geoid".*

	Each notion is accompanied by theoretical and practical applications. ***Knowledge:*** *- Understand the role of geodesy in defining reference frames for expressing the coordinates of objects and provide the tools and methods used to determine coordinates at both local (Topometry) and global (spatial geodesy) scales.* *- The basic concepts of reference frame definition and the means to achieve geolocation of objects in these frames.* *- Understand the uses of reference systems in many applications such as: geolocation, geophysics, space and atmospheric sciences, observation of climate and ocean changes, knowledge of continental drift, etc.* *- Understand the contribution of the tools to the simulation, prevention and study of natural hazards.* ***Skills:*** *The students learn to define the basic of:* *- Spherical Trigonometry.* *- The notions of Positional Astronomy.* *- Geometry of the Ellipse and the Ellipsoid.* *- Geodetic Systems and Tunisian Geodesy.* *- Plane representations (Lambert and UTM).* *- Transformations between geodetic systems.* *- Notion on the Motion of an Artificial Earth Satellite.* *- General information on satellite positioning systems.* *- Signals and measurements.* *- Errors in GNSS measurements.* *- Use of GNSS for positioning.* ***Competences:*** *- The student masters the notion of geodetic reference frame and will be able to define the reference frames and provide the tools and methods used to determine coordinates at the local scale (Topometry) and at the global scale (spatial geodesy).* *- Be able to use or design topometric or geodetic reference frames.* *- Choose the appropriate reference frames when integrating and processing data in Geographic Information Systems (GIS).* *- Operate or design automatic survey, metrology (monitoring) or GNSS observation systems.* *- The student will be able to make precise measurements of GNSS station coordinates in real time, monitor sea levels or observe variations in gravity (thus ensuring qualitative and quantitative monitoring of various geophysical phenomena (tectonics, volcanics, seismics, etc.)).* *- Exploit, process and edit the acquired data to derive the expected products, or even develop future processing tools.* *- Learn about research in the field of geodesy.* *- Restitute and analyse/critique results.*

Content	***Chapter XI: Plane representations*** *XI.1. Introduction* *XI.2. Corresponding Elements* *XI.3. Canvas* *XI.4. Cylindrical Representations* *XI.5. Conical and Azimuthal Representations* *XI.6. Alterations* *XI.7. Tissot indicator* *XI.8. Plane representations and analytic functions* *XI.9. Quasi-conformal representations or transformations* *XI.10. Exercises and problems* ***Chapter XII: The Lambert Plane Representation*** *XII.1. Definition and Properties* *XII.2. Tissot Indicator* *XII.3. Calculation of the principal moduli* *XII.4. Establishing the formulas R(φ) and Ω(λ)* *XII.5. Determination of the constants R0 and n* *XII.6. Expression of the Cartesian coordinates* *XII.7. Passage from coordinates (R, Ω) to coordinates (x, y)* *XII.8. Passage from (x, y) to (R, Ω) coordinates* *XII.9. Study of the linear alteration* *XII.10. Convergence of meridians* *XII.11. Calculation of the Chord Reduction* *XII.12. Exercises and Problems* ***Chapter XIII: UTM Plane Representation*** *XIII.1. Definition and Properties* *XIII.2. Determination of UTM Coordinates* *XIII.3. Appendix: Calculation of the length of an arc of the meridian of an ellipsoid of revolution* *XIII.4 Exercises and problems* ***Chapter XIV: Transformations between geodetic systems*** *XIV.1. Introduction* *XIV.2. The Bursa-Wolf Model* *XIV.3. The Molodensky Formulae* *XIV.4. The Standard Molodensky Formulae* *XIV.5. Abbreviated Molodensky Formulae* *XIV.6. The search for passage parameters by Molodensky formulae* ***Chapter XIX: Use of GNSS for positioning*** *XIX.1. Absolute positioning* *XIX.2. Differential positioning* *XIX.3. Summary of the different positioning strategies* ***Chapter XX: The main GNSS***

	XX.1. GPS *XX.2 Glonass* *XX.3. Galileo* *XX.4. Compass* *XX.5. Satellite Performance Augmentation System* ***Chapter XXI: Permanent GNSS Networks*** *XXI.1 Why permanent GNSS networks?* *XXI.2 International networks* *XXI.3. The CTA PGR* ***Chapter XXII: The GPS System*** *XXII.1 Introduction* *XXII.2 General aspects* *XXII.3. GPS measuring instruments* *XXII.4. Principles of GPS measurements* *XXII.5. The Fundamental Observational Equations* *XXII.6. The different types of GPS positioning* *XXII.7. GPS applications* *XXII.8. Almanac*
Study and examination requirements and forms of examination	*Continuous Evaluation* *A Midterm Exam* *A Final Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*Jean-Baptiste HENRY (2005). Cours de Topographie et Topométrie Générale « Notions géodésiques de base ». Ecole et Observatoire des Sciences de la Terre (EOST). 65p.* *Françoise et Henri DUQUENNE (2002). COURS DE GÉODÉSIE "Généralités sur la Géodésie". ÉCOLE SUPÉRIEURE DES GÉOMÈTRES ET TOPOGRAPHES. 257p.*

Object Oriented Programming (OOP) Module Handbook

Module designation	*Object Oriented Programming (*OOP*)*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE107*
Subtitle, if applicable	*JAVA programming*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr. Asma BEN AHMED*
Lecturer	*Dr. Asma BEN AHMED*
Language	*French*
Relation to curriculum	*Object Oriented Programming is of great interest since it introduces object-oriented design techniques as well as problem solving. This module will be useful to better understand others programming languages (Python programming). Besides, it serves to help understanding modelling and designing problems and projects.*
Type of teaching, contact hours	*2 hours / week* *Theoretical and practical works* *Classes of 30 students*
Workload	*28 contact hours* *21 Hours of Self Study*
ECTS Credits/Points	*1.96*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.*
Recommended prerequisites	*Prerequisites in algorithms are helpful but not mandatory.*
Module objectives/intended learning outcomes	*This course presents an overview of simple and some advances programming utilities provided by JAVA language. Both theoretical and practical studies are offered at this course.* *At the end of this training, participants will be able to deepen their knowledge in complete autonomy.*

	Among the expected outcomes of this course, those listed below: ***Knowledge:*** *the students learn to:* ○ *Manipulate basic primitive types (int, double, etc.) and operations in JAVA* ○ *Understand conditional and choice structures* ○ *Understand problems where iterative structures are needed and distinguish between different loops (for, while, do...while)* ○ *Understand the object-oriented programming concepts: class, object, attributes, methods, encapsulation, inheritance and polymorphism* ***Skills:*** ○ *They learn how to translate algorithms into JAVA syntax and how to correctly write them* ○ *Use logic analysis to solve problems using conditional and choice structures* ○ *They understand how to read different types from scanner and how to print a message using text, variable values, punctuation…* ○ *Students learn how to implement new classes to solve a specific problem* ○ *They learn how to access and use existing methods for each class* ○ *They are able to connect to databases through java application.* ***Competences:*** ○ *Students will be able to design, code and solve simple and complex problems using JAVA programming language.* ○ *Students are able to develop useful software projects* ○ *Know how to decompose a complex program into classes and implement each one in JAVA* ○ *Demonstrate problem solving skills by analysing problems, modelling it as a system of objects, and implementing algorithms in an object-oriented language.* ○ *They become able to implement new classes and use it to solve practical real-world problems.*

Content	- *CHAP 7: Oriented Object JAVA*
	  ○ Classes and objects
	  ○ Attributes and methods
	  ○ Constructors
	  ○ "This" Keyword
	- *Workshop 6*
	- *CHAP 8: Encapsulation in JAVA*
	  ○ Visibility
	  ○ Getters and setters
	- *Workshop*

	- *CHAP 9: Inheritance and Polymorphism*
	  ○ Inheritance
	  ○ Overloading Vs overriding
	  ○ Polymorphism
	- *Workshop 8*
	- *CHAP 10: Interacting with databases*
	  ○ Setting the environment (JDBC and java library)
	  ○ BD creation
	  ○ CRUD operations with java
	- *Workshop 9*
	- *CHAP 11: Graphical User Interface (GUI)*
	  ○ SWING components
	  ○ Events management
	- *Workshop 10*

Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab projects* *A Final Practical Exam*
Final Grade Calculation	*Continuous Evaluation and Lab Projects 40%* *Final Practical Exam 60%*
Media employed	*Computer, NetBeans IDE, JDK, JDBC, internet access*
Reading list	*Programmer en Java, 7th Edition, Claude Delannoy, Eyrolles, 2011* *Java World Site : http://www.javaworld.com* *Java tutorial : http://java.sun.com/developer/onlineTraining*

CAD Module Handbook

Module designation	*Computer-Aided Design (CAD)*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE113*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Makrem BLAGUI*
Lecturer	*Makrem BLAGUI*
Language	*French*
Relation to curriculum	*This module is a continuation of Cartography, Topography and Geodesy.* *This module is a preparation for Thematic Mapping, Topographic Projects, Bathymetry, Microgeodesy and Quality control of topographic works.*
Type of teaching, contact hours	*2 hours / week* *Classes of 30 students*
Workload	*28 contact hours* *21Hours of Self Study*
ECTS Credits/Points	*1.96*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basic knowledge of Topography, Cartography, Geodesy and GIS is required.* *For the smooth running of this course, knowledge of the processing and Topography is required, the mastery of the principles of vectorization and digital cartography and the principles of topographic surveying, geodesy, coordinate systems, concept of scale, spatial database design, and GIS are also mandatory.*
Module objectives/intended learning outcomes	*This course allows participants to have a complete overview of the new approach to Computer-Aided Drafting (CADD) based on the morphological analysis of the three major components of any urban structure, namely roads, parcels and buildings, the combination of these components constitutes the characteristics of "urban forms".* *Each notion is accompanied by theoretical and practical applications.*

	Knowledge: *- Students understand the basic knowledge for the collection of geographical data according to the requested scale.* *- Students understand the basic knowledge of cartographic Drafting in an urban environment, in rural area or other.* ***Skills:*** *- Students learn to define the basic elements for the creation data in urban and rural areas according to the requested scale for the topographic survey.* *- Geometric modelling to design, test virtually with the help of a computer and digital simulation techniques and produce manufactured products and the tools to make them.* *- Simulation of the behaviour of the designed object.* *- Possible edition of a plan or a diagram being automatic and accessory.* ***Competences:*** *The student will be able to perform very heavy numerical computing functions:* *- numerical modelling;* *- graphic representation;* *- Drawing of plans;* *- manipulation of 3D objects;* *- management of large assemblies.*

Content	***Chapter 1: HANDLING OVER*** *1.1. General Presentation* *1.2. Interface* *1.3. Menus* *1.4. Relationship with AUTOCAD* ***Chapter 2: Co. Calculus*** *2.1. Calculation of the coordinates of a point (Raising/Intersection)* *2.2. Eccentric station calculation* *2.3. Calculation of VO* *2.4. Path calculation column* *2.5. Point calculation Level* *2.5.1. Levelling calculation* *2.5.2. Options* ***Chapter 3: COVADIS 2D*** *3.1. Topographic points* *3.1.1. Loading of seedings* *3.1.2. Modification of altitudes* *3.1.3. Drawing of topo points* *3.1.4. Listing topo points* *3.1.5. Drawing the points' table* *3.1.3. Writing a points' file*

	3.2. Symbols *3.2.1. Inserting symbols* *3.2.2. Management of biblio* *3.3. Dressing* *3.3.1. Boundary design* *3.3.2. Fence design* *3.3.3. Network design* *3.3.4. Enbankment design* *3.4. Rating / Division* *3.4.1. Linear rating* *3.4.2. Quotation of coordinates* *3.4.3. Slope and area scoring* *3.4.4. Division* *3.5. Listing* *3.5.1. Listing of layers* *3.5.2. Listing of points* *3.5.3. Listing of layouts* *3.5.4. Listing of subdivisions* *3.5.1. Listing of polygons* *3.6. Digitalisation Helmeret* ***Chapter 4: COVADIS EDITION*** *4.1. Topographical points* *4.2. Preparation of the trace* *4.2.1. Configuration and design of the squaring* *4.2.2. Frame tilt* ***Chapter 5: COVADIS 3D*** *5.1. Longitudinal and cross-sectional profiles* *5.1.1. Const 30/PL & PV per points* *5.1.2. PL & PV per polylines 3D* *5.2. Level curves* *5.3. Prism cubing calculation* *5.3.1. By prism /1 MNT and plan HZ* *5.3.2. By prism /1 MNT and inclined plane* *5.3.3. Between two MNT*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab projects* *A Final Practical Exam*
Final Grade Calculation	*Continuous Evaluation and Lab Projects 40%* *Final Practical Exam 60%*

Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*CADASTRE.GOUV.FR (2021). LEGENDE DU PLAN CADASTRAL.* *Hervé Parmentier (2017). Sémiologie : « définitions, usages et bonnes pratiques ».* *Standard CNIG (2017). PLAN LOCAL D'URBANISME.* *Cournav (2016). La représentation cartographique.* *Armand Colin (2016). Manuel de Cartographie.* *Guillaume Touya (2012). Le Modèle CollaGen : collaboration de processus automatiques pour la généralisation cartographique de paysages hétérogènes.*

Applied Topography Module Handbook

Module designation	*Applied Topography*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE114*
Subtitle, if applicable	*Surveying*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Makram BLAGUI*
Lecturer	*Makram BLAGUI*
Language	*French*
Relation to curriculum	*The Applied Topography module is fundamental for the creation of maps and topographic plans (paper or digital).* *Layout technics, Ground and condominium subdivision, Topographic Projects and Quality control of topographic works is a continuation of this module.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*3*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.* *A student must have attended at least 75% of the lectures to sit in the exams.*
Recommended prerequisites	*Some basic knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra) is required.*

Module objectives/intended learning outcomes	*Theoretical and practical applications of technics of Surveying* ***Knowledge:*** *- The student must understand the concepts of different methods of Theoretical and practical applications of technics of Surveying:* • *Measuring heights,* • *Topometric calculations,*
	• *Topometric calculations,* • *Angle measurements,* • *Topometric calculations.* *- Students become familiar with using instruments of Topography.* *- Demonstrate the value of topographic plans and their various uses.* *- Students understand the basic knowledge of collecting and creating geographic data for surveying plans.* *- Students understand the basic knowledge of topographic presentation.* ***Skills:*** *- Master the topographic language.* *- Dress up topographic plans.* *- Learn how to represent absolute and relative quantitative variables.* *- Students can perform the processing necessary for Topographic definition and writing.* ***Competences:*** *At the end of this module, the student should be able to:* *- Understand a map or plan,* *- Construct a topographic language,* *- Understand and use graphic semiology,* *- Construct, study and standardise conventional signs relating to topographic plans.*
Content	***Chapter I: Initiation with levelling instruments*** ***Chapter II: Various levelling*** *II.1. Single levelling* *II.2. Round trip levelling* *II.3. Levelling in a loop* *II.4. Levelling by pathway* ***Chapter III: Initiation with the Total Station*** *III.1. Setting up the station* *III.2. Angles and distances Measurement* ***Chapter IV: Sketch Drawing technics*** ***Chapter V: Topographic survey (dimensioned plan in Korbous)*** ***Chapter VI: Calculation and Drawings of plans***

Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab projects* *A Final Practical Exam* *A Final Written Exam*
Final Grade Calculation	*Continuous Evaluation and Lab Projects 40%* *Final Practical Exam and Final Written Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*Khallef Boubaker (2022). Cartographie assistée par ordinateur. Université de Ferhat Abbas -Sétif 1.* *Bitaisha Shukuru (2022). Notes de cours Cours de Topographie et Cartographie I. B.N. Shukuru, MSc. Candidate in Plant Pathology, SAGR, LPU, India.* *Nicolai, Roel (2014) : A critical review of the hypothesis of a medieval origin of portolan charts. Thèse. Université d'Utrecht, Pays-Bas.* *ZANIN C. & TREMELO M.-L. (2003), « Savoir-faire une carte : aide à la conception et à la réalisation d'une carte thématique univariées », Imp. CHIRAT (France), 199 p.*

Spatial Database Management Systems 1 (SDBMS 1)
Module Handbook

Module designation	*Spatial Database Management System 1*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE115*
Subtitle, if applicable	*Spatio-temporal Database*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Adnène KASSEBI*
Lecturer	*Adnène KASSEBI*
Language	*French*
Relation to curriculum	*This module is a continuation of the Database Management System and GIS modules.* *This module is a preparation for Spatial Database Management System II.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*3*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basics knowledge of Database Management System, Cartography, Geodesy and GIS is required.* *Have a good knowledge of tools in Cartography and GIS.*
Module objectives/intended learning outcomes	*This course allows participants to have a complete overview of the structure of spatio-temporal databases of infrastructures and which can be used in monitoring systems for natural phenomena, to be able to meet real-time requirements of the made of the semi-widespread use of sensor networks.* *Each notion is accompanied by theoretical and practical applications.*

	Knowledge: *- Students understand the basic knowledge of the different Spatiotemporal Database management systems available.* *- Students understand the basic knowledge of dissemination of spatial components (vector and Raster) via Spatiotemporal Database Servers.* *- Students understand international geographic information/Geomatics standards (ISO 19100 series).* *- Students understand the requirements of international geographic information/Geomatics standards (ISO 19103 and ISO 19107) for modelling and creating spatiotemporal databases.* ***Skills:*** *- Students learn to define the basic elements for the modelling and creation of Spatiotemporal Databases in the form of a Data Dictionary.* *- Students become familiar with the management tools of spatiotemporal databases.* *- Students can perform processing, execute queries and manage the spatiotemporal databases created.* ***Competences:*** *- The student becomes knowledgeable in the field of designing spatial databases according to the requirements of international standards.* *- The student can play the role of a spatial database administrator.*

Content	***Chapter I: Terminology*** *I.1 Spatio-temporal information systems* *I.2 Spatio-temporal data* *I.3 Databases* *I.4. Spatial database* *I.5. Database management system* *I.6. Presentation of a Geodatabase* *I.7. Geographic information standards* *I.8. Merise vs UML* ***Chapter II: Modelling*** *II.1 Representation* *II.2 Query* *II.3 Indexing* *II.4 Uncertainty* ***Chapter III: Design and structuring of a spatio-temporal database (case of a topographic database)*** *III.1 Content* *III.2 Structuring of data in a Dictionary of a Topographic Database* *III.3 Components of a Topographic Database* *III.4. Presentation of 3D spatial relationships* *III.5. Cardinalities and management rules* ***Chapter IV: Basic concepts relating to the modelling of Merise processes*** *IV.1 Conceptual and logical data models* *IV.2 Physical data model* *IV.3 Object-oriented model* *IV.4 XML model*
	Chapter V: UML Modelling *V.1 Design and implementation of the spatial database (GDB) using the UML modelling method* *V.2 Implementation of the Geodatabase* *V.3 Modelling and designing an ArcGIS geographic database with the MDG Enterprise Architect (EA)*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab projects* *A Final Practical Exam* *A Final Written Exam*
Final Grade Calculation	*Continuous Evaluation and Lab Projects 40%* *Final Practical Exam and Final Written Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*

Reading list	*IGN, 2019. BD TOPO® Version 3.0 – Descriptif de contenu. Institut Géographique National, Saint-Mandé, Paris, France. 363 p.* *ISO 19103 : 2005 – Langage de schéma conceptuel.* *ISO 19107 : 2003 – Schéma spatial.* *ISO 19108 : 2002 – Schéma temporel.* *ISO 19109 : 2005 – Règles de schéma d'application.* *ISO 19110 : 2005 – Méthodologie de catalogage des entités.* *ISO 19115–1 : 2014 – Métadonnées – Partie 1 : Principes de base.* *ISO 19115–2 : 2009 – Métadonnées – Partie 2 : Extensions pour les images et les matrices.* *ISO 19126 : 2009 – Dictionnaires de Concept de caractéristiques et registres.* *ISO 19137 : 2007 – Profil minimal du schéma spatial.* *ISO 19139 : 2007 – Implémentation de schémas XML.*

Remote Sensing 1 Module Handbook

Module designation	*Remote Sensing 1*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE116*
Subtitle, if applicable	*Introduction to Remote sensing*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr. Mohamed Khaled BOUZID / Adnène KASSEBI*
Lecturer	*Dr. Mohamed Khaled BOUZID*
Language	*French*
Relation to curriculum	*Remote Sensing 1s based on the mathematical and physical concepts of image and camera.* *The Remote Sensing 1 module is basic for the creation of topographic maps and plans. It also allows the creation of digital terrain models and digital surface modules, for spatial analysis and geohazard studies.* *This module is a preparation for the Remote Sensing 2 module.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 2h00 per week.* *Laboratory session: 1h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*3*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra) and physics (Mechanics & optics), are required.* *For the smooth running of this course, knowledge of the processing and correction of aerial photos is required, the mastery of the principles of vectorization and digital cartography and the principles of topographic surveying, geodesy, coordinate systems, concept of scale, spatial database design, and GIS are also mandatory.*

Module objectives/intended learning outcomes	*This course allows participants to have a complete overview of the new approach to detecting and monitoring the physical characteristics of an area by measuring its reflected and emitted radiation at a distance (typically from satellite or aircraft). Special cameras collect remotely sensed images, which help researchers "sense" things about the Earth. Some examples are:* *− Cameras on satellites and airplanes take images of large areas on the Earth's surface, allowing us to see much more than we can see when standing on the ground.* *− Sonar systems on ships can be used to create images of the ocean floor without needing to travel to the bottom of the ocean.* *− Cameras on satellites can be used to make images of temperature changes in the oceans.* *Some specific uses of remotely sensed images of the Earth include:* *− Large forest fires can be mapped from space, allowing rangers to see a much larger area than from the ground.* *− Tracking clouds to help predict the weather or watching erupting volcanoes, and help watching for dust storms.* *− Tracking the growth of a city and changes in farmland or forests over several years or decades.* *− Discovery and mapping of the rugged topography of the ocean floor (e.g., huge mountain ranges, deep canyons, and the "magnetic striping" on the ocean floor).* ***Knowledge:*** *- Students understand the basic knowledge for collecting geographical data from remote sensing.* *- Students understand the basic knowledge of geoprocessing image from remote sensing.* ***Skills:*** *- Students can carry out the processing and corrections necessary to the satellite images.* *- Students learn to define the basic elements for collecting geographical data from satellite images.* *- The students become familiar with the problems of remote sensing and the know-how to solve them.* ***Competences:*** *- The student becomes a specialist in the processing and exploitation of satellite images.* *- The student can manage a remote sensing project; either in the selection of the type of imagery related to the project's theme, or in the choice of the most efficient technique for a processing.*

Content	***Chapter I: A story of photons*** *I.1. Birth: the light from the black bodies* *I.2. Dierent kind of interactions* *I.3. Spectral signatures* ***Chapter II: The satellites: instruments on platforms*** *II.1. Orbits* *II.2. Satellites*
	II.3. Ground segment and level of diusion *II.4. Space and a-liated programs* ***Chapter III: Image analysis, photo identification and interpretation*** *III.1. Principles* *III.2. Prerequisites* *III.3. Some tools* ***Chapter IV: Principles of Image Acquisition*** *IV.1. Image Acquisition* *IV.2. Raw Image Processing* ***Chapter V: Definition, History and Areas of Application*** *V.1. Definition* *V.2. History* *V.3. Applications* ***Chapter VI: Principles of Remote Sensing*** *VI.1. Electromagnetic radiation* *VI.2. Radiation and matter* *VI.3. Remote Sensing Applications* *VI.4. Radiation and the Atmosphere* ***Chapter VII: Sensors*** *VII.1. Photographic Sensors* *VII.2. Imaging Radiometer* *VII.3. Active Sensors* ***Chapter VIII: Satellites and Orbits*** *VIII.1. Elements of satellite mechanics* *VIII.2. Two main types of orbits used in remote sensing* *VIII.3. Orbit disturbances and their consequences* ***Chapter IX: From Data Acquisition to Applications: Introduction to Digital Processing of Remote Sensing Data*** *IX.1. NOAA-AVHRR image* *IX.2. Image of the high spatial resolution Earth observation satellites SPOT-HRV and LANDSAT-TM over the Bay of Sum* *IX.3. LANDSAT and SPOT image*

Study and examination requirements and forms of examination	*Continuous Evaluation* *A Midterm Exam* *A Final Practical Exam* *A Final Written Exam*
Final Grade Calculation	*Continuous Evaluation and Miterm Exam 40%* *Final Practical Exam and Final Written Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*Guo, Huadong; Huang, Qingni; Li, Xinwu; Sun, Zhongchang; Zhang, Ying (2013). "Spatiotemporal analysis of urban environment based on the vegetation–impervious surface–soil model" (PDF). Journal of Applied Remote Sensing. **8**: 084597. Bibcode:2014JARS....8.4597G. doi: 10.1117/1.JRS.8.084597. S2CID 28430037. Archived (PDF) from the original on 19 July 2018. Retrieved 27 October 2021.* *Schowengerdt, Robert A. (2007). Remote sensing: models and methods for image processing (3rd ed.). Academic Press. p. 2. ISBN 978-0-12-369407-2. Archived from the original on 1 May 2016. Retrieved 15 November 2015.* *Schott, John Robert (2007). Remote sensing: the image chain approach (2nd ed.). Oxford University Press. p. 1. ISBN 978-0-19-517817-3. Archived from the original on 24 April 2016. Retrieved 15 November 2015.* *"Saving the monkeys". SPIE Professional. Archived from the original on 4 February 2016. Retrieved 1 January 2016.* *Howard, A.; et al. (19 August 2015). "Remote sensing and habitat mapping for bearded capuchin monkeys (Sapajus libidinosus): landscapes for the use of stone tools". Journal of Applied Remote Sensing. **9** (1):096020. doi: 10.1117/1.JRS.9.096020. S2CID 120031016.* *Liu, Jian Guo & Mason, Philippa J. (2009). Essential Image Processing for GIS and Remote Sensing. Wiley-Blackwell. p. 4. ISBN 978-0-470-51032-2.* *Makki, Ihab; Younes, Rafic; Francis, Clovis; Bianchi, Tiziano; Zucchetti, Massimo (1 February 2017). "A survey of landmine detection using hyperspectral imaging". ISPRS Journal of Photogrammetry and Remote Sensing. **124**: 40–53. Bibcode:2017JPRS..124...40M. doi:10.1016/j.isprsjprs.2016.12.009. ISSN 0924-2716.* *Stewart, J.E.; et al. (2014). "Finescale ecological niche modeling provides evidence that lactating gray seals (Halichoerus grypus) prefer access to fresh water in order to Drink" (PDF). Marine Mammal Science. **30** (4): 1456–1472. doi:10.1111/mms.12126. Archived (PDF) from the original on 13 July 2021. Retrieved 27 October 2021.* *"Begni G. Escadafal R. Fontannaz D. and Hong-Nga Nguyen A.-T. (2005). Remote sensing: a tool to monitor and assess desertification. Les dossiers thématiques du CSFD. Issue 2. 44 pp". Archived from the original on 26 May 2019. Retrieved 27 October 2021.*

Probability and Statistics Module Handbook

Module designation	*Probability and statistics*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE117*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr. Firas Feki*
Lecturer	*:* *Dr. Firas Feki*
Language	*French*
Relation to curriculum	*Statistic and probability is of great interest in Geomatics and Topography engineering. This module is the continuity of the mathematics modules and it is a preparation for the Geostatistics and spatial analysis modules.*
Type of teaching, contact hours	*3 hours / week* *Classes of 30 students*
Workload	*42 contact hours=* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*
Recommended prerequisites	*Basic knowledge of mathematics, basic calculus, and linear algebra are required.* *For this course, knowledge of engineer maths are also necessary.*
Module objectives/intended learning outcomes	***Knowledge:*** *- Students understand Grouped Frequencies and Graphical Descriptions.* *- Students learn Probability Distributions of Continuous Variables and Discrete Variable.*

	- Students understand how Using a computer to Calculate Summary Numbers. *- Students understand how Using a computer to Calculate Frequency Graphs of Disrete Data and Continuous Data.* ***Skills:*** - *Develop problem-solving techniques needed to accurately calculate probabilities.* - *Apply problem-solving techniques to solving real-world events.* - *Apply selected probability distributions to solve problems.* - *Students use probability to calcul and programming some numerical methods.* - *Students use their skills in statistic and probability Competences:* - *Students are able to programming, and to develop some and useful methods in statistic and probability.* - *Students are able to use statistic and probability in their field of study work.* - *To enable students to develop their problem-solving skills by using relevant mathematical and statistical techniques.*

Content	*Chap 1 Basic probability* *1.1 Fundamental Concepts* *1.2 Basic Rules of Combining Probalities* *1.2.1 Addition Rule* *1.2.2 Multiplication Rule* *1.3 Permutations and Combinations* *1.4 More Complex Problems: Bayes' Rule* *Chap 2 Descriptive Statistics: Summary Numbers* *2.1 Central Location* *2.2 Variability or Spread of the Data* *2.3 Quartiles, Deciles, Percentiles, and Quantiles* *2.4 Using a computer to Calculate Summary Numbers* *Chap 3 Grouped Frequencies and Graphical Descriptions* *3.1 Stem-and-Leaf Displays* *3.2 Box Plots* *3.3 Frequency Graphs of Disrete Data* *3.4 Continuous Data: Grouped Frequency* *3.5 Use of computers* *Chap 4 Probability Distributions of Discrete Variable* *4.1 Probability Functions and Distribution Functions* *4.2 Expectation and Variance* *4.3 Binomial Distribution* *4.4 Poisson Distribution* *4.4.1 Calculation of Poisson Probabilities* *4.4.2 Approximation to the binomial Distribution* *4.4.3 Use of Computers*
	Chap 5 Probability Distributions of Continuous Variables *5.1 Probability from the Probability Function* *5.2 Expected Value and Variance* *5.3 Extension: Useful Continuous Distributions* *5.4 Extension: reliability*
Study and examination requirements and forms of examination	*Continuous Evaluation* *A Midterm Exam* *A Final Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Whiteboard* *Computer* *Data show*

Reading list	- *Introduction à la méthode statistique - 6e édition, Bernard Goldfarb, Catherine Pardoux, Dunod, 2011* - *https://www.biblio-sciences.org/2022/04/introduction-la-methode-statistique-6e.html* - *Mathématiques L1 L2 Statistique et probabilités en 30 fiches, Daniel Fredon, Myriam Maumy-Bertrand, Frédéric Bertrand, Dunod, 2012* - *https://www.biblio-sciences.org/2022/06/mathematiques-l1-l2-statistique-et.html#google_vignette* - *Statistique et Probabilités : Cours et exercices corrigés - 6e édition, Jean-Pierre Lecoutre, Dunod, 2016* - *https://www.biblio-sciences.org/2020/03/statistique-et-probabilites-cours-et.html*

Field School 1 Module Handbook

Module designation	*Field school 1*
Module level, if applicable	*1st year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE118*
Subtitle, if applicable	*Field trips*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Adnène KASSEBI*
Lecturer	*Adnène KASSEBI (Expert)* *Rezgui MAGTOUF (Expert)* *Mohamed Ali El YAHMADI (Expert)*
Language	*French*
Relation to curriculum	*This module presents the opportunity for the students to apply the concepts learned in class directly in the field:* *- Topographic survey with different techniques and materials (Setting up, linking, routing, levelling etc...)* *- Field mapping (understanding the elements of the infrastructure, task of the cartographer in the field, making measurements and Drawing sketches, etc.)*
Type of teaching, contact hours	*Supervision, coding and simulations* *2 contact hours per week*
Workload	*28 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.24*
Requirements according to the examination regulations	*Students must attend the field school.* *Authorized calculator.* *Authorized documents.* *Allowed internet access.*
Recommended prerequisites	*Basic knowledge of Cartography, Topography and mathematics modules are required.*

Module objectives/intended learning outcomes	*This module offers the opportunity to carry out a field project under the guidance of a supervisor. The main objectives are as follows:* ***Knowledge:*** *- Learn how to prepare a literature review of the area to be visited.* *- learn how to locate themselves on the map and draw the access route to the study area.* *- know the different methods to collect topographic data*
	This module offers the opportunity to carry out a field project under the guidance of a supervisor. The main objectives are as follows: *Knowledge:* *- Learn how to prepare a literature review of the area to be visited.* *- learn how to locate themselves on the map and Draw the access route to the study area.* *- know the different methods to collect topographic data* *- Know how to do a cartography of the study area.* *- Know how to do cartographic study and analysis.* *- Know how to do a topographic survey.* *- Know how to do topographic study and analysis.* ***Skills:*** *- Manipulate the material and do practical field exercises.* *- Apply the basic concepts of Cartography and Topography seen in class.* *- Develop the student's skills in the use of the main surveying tools.* *- Learn how to apply theoretical concepts directly on the field* *- Acquire the skills necessary to interpret and process data.* *- Acquire the skills necessary to carry out field surveys and their layout.* *-Develop research, analytical, writing, editing and organisational skills and the ability to synthesise through in-depth exploration of fieldwork tasks.* *-Acquire the skills and attitudes necessary to collect topographic data using the usual surveying instruments (total station, theodolite, level, etc.), .* *- Specify and transform, by means of mathematics, this technical information, and to translate graphically, in the form of topographic Drawings and layouts, on a Drafting table or on the computer, the surveys already carried out* *- Work in a guided way with the support of a supervisor.* ***Competences:*** *- To be able to assess the needs to ensure a good work in fields.* *- To be able to conduct a field survey and research.* *- Master the written technical skills.*

Content	***Part A: Terrain Mapping*** ***Chapter I: Principles and methods of field mapping*** *I.1 Rehabilitation of existing stock* *I.2 Degree of reliability of maps* *I.3 Specificities of the map-raising work* *I.4 What to map?* *I.5. Time required to survey a map* ***Chapter II: Exploratory techniques*** *II.1 How to choose your routes* *II.2 How to move and observe at the same time* *II.3 How to proceed in ambiguous cases* *II.4 Using aerial photographs* *II.5. Field measurements*
	Chapter III: Plotting techniques (map keeping) *III.1 Drawing in the field* *III.2. clean plotting* *III.3 Notations (structural and others)* *III.4. Main types of geometry that may be encountered in contour Drawing* ***Part B: Topographic survey*** ***Chapter I: Canvases and surveys*** *I.1 Setting up the station* *I.2 Performing basic plots* *I.3 Measuring angles, distances and elevations* *I.4 Angular closure* *I.5. Closing in position* *I.6. Calculating a polygonal* *I.7. Surveying a flat terrain and drawing a plan* ***Chapter II: Coding*** ***Chapter III: Export*** ***Chapter IV: Documents to be produced or included in the file*** *IV.1 Field notes including, among other things, sketches of polygons and the location of each station, levelling paths, etc.* *IV.2 Raw data files from the total station or GPS.* *IV.3 Documentation showing the processing of the raw data.* *IV.4 "Benchmark description" form. Include on the form the numbers of other visible landmarks or high points.* *IV.5. Real-time GPS observation form (basic framework).*
Study and examination requirements and forms of examination	*In Fiedl Work* *Dissertation/Written Report*

Final Grade Calculation	*IIn Field Work 25%* *Dissertation 75%.*
Media employed	*Laptop computer / Tablet / Field equipment / Notebook*
Reading list	

A2.4 Semester 3 Modules' Handbook

UML Modeling Module Handbook

Module designation	*UML Modeling*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE201*
Subtitle, if applicable	*Unified Modelling Language*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Adnène KASSEBI*
Lecturer	*Adnène KASSEBI*
Language	*French*
Relation to curriculum	*UML programming provides a recognized tool for practical training of students in understanding and visualizing software design.* *This module if essential to accurately conduct project studies and engineering especially when tackling the synthesis, end of year and end of studies projects.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*3*
Requirements according to the examination regulations	*Unauthorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*basic knowledge of software engineering and object oriented programming*
Module objectives/intended learning outcomes	***Knowledge:*** - *Students know the advantages of using UML design.* - *Students get a general view on the most important UML diagrams used in the field of geomatics projects.* - *Students know the graphical elements of different UML diagrams and their meaning.*

Module objectives/intended learning outcomes	- *Students learn the related terminology for each UML diagram.* ***Skills:*** - *Students learn how to limit the system environment and identify its stockholders.* - *Students learn how to use elementary graphical components to design diagrams using UML paradigm.* - *Students learn how to link appropriately the different diagram components.* - *Students learn how to express descriptive text through UML diagrams.* ***Competences:*** - *Students are able to abstract real case studies and projects by elaborating different UML diagrams.* - *Students are able to select the most appropriate UML diagrams to design and explain concepts and ideas* - *Students are able to establish the links between the different UML diagrams used to model a real case study in order to offer a coherent solution.*

Content	*CHAP 1: Generalities: Development cycles and design methodology* *1.1. Information system* *1.2. Software development cycle* *1.3. UML and its diagrams* *1.4. UML views of a system* *1.5. Contribution of UML modeling* *CHAP 2 : Use case diagram* *2.1. Use case diagram* *2.2. Basic elements* *2.3. Actor, use case* *2.4. Generalization between actors* *2.5. Use case relationships: inclusion, extension, generalization* *2.6. Textual description of use cases* *CHAP 3 : Class diagram, Object diagram* *3.1 Class diagram: definition, purpose of class and object concept* *3.2 Class characteristics* *3.3 Visibility of attributes and methods* *3.4 Relationship between class and multiplicities* *3.5 Aggregation, composition and generalization* *CHAP 4 : Interaction diagram* *4.1 Definition, objective, notation* *4.2 Concept of messages* *4.3 Types of messages* *4.4 Control structures (ALT, LOOP, ...)*

Content	*CHAP 5 : Activity diagram* *5.1. Activity diagram: definition, purpose* *5.2. Activities, connections* *5.3. Conditional connection, parallel ...* *5.4. Building an activity diagram* *CHAP 6 : Transition-state diagram* *6.1. Transition state diagram: definition, purpose* *6.2. State* *6.3. Event, transition* *6.4. Action* *6.5. Dynamics of a state*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab Assignments* *Lab Exam*
Final Grade Calculation	*Continuous Evaluation and Lab Assignments 40%* *Lab Exam 60%*
Media employed	*Booklets for theoretical exercises,* *Whiteboard* *Computer* *Data show*
Reading list	*UML 2.0, M. Fowler, PEARSON, 2004* *Unified Modelling Language: Systems Analysis, Design and Development, T. Halpin, K. Siau, Igi Global, 2001* *Object-Oriented Analysis and Design Through Unified Modelling Language, G. Swain, Laxmi Publications First Edition, 2017*

Python Module Handbook

Module designation	*Python*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE202*
Subtitle, if applicable	*Python Programming*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Asma BEN AHMED*
Lecturer	*Dr. Asma BEN AHMED*
Language	*French*
Relation to curriculum	*This module helps students to deepen their knowledge in problem solving. It is of great interest since it powers programming for GIS and AI modules.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.*
Recommended prerequisites	*The students have basic knowledge in algorithms writing and have already get a course in Object Oriented Programming language (Java). Thus, they have already an idea about the concepts of object-oriented programming.*

Module objectives/intended learning outcomes	*This course presents an overview of simple and some advances programming utilities provided by Python language. Both theoretical and practical studies are offered at this course.* *At the end of this training, participants will be able to deepen their knowledge in complete autonomy.* *Among the expected outcomes of this course, those listed below:* ***Knowledge:** the students learn to:* - *Manipulate Data Types and Variables within Python (numbers, Booleans, strings, etc)* - *Manipulate basic (comparison, assignment) and arithmetic operations in Python*
	- *Use logic analysis to resolve problems using different control structures* - *Manipulate loops in Python* - *Define new functions and operations in Python* - *Learn composed data types in Python: Lists et Sets* - *Use Python libraries* ***Skills:*** - *The students learn how to correctly write programs in Python syntax* - *They understand how to read and print a message using text, variable values, punctuation…* - *They learn how to translate algorithms (conditional structures, loops, etc.) into Python syntax.* - *They learn how to access and use existing methods for each class* ***Competences:*** - *The students are able to design and develop simple and useful information system using the most popular programming language today: Python.* - *They become able to implement new classes and use it to resolve a complex problem in python.*

Content	*CHAP1 INTRODUCTION TO PYTHON LANGUAGE* *1.1. Python characteristics* *1.2. Python development tools* *1.3. Installation and configuration* ***Workshop1*** *CHAP2 BASIC COMPONENTS OF PYTHON* *2.1. Variables* *2.2. Constants* *2.3. Operators* *CHAP3 INPUT AND OUTPUTS IN PYTHON* ***Workshop2*** *3.1. Strings* *3.2. Strings slicing* *3.3. Types conversion* ***Workshop3*** *CHAP4 CONDITIONAL STATEMENTS* *4.1 If... else…* *4.2 If … elif… else* ***Workshop3*** *CHAP5 FUNCTIONS* *5.1 Function definition* *5.2 Built-in functions* ***Workshop4*** *CHAP6 LOOPS IN PYTHON* *6.1. While* *6.2. For* *6.3. Range* ***Workshop5***
Content	*CHAP7 OBJECT ORIENTED PROGRAMMING IN PYTHON* *7.1. Classes* *7.2. Properties* *7.3. Decorators* *7.4. Inheritance* *7.5. Polymorphism*
Study and examination requirements and forms of examination	*Continous Evaluation* *Lab projects* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Lab Projects 40%* *Final Exam 60%*
Media employed	*Computer, Thonny/ PyCharm, internet access*
Reading list	*Python en concentre De Alex Martelli ; 'Head-First Python' by Paul Barry*

Urban hydraulic systems Module Handbook

Module designation	*Urban hydraulics*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE203*
Subtitle, if applicable	*Drinking water supply - Urban sanitation*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Hela AYEB MRABTINI*
Lecturer	*Dr. Hela AYEB MRABTINI*
Language	*French*
Relation to curriculum	*The module Urban hydraulics is of great interest in Geomatics and Topography engineering since it makes it possible to analyse and design networks for Drinking water distribution and also networks for rainwater or waste water evacuation in urban areas.*
Type of teaching, contact hours	*Lecture: 2h per week.* *Classes of 30 students*
Workload	*28 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.68*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*
Recommended prerequisites	*Prerequisites in hydraulics may be useful.* *Some basics knowledge of mathematics and basic calculus are required.* *For this course, hydraulic bases are required. Some knowledge of engineer maths is also necessary.*

Module objectives/intended learning outcomes	***Knowledge:*** *-Students learn the methods of managing water resources from collection to distribution to consumers.* *-Students understand the types of Drinking water distribution networks* *-Students understand the wastewater and rainwater Drainage systems* *-Students are more oriented towards new sanitation technologies and up-to-date treatment processes using efficient, rational,* *energetic and ecological techniques.*
	Skills: *-Students use the Hardy Cross method to calcul a Drinking water distribution network* *-Students use the rational method and the superficial method to calculate a sewerage network* *-Students use their skills in iterative calculation.* ***Competences:*** *- Students will be able to understand all the operations involved in supplying the population with Drinking water, from abstraction from the natural environment to users.* *- Students will be able to Control the various water needs of the populations.* *- Students will be able to design and size a Drinking water distribution network.* *- Students will be able to understand all the techniques which aim to ensure the evacuation of all rain and waste water as well as their treatment and discharge into natural outlets in modes compatible with public health requirements.* *- Students will be able to design and size wastewater and rainwater networks*

Content	***PART 1: Drinking water supply*** *CHAP 1: Introduction to water scarcity in Tunisia* *1.1. Water resources of Tunisia* *1.2. Use of water* *1.3. National strategy for water saving* *1.4. Power supply diagram* *1.5. Needs to be met* *1.6. Estimation of needs* *1.6.1. Estimation of the flow rates consumed* *1.6.2. Estimation of domestic needs* *CHAP 2: tanks* *2.1. Capacity of tanks* *2.2. Location of tanks* *CHAP 3: Distribution network* *3.1. Debit* *3.2. Velocity* *3.3. Pressure* *CHAP 4: Classification of networks* *4.1. Network structure* *4.2. Calculation assumptions* *4.3. Calculation methods* *CHAP 5: Calculation of networks* *5.1. Calculation of branched networks* *5.2. Calculation of meshed networks by the Hardy Cross method*

	PART 2: Urban sanitation *CHAP 1: Sanitation systems* *1.1. Introduction* *1.2. Sewage and rainwater disposal systems* *1.2.1. Unitary system* *1.2.2. Separative system* *1.2.3. Pseudo-separative system* *1.2.4. Mixed system* *1.2.5. composite system.* *1.2.6. Special systems.* *1.3. Typical network diagrams* *1.4. Overall methodological outline of the sanitation data* *CHAP 2: Calculation of stormwater flows* *2.1. The rational method* *2.2. The superficial method or Caquot model* *CHAP 3: Calculation of wastewater flows* *3.1. Domestic and collective wastewater flows* *3.2. Industrial wastewater flows* *3.3. Parasitic clear water flows* *3.4. Dry time flows* *CHAP 4: Sizing of sewage pipes* *4.1. Introduction* *4.2. Calculation methods* *4.2.1. Chezy formula* *4.2.2. Manning–Strickler formula* *4.3. Network calibration constraints* *4.3.1. Wastewaters* *4.3.2. Rainwaters* *4.4. Calculation of sections and slopes* *4.4.1. Filling - Loading pipes* *4.4.2. Establishment of the piezometric line* *4.4.3. Network profiles and routes* *4.5. Choice of pipes* *CHAP 5: Related works execution* *CHAP 6: Wastewater station*
Study and examination requirements and forms of examination	*Continuous Evaluation* *A Midterm Exam* *A Final Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*

Media employed	*Booklets for theoretical exercises,* *Whiteboard* *Computer* *Data show*
Reading list	*Bonnin, J. (1986) Hydraulique urbaine Appliquée aux agglomérations de petite et moyenne importance. Ed. Eyrolles, Paris* *Bourrier R., Satin M. et Selmi, B. (2010) Guide technique de l'assainissement. Le Moniteur.* *Bourrier R. (1991), Les réseaux d'assainissement. Calculs, applications, perspectives. Lavoisier TEC & DOC Paris - France.* *Boussicaud A. (1983), Calcul des pertes de charge. C.F.P. France* *Carlier, M. (1972) Hydraulique générale et appliquée. Ed. Eyrolles, Paris* *Gomolla C. & Guerrée H. (1980), La distribution d'eau dans les agglomérations urbaines et rurales. Eyrolles Paris - France.* *Guerrée H. & Cauvin A. (1973), Éléments d'hydraulique. Édition Eyrolles Paris - France.* *Hamou B. (1980), Les réseaux d'assainissement. Centre d'assistance technique et de documentation. France.* *Réménérias G., (1993), Hydrologie de l'ingénieur, Ed. Eyrolles, Paris,.* *Service technique de l'urbanisme. (1989), Mémento sur l'évacuation des eaux pluviales. La documentation française. France.* ***Web site URL :*** *https://www.pseau.org/outils/ouvrages/enit_alimentation_en_eau_potable_2002.pdf*

Geostatistics Module Handbook

Module designation	*Geostatistics*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE213*
Subtitle, if applicable	*Variography, kriging, interpolation and simulation*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Mohamed Ali El YAHMADI (Expert)*
Lecturer	*Mohamed Ali El YAHMADI (Expert)*
Language	*French*
Relation to curriculum	*This module is a continuation of the mathematical modules (Interpolation and Meshing) and the Probability and Statistics module. It is a preparation for the thematic cartography module and Online mapping (WEB Mapping).* *The Geostatistics module is fundamental for Spatial Analyst to create maps or thematic maps applied to Geohazard or others.*
Type of teaching, contact hours	*Lecture and Exercises: 2h per week.* *Classes of 30 students*
Workload	*28 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.68*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra, Probability and Statistics) and GIS required.*

Module objectives/intended learning outcomes	***Knowledge:*** *- Students learn Probability Theory and Spatial Analysis* *- Students understand Variogram Modeling and Estimation* *- Students learn Basic Permissible Models.* ***Skills:*** *- Students are able to interpolate and estimate problems when analyzing sparse data from field observations.* *- Students are able to use Geostatistics to characterize spatial or temporal phenomena.*
	Competences: *- Students are able to use Geostatistics in their field of study work.* *- The student becomes a specialist in the field of Geostatistics applied to geographic information.* *- The student becomes capable of managing a project that integrates Geostatistics and spatial analysis.*
Content	***Chapter 1: Overview*** *1.1 Why Geostatistics?* *1.2 Geostatistical Prediction* *1.3 Geostatistics versus Simple Interpolation* *1.4 Limitations* ***Chapter 2: Probability Theory Review*** *2.1 Nomenclature and Notation* *2.2 Univariate Analysis* *2.3 Bivariate Analysis* *2.4 Multivariate Analysis* *2.5 Gaussian Distribution* *2.6 Central Limit Theorem* ***Chapter 3: Spatial Analysis*** *3.1 Conventional Analysis (Nongeostatistical)* *3.2 Spatial Continuity Analysis (Geostatistical)* ***Chapter 4: Variogram Modeling*** *4.1 Basic Permissible Models* *4.2 Model-Fitting "Rules of Thumb* ***Chapter 5: Estimation*** *5.1 The Problem of Estimation* *5.2 Nongeostatistical (Deterministic) Estimation* *5.3 Estimation Criteria* *5.4 Geostatistical (Probabilistic) Estimation*
Study and examination requirements and forms of examination	*Continuous Evaluation* *A Midterm Exam* *A Final Exam*

Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Booklets for laboratory sessions* *Whiteboard* *Computer* *Data show*
Reading list	*Yann Méneroux, 2019. Introduction à la Géostatistique Variographie, krigeage, interpolation et simulation. ECOLE NATIONALE DES SCIENCES GEOGRAPHIQUES. Cours au Mastere spécialisé Désigéo.* *Ye Zhang, 2011. Introduction to Geostatistics | Course Notes. Dept. of Geology & Geophysics. University of Wyoming.* *Bernard Goldfarb, 2011. Introduction à la méthode statistique - 6e édition, Catherine Pardoux, Dunod.* *https://www.biblio-sciences.org/2022/04/introduction-la-methode-statistique-6e.html*

Topographic projects Module Handbook

Module designation	*Topographic projects*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE205*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Rezgui MAGTOUF (Expert) / Mohamed Ali YAHMADI (Expert)*
Lecturer	*Rezgui MAGTOUF (Expert)* *Mohamed Ali YAHMADI (Expert)* *Makrem BLAGUI (Expert)*
Language	*English / French*
Relation to curriculum	*Students will be able to study and develop a project, review the literature on the Topographic topic, collect and analyse the data. Students will be then able to arrange and present their findings and conclusions in front of responsible for the module.* *This module is a preparation for the synthesis and final year project modules.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Requirements according to the examination regulations	*During the course, students will demonstrate their progress by the following activities:* *1. Produce a literature review,* *2. Weekly meetings with the responsible for the module to discuss project progress,* *3. Record notes of their work: reading, original empirical work, Draft chapters, questionnaire responses, or other material,* *4. Present a work-in-progress talk.* *Acquisition of the agreement of the responsible for the module to submit the manuscript within the deadline.*

Recommended prerequisites	*The students must have a valuable understanding of Topographic module, GIS and Cartography.* *The students should have a good knowledge of report writing in French and English.*
Module objectives/intended learning outcomes	*This project provides an opportunity to pursue a project under the guidance of a supervisor. The main aims are within the main Topographic fields of interest. The students use the base of mathematical modelling, the Cartography, the Photogrammetry, the Remote sensing, the Topography, the WEB Mapping and the Spatial Databases.* ***Knowledge:*** *- Learn how do review the state of the art* *- Understand the essential parts of a project report* *- Know how to use reference works* ***Skills:*** *- Able to do a comparative study* *- Acquire an editorial skill* *- Find and use documentation* *- Develop teamwork skills* *- Able to write a full and detailed report* ***Competences:*** *- Develop their ability to propose solutions to solve complex problems and practical issues related to Topographic modules,* *- Develop their analytical skills and how to interpret results related to Topographic,* *- They are able to work independently,* *- They are able to evaluate their training or self-training needs,* *- Master the written and oral technical communication.*
Content	*- Project overview and project methodology;* *- Introduction to the research process and determination of the main axes of the study;* *- Investigating the general approaches to research and designs* *- Identifying appropriate research problems; writing the problem statement and hypotheses; stating the purpose of a study;* *- Collecting data and analysing them to Draw conclusions;* *- Solution implementation;* *- Assessing the validity and reliability of results.*
Study and examination requirements and forms of examination	*Project Dissertation* *Seminar*

Final Grade Calculation	*Project Dissertation 50%* *Seminar 50%*
Media employed	*Laptops/ project board*
Reading list	*Khallef Boubaker (2022). Cartographie assistée par ordinateur. Université de Ferhat Abbas -Sétif 1.* *Bitaisha Shukuru (2022). Notes de cours Cours de Topographie et Cartographie I. B.N. Shukuru, MSc. Candidate in Plant Pathology, SAGR, LPU, India.* *Nicolai, Roel (2014) : A critical review of the hypothesis of a medieval origin of portolan charts. Thèse. Université d'Utrecht, Pays-Bas.* *ZANIN C. & TREMELO M.-L. (2003), « Savoir-faire une carte : aide à la conception et à la réalisation d'une carte thématique univariées », Imp. CHIRAT (France), 199 p*

Photogrammetry 2 Module Handbook

Module designation	*Photogrammetry 2*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE206*
Subtitle, if applicable	*Preparation of aerial photography missions and processing of airborne aerial photos*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Adnène KASSEBI*
Lecturer	*Adnène KASSEBI*
Language	*French*
Relation to curriculum	*The Photogrammetry II module is the continuation of the Photogrammetry I and the instrumental error material modules. This module allows a thorough analysis of Photogrammetry in general from the point of view of quality and accuracy. It is fundamental for the creation of topographic maps and plans. It also allows the creation of digital terrain models and digital surface modules of very high quality and accuracy, for in-depth spatial analysis and geohazard studies.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight factor/Coefficient	*3*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator*
Recommended prerequisites	*The Photogrammetry I module is mandatory for the understanding of this module.* *Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra) and physics (Mechanics & optics), are required.*

Module objectives/intended learning outcomes	***Knowledge:*** *- Students understand the basic knowledge of the principles of digital photogrammetry.* *- Students understand the basic knowledge of Processing applied to digital photos.* *- Students understand the basic knowledge for photogrammetric control, rendering and completion.* ***Skills:*** *- The students learn how to prepare an aerial photography mission and the best parameters for the successful completion of the mission.* *- Make the different corrections necessary for the different types of aerial photos.* *- The students master resolving the problems of photogrammetry.* *- Students can perform the processing and corrections necessary for the production and generation of photogrammetry products.* *- Students can perform photogrammetric control, rendering and completion.* ***Competences:*** *At the end of this module, the student should be able to:* *- Prepare an aerial photographic mission,* *- Define the different parameters of the camera and the digital image,* *- Perform the different types of photogrammetric control,* *- Complete the fieldwork of the digital data collected.*

Content	***Chapter I: Mathematical reminder*** *I.1. Rotations, similitudes, affinities, homographs* *I.2. Basic matrix calculations: rotation matrices* *I.3. Collinearity equation* *I.4. Real geometry of images* *I.5. Practical rules* ***Chapter II: Principles of digital photogrammetry*** *II.1. Types of digital cameras* *II.2. Camera components and concepts* *II.3. Image formats* *II.4. Display of digital images* *II.5. Digital noise reduction* ***Chapter III: Treatments applied to digital photos*** *III.1. Image formula for central perspective* *III.2. Corrections to the model* *III.3. Geometric calibration of a camera* *III.4. Obtaining the image formula* *III.5. Geometric ground/image relationships* *III.6. Specific problem of the orientation of a couple: coplanarity equation* *III.7. Automation of measurements: automatic correlation* *III.8. Principle of Minimisation* *III.9. Summary*

	Chapter IV: Aerial photography *IV.1. Time of aerial photography* *IV.2. Overlap* *IV.3. Requirements* *IV.4. Photogrammetric control* *IV.5. Restitution* *IV.6. Completely* ***Chapter V: Installation and Activation*** *V.1. System requirements* *V.2. GPU recommendations* *V.3. Installation procedure* ***Chapter VI: Capturing scenarios*** *VI.1. Equipment* *VI.2. Camera settings* *VI.3. Object/scene requirements* *VI.4. Image pre-processing* *VI.5. Capturing scenarios* *VI.6. Restrictions* *VI.7. Lens calibration* *VI.8. Automated mission planning* *VI.9. Plan Mission parameters* *VI.10. Excessive image elimination* ***Chapter VII: General workflow*** *VII.1. Preferences settings* *VII.2. Loading images* *VII.3. Camera groups* *VII.4. Aligning photos* *VII.5. Building dense point cloud* *VII.6. Building mesh* *VII.7. Building model texture* *VII.8. Building tiled model* *VII.9. Building digital elevation model* *VII.10. Building orthomosaic* *VII.11. Processing report generation* ***Chapter VIII: Referencing*** *VIII.1. Camera calibration* *VIII.2. Setting coordinate system* *VIII.3. Optimization* *VIII.4. What do the errors in the Reference pane mean?* *VIII.5. Working with coded and non-coded targets*

	Chapter IX: Measurements *IX.1. Performing measurements on 3D model* *IX.2. Performing measurements on DEM* *IX.3. Vegetation indices calculation* *IX.4. Stereoscopic measurements and vectorization* ***Chapter X: Editing*** *X.1. Using masks* *X.2. Editing point cloud* *X.3. Classifying dense point cloud* *X.4. Editing model geometry* *X.5. Shapes* *X.6. Orthomosaic seamlines editing*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab Assignments* *A Final Exam*
Final Grade Calculation	*Continuous Evaluation and Lab Assignments 40%* *Final Exam 60%*
Media employed	*Booklets for theoretical exercises,* *Booklets for laboratory sessions* *Whiteboard* *Computer* *Data show*
Reading list	*Agisoft LLC, 2021. Agisoft Metashape User Manual Professional Edition, Version 1.7.* *Université LAVAL, 2022. Photogrammétrie fondamentale (GMT-7034). Faculté de foresterie, de géographie et de géomatique Département des sciences géomatiques.* *Arnadi Dhestaratri Murtiyoso, (2016). 'Protocoles d'acquisition d'images et de traitement des données par Drone. Modélisation 3D de bâtiments remarquables par photogrammétrie'.* *Stéphane LHOMME, (2015). 'HEXAGON GEOSPATIAL WORLD TOUR'.* *Raphaële Héno – Dias, (2008). 'Photogrammétrie numérique'.* *Thibaut Dudka, (2015). 'Photogrammétrie et Modélisation 3D à partir d'images Drone au sein de TPLM 3D'.* *https://support.pix4d.com/hc/en-us/sections/360003718992-Manual*

Thematic cartography Module Handbook

Module designation	*Thematic Cartography*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE207*
Subtitle, if applicable	*Urban Cartography, Geological Cartography*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Adnène KASSEBI*
Lecturer	*Adnène KASSEBI*
Language	*French*
Relation to curriculum	*This module is a continuation of Cartography, Topography, Geodesy, Photogrammetry and Remote sensing modules.* *This module is a preparation for Spatial Analyst and GIS quality control.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*3*
Requirements according to the examination regulations	*Authorized calculator* *Authorized documents* *Authorized internet access.*
Recommended prerequisites	*Some basics knowledge of Spatial Database Management System, Cartography, Geodesy and GIS is required.* *For the smooth running of this course, knowledge of the processing and correction of satellite images and aerial photos is required, the mastery of the principles of vectorization and digital cartography and the principles of topographic surveying, geodesy, coordinate systems, concept of scale, spatial database design, and GIS.*

	This course allows participants to have a complete overview of the new approach to the city and urban history based on the morphological analysis of the three major components of any urban structure, namely roads, parcels and buildings, the combination of which constitutes characteristic "urban forms". With the main instrument, the cartographic representation at different scales, which makes it possible both to capitalize on the most diverse sources and to account for the complexity and morphological evolution of an thematic structure. *Each notion is accompanied by theoretical and practical applications.* ***Knowledge:*** *- Students understand the basic knowledge for the collection of geographical data according to the requested scale.* *- Students understand the basic knowledge of cartographic Drafting in an urban environment, in Geological area or other.* ***Skills:*** *- Students learn to define the basic elements for the design of spatial databases in urban areas according to the requested scale (topographic survey and aerial photography).* *- Students learn to define the basic elements for the design of spatial databases in urban areas according to the requested scale (topographic survey and aerial photography).* *- Construct a thematic cartographic language,* *- The students become familiar with the problems of Geological mapping and the know-how to solve them.* *- Students can carry out the processing and corrections necessary for the thematic cartographic production.* ***Competences:*** *At the end of this module, the student should be able to:* *- Student be able a Cartographer,* *- Understand and use graphic semiology,* *- Dress up thematic maps,* *- Construct, study and standardise conventional signs relating to thematic maps.*

Content	***Chapter I: Language of thematic maps*** *I.1 Representation of qualitative components* *I.2 Representation of ordered components* *I.3 Representation of quantitative components* *I.4 Dynamic map* ***Chapter II: Study and Design of a Thematic Map*** *II.1 Thematic map design phase* *II.2 Study and design of a thematic map* *II.3. Client-Mapper Approach*
	Chapter III: Thematic Database Design *III.1 General information on thematic data* *III.2 General organisation of the Data Dictionary* *III.3 Design and generation of the Thematic Database* *III.4 Management of the Thematic Database* ***Chapter IV: Geological Mapping*** *IV.1 Geological Data Infrastructure* *IV.2 Geological Map Legend* *IV.3 Geological Vector Maps* *IV.4. Borehole data* *IV.5. Geophysical data* *IV.6. Harmonisation of geological maps* *IV.7. Dressing of the Geological Map* *IV.8. Geological toponymy* ***Chapter V: Urban Mapping*** *V.1 Land use and spatial organisation* *V.2 Densities of urban space* *V.3. Urban structure and grid* *V.4 Stages of development* *V.5 Images and treatment* *V.6. Analysis and interpretation of results* *V.7. Dressing of urban plans* *V.8. Urban toponymy*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab/Project Assignments* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Lab/Project Assignments 40%* *Final Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*

Reading list	*CADASTRE.GOUV.FR (2021). LEGENDE DU PLAN CADASTRAL.* *Hervé Parmentier (2017). Sémiologie : « définitions, usages et bonnes pratiques ».* *Standard CNIG (2017). PLAN LOCAL D'URBANISME.* *Cournav (2016). La représentation cartographique.* *Armand Colin (2016). Manuel de Cartographie.*
Reading list	*Guillaume Touya (2012). Le Modèle CollaGen : collaboration de processus automatiques pour la généralisation cartographique de paysages hétérogènes.* *http://www.geol-alp.com/varietes/cartes_geol.html* *https://quentinlefevre.com/projets/urban-analysing-maps-design/*

Mobile GIS Module Handbook

Module designation	*Mobile Programming for GIS*
Module level, if applicable	*2nd year geomatics and topography engineering cycle*
Code, if applicable	*GTE208*
Subtitle, if applicable	*Mobile apps for GIS*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Asma BEN AHMED*
Lecturer	*Dr. Asma BEN AHMED*
Language	*French*
Relation to curriculum	*This module is an introduction to mobile programming applied to GIS. It allows the students to expand the skills acquired in object-oriented programming, DBMS and GIS modules by integrating mobile solutions for recurrent GIS issues such as mapping and geolocation.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted..*
Recommended prerequisites	*Java/OOP programming is required.* *The students must have also basic understanding in GIS.*

Module objectives/intended learning outcomes	*This course covers introductory mobile application development for the Android Operating System using XML and Java. Includes developing simple and complex applications that could run on Android phones and tablets. Both theoretical and practical studies are offered at this course.* *At the end of this training, participants will be able to deepen their knowledge in complete autonomy.* *Among the expected outcomes of this course, those listed below:* ***Knowledge:** the students learn to:* - *Understand the Android platform's organization, patterns and programming mechanisms* - *Understand the basic user interfaces and the main building blocks of Android application* - *Understand Java programming concepts needed to Android application development.* ***Skills:*** - *Student will get familiar with the Android Studio environment* - *Apply Java programming concepts to Android application development.* - *Get familiar with the google maps API* - *Know where to find additional sources of information to understand and solve Android-related problems.* ***Competences:*** - *Design and develop an entire mobile application* - *Demonstrate their ability to deploy software to mobile devices* - *Learn how to publish their apps on Google Play.*

Content	***CHAP1: Android UI Overview*** *Introduction* *Android App Structure and UI patterns* *Standard components* *Multiple devices support* ***CHAP 2: Understanding Views*** *Overview* *Views* *UI Events and Listeners* *UI Development* ***CHAP 3: Layouts with View Groups*** *Overview* *Layout overview* *UI Events and Listeners* *UI Development*
	CHAP 4: Adding Multimedia to an App *Multimedia API* *Graphics* *Drawable* ***CHAP 5: Database and Android*** *Creating a database* *Performing CRUD operations* ***CHAP 6: Mapping and location-based services*** *Adding a Map* *Adding a marker to a map* *Find locations in a map.* ***Workshops***
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab/Project Assignments* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Lab/Project Assignments 40%* *Final Exam 60%*
Media employed	*Data show* *Workshops for practical sessions* *Computer,* *Android Studio* *internet access*
Reading list	*Android Application Development All-in-One For Dummies, 3rd Edition, Barry / Mueller Burd, Eyrolles, 2020* *Créez des applications sous Android, Apollidore, 2019* *Android for Developers : https://developer.android.com/*

Communication skills Module Handbook

Module designation	*Communication skills*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE209*
Subtitle, if applicable	*French Communication technique*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Rym Mansour*
Lecturer	*Rym Mansour*
Language	*French*
Relation to curriculum	*For all programmes, including those running out, in which the module is taught: programme, specialization if applicable, compulsory/elective, semester*
Type of teaching, contact hours	*Lecture: 1h30*
Workload	*21 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.4*
Weight Factor/Coefficient	*1*
Requirements according to the examination regulations	*Neither documents nor internet access permitted..*
Recommended prerequisites	*- satisfactory command of the French language* *- editorial and oral competence*
Module objectives/intended learning outcomes	*to ensure the integration of students into professional life*

Content	***Chapter 1: The trainer and communication*** *1.1. Communication* *1.2. Creating the framework for a training sequence: the SIOM* ***Chapter 2: Communication in the company*** *2.1. Communication in the company* *2.2. Communication forms, networks and tools communication*
Content	***Chapter 3: Teaching aids and communication*** *3.1. A few general points of reference* *3.2. Preparing and using a slide show* *3.3. Using flipcharts* *3.4. Using flip charts* *3.5. The metaplan technique* *3.6. Integrating audiovisuals into training* *3.7. Written notes* *Appendix: Creating a slide show* ***Chapter 4: Group facilitation techniques*** *4.1. The three functions of group facilitation* *4.2. Magisterial method: choosing a training technique training* *4.3. Demonstrative method: the practical exercise practical exercises (A.P.)* *4.4. The discovery method: choosing an animation technique* *4.5. The importance of instructions in demonstrative and discovery methods* ***Chapter 5: The different types and conduct of meetings*** *5.1. Conducting meetings* *5.2. Different types of meetings* ***Chapter 6: Communication and the coaching relationship*** *6.1. Coaching: a few points of reference* *6.2. Coaching interviews* *6.3. Some coaching techniques* ***Chapter 7: Documentary resources: where to find information?*** *7.1. Information management* *7.2. Major Internet services* *7.3. Organizing your online documentary research*

Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*whiteboard*
Reading list	

Web development Module Handbook

Module designation	*Web development*
Module level, if applicable	*2nd year geomatics and topography engineering cycle*
Code, if applicable	*GTE210*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Asma BEN AHMED*
Lecturer	*Dr. Asma BEN AHMED*
Language	*French*
Relation to curriculum	*The students are able to develop and build real websites. Web development forms the main pillar module around which other core modules revolve such as webmapping.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight factor	*3*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.*
Recommended prerequisites	*The student has basic knowledge in algorithms writing.*
Module objectives/intended learning outcomes	*The goal of this course is to equip learners with skills they need to build and develop a variety of web applications.* *Both theoretical and practical studies are offered at this course.* *At the end of this training, participants will be able to deepen their knowledge in complete autonomy.* *Among the expected outcomes of this course, those listed below:* ***Knowledge:** the students learn to:* - *Understand the basic knowledge in HTML and know how to structure a web page using HTML.* - *Understand the basic knowledge in CSS and know how to design a web page using CSS.*

	- *Learn how construct responsive websites using CSS, Flexbox and CSS Grid,* - *Understand the basic knowledge in Javascript and know how to make a web page interactive using Javascript* - *Manipulate basic primitive functions of JS.* - *Understand the object-oriented programming concepts of Javascript.* - *Understand the basic knowledge in PHP and know how to make a web page dynamic using PHP.* - *Connect a web application to backend server data using PHP.* ***Skills:*** - *Know how to decompose a web site code into elementary files and implement each one with the corresponding program language.* - *Learn how to correctly use reference websites in web development such as w3S, MDN….* - *Learn how to share and built knowledge using forums web sites such as stackOverFlow.* - *Learn how to cope with problems and self-correct their errors.* - *Learn how to correctly write codes using HTML, CSS, JS and PHP.* ***Competences:*** - *The students are able to develop and build a real technological product (a real website).*

Content	***Part1: Front-End Development*** ***CHAP1: The web and HTML*** ▪ Web pages and servers ▪ HTML and programming ▪ Markup ▪ Block and inline elements ▪ Head and body ▪ Different HTML elements ▪ Workshops ***CHAP2: Styling with CSS*** ▪ CSS syntax ▪ Styling HTML directly ▪ Styling HTML separately ▪ Selectors: type ▪ Selectors: class and ID ▪ Bootstrap library ▪ Workshops ***CHAP3: Javascript and DOM*** ▪ What is Javascript (js) ▪ Data types and variables ▪ conditionals
	▪ Loops ▪ Functions ▪ Arrays ▪ Objects ▪ The DOM ▪ Creating content with js ▪ Working with browsers events ▪ Workshops ***Part2: Back-End Development*** ▪ The web and web servers ▪ Web pages and databases ▪ CRUD (Create, Read, Update and Delete) operations and PHP ▪ Workshops
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab/Project Assignments* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Lab/Project Assignments 40%* *Final Exam 60%*
Media employed	*Computer, Visual Studio Code, XAMP/WAMP server, internet access*

Reading list	*HTML 5: Une référence pour le développeur web, third Edition, Rodolphe Rimelé, Eyrolles, 2017* *CSS3 - Pratique du design web, Hugo Giraudel & Raphaël Goetter, Eyrolles, 2019* *PHP 7: Cours et exercices, Jean Engels, Eyrolles, 2017* *Tout JavaScript, 2nd Edition, Olivier Hondermarck, Eyrolles, 2020* *W3Schools Online Web Tutorials: https://www.w3schools.com* *MDN Web Docs: https://developer.mozilla.org/en* *Stack Overflow - Where Developers Learn, Share, & Build ... knowledge: https://stackoverflow.com/*

Technical English 2 Module Handbook

Module designation	*Technical English 2*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE211*
Subtitle, if applicable	*Business Result (Advanced)*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Amira Gara*
Lecturer	*Amira Gara*
Language	*English*
Relation to curriculum	*Teach students how to communicate in their professional lives/ it provides real world business: it addresses the language and communication needs of employees at all levels of an organisation who need to use English at work in a global environment the whole book focuses primarily on shaping effectively students' soft skills*
Type of teaching, contact hours	*Contact hours: 1 h 30/ week* *in class sessions: 2 hours*
Workload	*21 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.4*
Weight Factor	*2*
Requirements according to the examination regulations	*Oral exams: check students' ability and skills in terms of communicating easily in work life* *Written exams: evaluate students' writing skills and grammar mainly technical engineering writing.* *Neither documents nor internet access permitted.*
Recommended prerequisites	*English existing competences in speaking and writing technically in the field.*

Module objectives/intended learning outcomes	*-Help students communicate in English in real-life work situation to acquire the key communication skills they will need in their future working life.* *-All units are about helping students communicate in English real life work situations. The priority is enabling them to do so more effectively and with confidence.* *-The course recognizes that, With so many businesses now being staffed by people of different nationalities there is an increasing trend towards using English as the language of internal communication in many organisations.as well as learning appropriate language for communicating externally. With clients, suppliers; colleagues….* *-The main emphasis is on the students speaking and trying out the target language in meaningful and authentic ways to activate students' interest and to encourage them to talk spontaneously.*
Content	*Chapter 1: Connections* *- Describing cross-cultural experiences* *- Reporting back on research* *Technical English: Definition of Geomatics* *Chapter 2: Careers* *- Comparing career paths* *- Managing the discussion/sharing ideas* *Technical English: Earth physical and natural features* *Chapter3: Change* *- Giving a formal presentation* *- Speculating about future changes* *Technical English: Topographic relief* *Chapter 4: Risk* *- Handling a corporate crisis* *- Taking part in a teleconference* *Technical English: Contour lines* *Chapter 5: Teamwork* *- Exploring team relationships* *- Dealing with conflict* *Technical English: Contour characteristic terminology* *Chapter 6: Progress* *- Discussing factors for success* *- Brainstorming ideas*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Project Assignments* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Project Assignments 40%* *Final Exam 60%*
Media employed	*Videos: data show/ JBL/smartphones*

Reading list	*Business results teacher's book/ student book (Advanced)*

Remote Sensing 2 Module Handbook

Module designation	*Remote Sensing 2*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE212*
Subtitle, if applicable	*Advanced Remote sensing*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Mohamed Khaled BOUZID / Adnène KASSEBI*
Lecturer	*Dr. Mohamed Khaled BOUZID*
Language	*French*
Relation to curriculum	*Remote Sensing is based on the mathematical and physical concepts of image and camera.* *The Remote Sensing 2 module is basic for the creation of topographic maps and plans. It also allows the creation of digital terrain models and digital surface modules, for spatial analysis and geohazard studies:* *− Large forest fires can be mapped from space, allowing rangers to see a much larger area than from the ground.* *− Tracking clouds to help predict the weather or watching erupting volcanoes, and help watching for dust storms.* *− Tracking the growth of a city and changes in farmland or forests over several years or decades.* *− Discovery and mapping of the rugged topography of the ocean floor (e.g., huge mountain ranges, deep canyons, and the "magnetic striping" on the ocean floor).* *This module is a preparation for the Lasergrammetry and GIS quality control modules.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*3*

Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra), physics (Mechanics & optics), Photogrammetry, Thematic Cartography and Remote sensing are required.* *For the smooth running of this course, knowledge of the processing and correction of aerial photos is required, the mastery of the principles of vectorization and digital cartography and the principles of topographic surveying, geodesy, coordinate systems, concept of scale, spatial database design, and GIS.*
Module objectives/intended learning outcomes	*Deepen the knowledge acquired in remote sensing; become familiar with radar, hyperspectral and lidar data acquisition and analysis techniques; learn about specialized software for processing radar, hyperspectral and lidar data; manipulate, process and extract information from radar, hyperspectral and lidar data; demonstrate critical thinking and the ability to work independently.* ***Knowledge:*** *- Working with passive and active remote sensing sensors. Ground, airborne and space-based platforms and sensors for data acquisition.* *- Understanding the Mechanisms of interaction between electromagnetic radiation and observed targets: spectral signatures and spatial patterns.* ***Skills:*** *- Performing corrections of remote sensing data: calibration and validation.* *- Mastering the fields of application of remote sensing and the technical and socio-economic issues of remote sensing.* *- Carry out practical data acquisition work in the field and in the spectroradiometry laboratory. Physical processing and interpretation of measurements and images applied to the environment.* *- Students learn to define the basic elements for collection of geographical data according from Advancing satellite images.* *- The students become familiar with the problems of remote sensing and the know-how to solve them.* *- Students can carry out the advancing processing and corrections necessary to the satellite images.* ***Competences:*** *- The student becomes a specialist in the processing and exploitation of satellite images.* *- The student can manage a remote sensing project; either in the selection of the type of imagery related to the project's theme, or in the choice of the most efficient technique for a advancing processing: Optic, RADAR and LIDAR.*

Content	***Chapter I: Comparative approach to optical and radar remote sensing*** *I.1 Remote sensing?* *I.2 Some properties of electromagnetic waves* *I.3. airborne trajectories and sensor orbits* *I.4. image generation, image geometry (including relief effects)* *I.5. Nature of the recording (sensor), what information on the surface* *I.6. Resolutions (spatial, spectral, radiometric, temporal)* *I.7. Access to the relief* *I.8. Restitution, visualisation of images* ***Chapter II: Optical remote sensing*** *II.1 General information, general expression of the power received by the sensor* *II.2 Discussion: notion of luminance and bidirectional reflectance* *II.3 Spatial resolution of images* *II.4. Analysis of some curves and numerical values, solar flux, atmospheric absorption* *II.5. Characterisation of a surface, spectral response* *II.6. Some space instruments and sensors* *II.7. Illustrations, derived channels and conclusion* ***Chapter III: Radar remote sensing*** *III.1 Discussion of the design* *III.2 Power measurement, comparison with radar formulation, backscatter coefficient* *III.3 Resolution cell, parameters influencing the measurement (slope, surface properties, wave characteristics)* *III.4. Speckle (variability of the response (amplitude. phase) measured over a homogeneous area* *III.5. A few words on polarimetry and interferometry* *III.6. Influence of surface parameters, natural landscapes* *III.7. Some sensors since 1991* *III.8. Illustrations* ***Chapter IV: Visualisation of an image*** *IV.1 Possible representation of a histogram* *IV.2 Improving the visualisation of an image* *Chapter V: Image Filtering* *V.1 Linear Filters* *V.2 Non-linear filters* *V.3. Morphological Filters* ***Chapter VI: Processing applied to photo-interpretation*** *VI.1 Principal component analysis* *VI.2 Vegetation detection* *VI.3 Classification methods* *VI.4. Hierarchical object-oriented classifications*

	Chapter VI: LIDAR remote sensing *VI.1 Overview of the LIDAR system* *VI.2 Lidar remote sensing: Full wave mode* *VI.3 Point Cloud Mode* *VI.4 Acquisition Methods* *VI.5. Basic data processing* *VI.6. Some applications in Earth & Environmental Sciences*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Practical Exam* *Final Written Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam and Final Written Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	SlideShare, 2021. Cours Topographie haute résolution & lidar, M1. *"Air Force Magazine". www.airforcemag.com. Archived from the original on 19 February 2019. Retrieved 19 February 2019.* *"Military Imaging and Surveillance Technology (MIST)". www.darpa.mil. Archived from the original on 18 August 2021. Retrieved 19 February 2019.* *"The Indian Society of International Law - Newsletter: VOL. 15, No. 4, October - December 2016". doi:10.1163/2210-7975_hrd-9920-2016004.* *"In Depth | Magellan". Solar System Exploration: NASA Science. Archived from the original on 19 October 2021. Retrieved 19 February 2019.* *Garner, Rob (15 April 2015). "SOHO - Solar and Heliospheric Observatory". NASA. Archived from the original on 18 September 2021. Retrieved 19 February 2019.* *Colen, Jerry (8 April 2015). "Ames Research Center Overview". NASA. Archived from the original on 28 September 2021. Retrieved 19 February 2019.* Ditter, R., Haspel, M., Jahn, M., Kollar, I., Siegmund, A., Viehrig, K., Volz, D., Siegmund, A. (2012) Geospatial technologies in school – theoretical concept and practical implementation in K-12 schools. In: International Journal of Data Mining, Modelling and Management (IJDMMM): FutureGIS: Riding the Wave of a Growing Geospatial Technology Literate Society; Vol. X Stork, E.J., Sakamoto, S.O., and Cowan, R.M. (1999) "The integration of science explorations through the use of earth images in middle school curriculum", Proc. IEEE Trans. Geosci. Remote Sensing 37, 1801–1817

A2.5 Semester 4 Modules' Handbook

Web Development Module Handbook

Module designation	*Web development*
Module level, if applicable	*2nd year geomatics and topography engineering cycle*
Code, if applicable	*GTE210*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr. Asma BEN AHMED*
Lecturer	*Dr. Asma BEN AHMED*
Language	*French*
Relation to curriculum	*The students are able to develop and build real websites. Web development forms the main pillar module around which other core modules revolve such as webmapping.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight factor/Coefficient	*3*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.*
Recommended prerequisites	*The student has basic knowledge in algorithms writing.*
Module objectives/intended learning outcomes	*The goal of this course is to equip learners with skills they need to build and develop a variety of web applications.* *Both theoretical and practical studies are offered at this course.* *At the end of this training, participants will be able to deepen their knowledge in complete autonomy.* *Among the expected outcomes of this course, those listed below:*

	Knowledge: *the students learn to:* - *Understand the basic knowledge in HTML and know how to structure a web page using HTML.* - *Understand the basic knowledge in CSS and know how to design a web page using CSS.* - *Learn how construct responsive* - *websites using CSS, Flexbox and CSS Grid,* - *Understand the basic knowledge in Javascript and know how to make a web page interactive using Javascript* - *Manipulate basic primitive functions of JS.* - *Understand the object-oriented programming concepts of Javascript.* - *Understand the basic knowledge in PHP and know how to make a web page dynamic using PHP.* - *Connect a web application to backend server data using PHP.* ***Skills:*** - *Know how to decompose a web site code into elementary files and implement each one with the corresponding program language.* - *Learn how to correctly use reference websites in web development such as w3S, MDN….* - *Learn how to share and built knowledge using forums web sites such as stackOverFlow.* - *Learn how to cope with problems and self-correct their errors.* - *Learn how to correctly write codes using HTML, CSS, JS and PHP.* ***Competences:*** - *The students are able to develop and build a real technological product (a real website).*

Content	***Part1: Front-End Development*** ***CHAP1: The web and HTML*** ▪ Web pages and servers ▪ HTML and programming ▪ Markup ▪ Block and inline elements ▪ Head and body ▪ Different HTML elements ▪ Workshops ***CHAP2: Styling with CSS*** ▪ CSS syntax ▪ Styling HTML directly ▪ Styling HTML separately ▪ Selectors: type ▪ Selectors: class and ID ▪ Bootstrap library ▪ Workshops
Content	***CHAP3: Javascript and DOM*** ▪ What is Javascript (js) ▪ Data types and variables ▪ conditionals ▪ Loops ▪ Functions ▪ Arrays ▪ Objects ▪ The DOM ▪ Creating content with js ▪ Working with browsers events ▪ Workshops ***Part2: Back-End Development*** ▪ The web and web servers ▪ Web pages and databases ▪ CRUD (Create, Read, Update and Delete) operations and PHP ▪ Workshops
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab/Project Assignments* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Lab/Project Assignments 40%* *Final Exam 60%*
Media employed	*Computer, Visual Studio Code, XAMP/WAMP server, internet access*

Reading list	*HTML 5: Une référence pour le développeur web, third Edition, Rodolphe Rimelé, Eyrolles, 2017* *CSS3 - Pratique du design web, Hugo Giraudel & Raphaël Goetter, Eyrolles, 2019* *PHP 7: Cours et exercices, Jean Engels, Eyrolles, 2017* *Tout JavaScript, 2nd Edition, Olivier Hondermarck, Eyrolles, 2020* *W3Schools Online Web Tutorials: https://www.w3schools.com* *MDN Web Docs: https://developer.mozilla.org/en* *Stack Overflow - Where Developers Learn, Share, & Build ... knowledge: https://stackoverflow.com/*

Technical English 2 Module Handbook

Module designation	*Technical English 2*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE211*
Subtitle, if applicable	*English*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Amira Gara*
Lecturer	*Amira Gara*
Language	*English*
Relation to curriculum	*Teach students how to communicate in their professional lives/ it provides real world business: it addresses the language and communication needs of employees at all levels of an organisation who need to use English at work in a global environment the whole book focuses primarily on shaping effectively students' soft skills*
Type of teaching, contact hours	*Contact hours: 1 h 30/ week*
Workload	*21 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.4*
Requirements according to the examination regulations	*Oral exams: check students' ability and skills in terms of communicating easily in work life* *Written exams: evaluate students' writing skills and grammar mainly technical engineering writing.* *Neither documents nor internet access permitted.*
Recommended prerequisites	*E.g. existing competences in speaking and writing technically in the field.*

Module objectives/intended learning outcomes	*Help students communicate in English in real-life work situation to acquire the key communication skills they will need in their future working life.* *All units are about helping students communicate in English real life work situations. The priority is enabling them to do so more effectively and with confidence.* *The course recognizes that, With so many businesses now being staffed by people of different nationalities there is an increasing trend towards using English as the language of internal communication in many organisations.as well as learning appropriate language for communicating externally. With clients, suppliers; colleagues….* *The main emphasis is o the students speaking and trying out the target language in meaningful and authentic ways to activate students' interest and encouraging them to talk spontaneously.*
Content	*Chapter 7: Learning:* *-Talking about training and learning* *-Communication strategies* *Technical English: Cross-sectioning landscape profiles* *Chapter8: Performance* *-Employer-employee expectations* *-Giving an impromptu presentation* *Technical English: The topographic map* *Chapter 9: Resources* *-Corporate social responsibility* *-Discussing options* *Technical English: The topographic terms : map scale, legend, index contours, a contour interval, relief,etc.* *Chapter 10: Leadership* *-Talking about leadership styles* *-Giving a briefing* *Technical English: Slope calculation* *Chapter 11: Values* *-Reaching agreement* *-Raising a difficult point* *Technical English: Types of slopes: convex and concave* *Chapter 12: Persuasion* *-Persuasion and influence* *-Discourse markers*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab/Project Assignments* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Lab/Project Assignments 40%* *Final Exam 60%*

Media employed	*Videos: data show/ JBL/smartphones*
Reading list	*Business results teacher's book/ student book (Advanced level)*

Geostatistics Projects Module Handbook

Module designation	*Geostatistics projects*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE204*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Mohamed Ali El YAHMADI (Expert)*
Lecturer	*Mohamed Ali El YAHMADI (Expert)*
Language	*English / French*
Relation to curriculum	*Students will be able to study and develop a project, review the literature on the Geostatistics topic, collect and analyse the data. Students will be then able to arrange and present their findings and conclusions in front of the responsible of the module.* *This module is a preparation for the synthesis and final year project modules.*
Type of teaching, contact hours	*2 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 1h00 per week.* *Classes of 30 students*
Workload	*28 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.68*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*During the course, students will demonstrate their progress by the following activities:* *1. Produce a literature review,* *2. Weekly meetings with the responsible for the module to discuss project progress,* *3. Record notes of their work: reading, original empirical work, Draft chapters, questionnaire responses, or other material,* *4. Present a work-in-progress talk.* *- Neither documents nor internet access permitted.*

Recommended prerequisites	*The students must have a valuable understanding of statistics, GIS and Cartography.* *The students should have a good knowledge of report writing in French and English.*
Module objectives/intended learning outcomes	*This project provides an opportunity to pursue a project under the guidance of a supervisor. The main aims are within the main Geostatistics fields of interest. The students use the base of mathematical modelling, the Cartography, the Photogrammetry, the Remote sensing, the Topography, the WEB Mapping and the Spatial Databases.* ***Knowledge:*** *- Learn how do review the state of the art* *- Understand the essential parts of a project report* *- Know how to use reference works* ***Skills:*** *- Able to do a comparative study* *- Acquire an editorial skill* *- Find and use documentation* *- Develop teamwork skills* *- Able to write a full and detailed report* ***Competences:*** *- Develop their ability to propose solutions to solve complex problems and practical issues related to Geostatistics modules,* *- Develop their analytical skills and how to interpret results related to Geostatistics,* *- They are able to work independently,* *- They are able to evaluate his training or self-training needs,* *- Master the written and oral technical communication.*
Content	*- Project overview and project methodology;* *- Introduction to the research process and determination of the main axes of the study;* *- Investigating the general approaches to research and designs* *- Identifying appropriate research problems; writing the problem statement and hypotheses; stating the purpose of a study;* *- Collecting data and analysing them to Draw conclusions;* *- Solution implementation;* *- Assessing the validity and reliability of results.*
Study and examination requirements and forms of examination	*Project Dissertation* *Seminar*
Final Grade Calculation	*Project Dissertation 50%* *Seminar 50%*
Media employed	*Laptops/ project board*

Reading list	*https://www.biblio-sciences.org/2022/04/introduction-la-methode-statistique-6e.html* *Yann Méneroux, 2019. Introduction à la Géostatistique Variographie, krigeage, interpolation et simulation. ECOLE NATIONALE DES SCIENCES GEOGRAPHIQUES. Cours au Mastere spécialisé Désigéo.* *Ye Zhang, 2011. Introduction to Geostatistics | Course Notes. Dept. of Geology & Geophysics. University of Wyoming.* *Bernard Goldfarb, 2011. Introduction à la méthode statistique - 6e édition, Catherine Pardoux, Dunod.*

Urban and Rural Space Layout Module Handbook

Module designation	*Urban and Rural Space Layout*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE214*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Zohra Makhlouf*
Lecturer	*Zohra Makhlouf*
Language	*French*
Relation to curriculum	*Land and cadastral laws, condominium Management and implantation technics modules can be considered as a continuation of this module.*
Type of teaching, contact hours	*1.5 hours / week* *Classes of 30 students*
Workload	*21 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.4*
Weight Factor/Coefficient	*1*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basic knowledge of Topography and GIS is required.*

Module objectives/intended learning outcomes	*Each notion is accompanied by theoretical and practical applications.* ***Knowledge:*** - *Know the main components of rural and urban spaces.* - *Students become familiar with the concepts of cartography in rural and urban areas.* - *Know the basic elements of data collection in different fields.* - *Understand the basic knowledge for Code of land use planning for urban and rural development.* ***Skills:*** - *Understand the major planning issues that are emerging and how planning policies and their players are evolving.* - *Understand the difference between urban and rural areas.* ***Competences:*** *At the end of this module, the student should be able to:* - *Master the Code of land use planning for urban and rural development.* - *Provide solutions to reduce territorial imbalances.* - *Provide solutions for organizing and transforming a given area, by rethinking the distribution of housing, facilities, transport infrastructures and activities...*
Content	***Chapter I: Introduction to Urban Planning*** 1. *Glossary and definition* 2. *Historical Overview of Spatial Planning in Tunisia* ***Chapter II: Planning tools*** 1. *National planning and sustainable development scheme* 2. *Regional planning and sustainable development schemes* 3. *Schéma provincial d'aménagement et de développement durable du territoire (Provincial land use and sustainable development plan)* 4. *Master plan for land use planning and sustainable development* ***Chapter III: Planning structures*** 1. *Conseil national d'aménagement et de développement durable du territoire (National council for land use planning and sustainable development)* 2. *Commission nationale d'aménagement et de développement durable du territoire (National commission for regional planning and sustainable development)*

Content	3. *Commission régionale d'aménagement et de développement durable du territoire (Regional planning and sustainable development commission)* 4. *Provincial planning and sustainable development commission* 5. *Communal planning and sustainable development commission* ***Chapter IV: Urban and rural development conditions*** 1. *Urban development* 2. *Rural development* 3. *Change of use of land for residential and non-residential purposes* ***Chapter V: Territorial Development Tools*** 1. *Legal framework* *1.1. Spatial Planning and Urban Planning Code* *1.2. Other Codes and Laws* 2. *Institutional framework* *Different Technical Commissions* 3. *Technical framework* *3.1. Master plan for development* *3.2. Urban development plan* *3.3. Detailed development plan* *3.4. Housing estates* *3.5. Building permits*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions,* *Computers* *Internet*
Reading list	

RADAR Remote sensing Module Handbook

Module designation	*RADAR Remote sensing*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE215*
Subtitle, if applicable	*RADAR*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr. Mohamed Khaled BOUZID / Adnène KASSEBI*
Lecturer	*Dr. Mohamed Khaled BOUZID*
Language	*French*
Relation to curriculum	*Remote Sensing is based on the mathematical and physical concepts of image and camera.* *The Remote Sensing 2 module is basic for the creation of topographic maps and plans. It also allows the creation of digital terrain models and digital surface modules, for spatial analysis and geohazard studies:* *− Large forest fires can be mapped from space, allowing rangers to see a much larger area than from the ground.* *− Tracking clouds to help predict the weather or watching erupting volcanoes, and help watching for dust storms.* *− Tracking the growth of a city and changes in farmland or forests over several years or decades.* *− Discovery and mapping of the rugged topography of the ocean floor (e.g., huge mountain ranges, deep canyons, and the "magnetic striping" on the ocean floor).* *This module is a preparation for the Lasergrammetry and GIS quality control modules.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*

Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra), physics (Mechanics & optics), Photogrammetry, Thematic Cartography and Remote sensing are required.* *For the smooth running of this course, knowledge of the processing and correction of aerial photos is required, the mastery of the principles of vectorization and digital cartography and the principles of topographic surveying, geodesy, coordinate systems, concept of scale, spatial database design, and GIS.*
Module objectives/intended learning outcomes	*Deepen the knowledge acquired in remote sensing; become familiar with radar, hyperspectral and lidar data acquisition and analysis techniques; learn about specialized software for processing radar, hyperspectral and lidar data; manipulate, process and extract information from radar, hyperspectral and lidar data; demonstrate critical thinking and the ability to work independently.* ***Knowledge:*** *- Working with passive and active remote sensing sensors. Ground, airborne and space-based platforms and sensors for data acquisition.* *- Understanding the Mechanisms of interaction between electromagnetic radiation and observed targets: spectral signatures and spatial patterns.* ***Skills:*** *- Performing corrections of remote sensing data: calibration and validation.* *- Mastering the fields of application of remote sensing and the technical and socio-economic issues of remote sensing.* *- Carry out practical data acquisition work in the field and in the spectroradiometry laboratory. Physical processing and interpretation of measurements and images applied to the environment.* *- Students learn to define the basic elements for collection of geographical data according from Advancing satellite images.* *- The students become familiar with the problems of remote sensing and the know-how to solve them.* *- Students can carry out the advancing processing and corrections necessary to the satellite images.* ***Competences:*** *- The student becomes a specialist in the processing and exploitation of satellite images.*
Module objectives/intended learning outcomes	*- The student can manage a remote sensing project; either in the selection of the type of imagery related to the project's theme, or in the choice of the most efficient technique for a advancing processing: Optic, RADAR and LIDAR.*

Content	**Part A** **Chapter I: Introduction** **Chapter II: General information on radar images** *II.1 About the acronym RADAR* *II.2 Image structure* *II.3 Spatial resolution*
	Chapter III: Image geometry *III.1 Effects of varying angle of incidence (flat ground)* *III.2 Effects of the difference between longitudinal and transverse spatial resolutions (flat ground)* *III.3 Effects of viewing direction* *III.3.1. Effects of sensor flight direction and beam orientation (flat ground)* *III.3.2. Complement: Geometric effects related to beam orientation - Case of space radar, simplest approach for equatorial regions* *III.4 Terrain effects* *III.4.1. Terrain effects (slope effects)* *III.4.2. Other examples* **Chapter IV: Radiometry: radar response, general characteristics** *IV.1 Introduction* *IV.2 Radar response in general* *IV.3 Speckle* *IV.3.1 General information on speckle* *IV.3.2. Probability laws for amplitude and intensity* *IV.3.3. quicklook generation, reduced averaged image* *IV.3.4. speckle-speckle summary* *IV.3.5. illustrations* *IV.4 Radar response, backscatter coefficient* *IV.4.1. radar equation, sigma0 backscatter coefficient* *IV.4.2. Terrain effects* *IV.4.3. Gamma and Beta coefficients* *IV.4.4. sigma0 variability in natural values and in dB* *IV.4.5. sigma0 calibration* *IV.4.6. visualization, Sigma0 dB graphs, paper prints* *IV.5. The Phase* *IV.5.1. Phase calculation* *IV.5.2. Phase calculation summary* **Part B** **Appli-1-Introduction** **Appli-2-Reminders of essential image properties** **Appli-3-Applications of amplitude images** **Appli-4-Applications using the phase of the radar response: interferometry** **Appli-5-Applications using the phase of the radar response: polarimetry** **Appli-6-Cross-sectional exposures :** *Appli-6-1-Methods for extracting relief from radar images* *Appli-6-2-Study of vegetation cover* **Part C: Exercises** **Exo-1-Generalities** **Exo-2-Image geometry** **Exo-3-Interferometry**

Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Practical Exam* *Final Written Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam and Final Written Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*https://earth.esa.int/web/guest/eo-education-and-training/sar-basics-snap-course* *https://earth.esa.int/web/guest/eo-education-and-training/sar-basics-snap-course/concepts* *https://earth.esa.int/web/guest/eo-education-and-training/sar-basics-snap-course/exercices-pratiques* *https://earth.esa.int/documents/10174/2610280/Support-de-cours-et-des-exercices* *https://www.youtube.com/playlist?list=PLbyvawxScNbsmfg70AFO5r9ktXH0mpw-c* *http://cours-fad-public.ensg.eu/course/index.php?categoryid=44* *http://cours-fad-public.ensg.eu/course/view.php?id=119* *https://earth.esa.int/web/guest/eo-education-and-trainingweb/eo-edu/education-for-schools* *http://www.onfinternational.org/fr/activites/formations* *http://cours-fad-public.ensg.eu/course/view.php?id=94* *http://cours-fad-public.ensg.eu/mod/imscp/view.php?id=513* *http://cours-fad-public.ensg.eu/course/view.php?id=116* *http://cours-fad-public.ensg.eu/course/view.php?id=113*

Spatial Database Management Systems 2 (SDBMS 2)
Module Handbook

Module designation	*Spatial Database Management System 2*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE216*
Subtitle, if applicable	*Spatiotemporal Database*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Adnène KASSEBI*
Lecturer	*Adnène KASSEBI*
Language	*French*
Relation to curriculum	*This module is a continuation of the Spatial Database Management System I, Database Management System and GIS modules.* *This module is fundamental to the spatial analysis and quality control modules.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*3*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basics knowledge of Spatial Database Management System, Cartography, Geodesy and GIS is required.* *Have a good knowledge of tools in Cartography and GIS.* *- Basic knowledge of SQL 92* *- Basic knowledge of PostgreSQL*

Module objectives/intended learning outcomes	*Deepening of the spatial database notions seen in the previous courses, both on the conceptual and implementation levels. Spatio-temporal modelling. Metamodeling. Update and metadata management. Transactional versus analytical systems. Multidimensional spatial databases, data warehouses, spatial OLAP. International standards.* ***Knowledge:*** *- Understanding PostGIS, its challenges, advantages and limitations.* ***Skills:*** *- Students become familiar with the management tools of spatiotemporal databases.* *- Deploying PostGIS as a spatial database for a GIS project.* *- Mastering the import of data and the formulation spatial queries.* *- To visualize the problems of the optimization of spatial queries.* *- Students can perform processing, execute queries and manage the spatiotemporal databases created.* ***Competences:*** *- The student becomes knowledgeable in the field of designing spatial databases according to the requirements of international standards, with any software.* *- The student can play the role of a spatial database administrator.*

Content	***Chapter I: Introduction*** *I.1. Project Steering Committee* *I.2. Core Contributors Present* *I.3. Core Contributors Past* *I.4. Other Contributors* ***Chapter II: PostGIS Installation*** *II.1. Short Version* *II.2. Compiling and Install from Source* *II.3. Installing and using the address standardizer* *II.4. Installing, Upgrading Tiger Geocoder and loading data* *II.5. Common Problems during installation* ***Chapter III: PostGIS Administration*** *III.1. Performance Tuning* *III.2. Configuring raster support* *III.3. Creating spatial databases* *III.4. Upgrading spatial databases* ***Chapter IV: Data Management*** *IV.1. Spatial Data Model* *IV.2. Geometry Data Type* *IV.3. Geography Data Type* *IV.4. Geometry Validation* *IV.5. Spatial Reference Systems* *IV.6. Spatial Tables* *IV.7. Loading Spatial Data* *IV.8. Extracting Spatial Data* *IV.9. Spatial Indexes*

	Chapter V: Spatial Queries *V.1. Determining Spatial Relationships* *V.2. Using Spatial Indexes* *V.3. Examples of Spatial SQL* ***Chapter VI: Performance Tips*** *VI.1. Small tables of large geometries* *VI.2. CLUSTERing on geometry indices* *VI.3. Avoiding dimension conversion* ***Chapter VII: Building Applications*** *VII.1. Using MapServer* *VII.2. Java Clients (JDBC)* *VII.3. C Clients (libpq)* ***Chapter VIII: PostGIS Reference*** *VIII.1. PostGIS Geometry/Geography/Box Data Types* *VIII.2. Table Management Functions* *VIII.3. Geometry Constructors* *VIII.4. Geometry Accessors* *VIII.5. Geometry Editors* *VIII.6. Geometry Validation* *VIII.7. Spatial Reference System Functions* *VIII.8. Geometry Input* *VIII.9. Geometry Output* *VIII.10. Operators* *VIII.11. Spatial Relationships* *VIII.12. Measurement Functions* *VIII.13. Overlay Functions* *VIII.14. Geometry Processing* *VIII.15. Affine Transformations* *VIII.16. Clustering Functions* *VIII.17. Bounding Box Functions* *VIII.18. Linear Referencing* *VIII.19. Trajectory Functions* *VIII.20. SFCGAL Functions* *VIII.21. Long Transaction Support* *VIII.22. Version Functions* *VIII.23. Grand Unified Custom Variables (GUCs)* *VIII.24. Troubleshooting Functions* ***Chapter IX: Topology*** *IX.1. Topology Types* *IX.2. Topology Domains* *IX.3. Topology and TopoGeometry Management* *IX.4. Topology Statistics Management* *IX.5. Topology Constructors* *IX.6. Topology Editors* *IX.7. Topology Accessors*

	IX.8. Topology Processing *IX.9. TopoGeometry Constructors* *IX.10. TopoGeometry Editors* *IX.11. TopoGeometry Accessors* *IX.12. TopoGeometry Outputs* *IX.13. Topology Spatial Relationships* *IX.14. Importing and exporting Topologies* ***Chapter X: Raster Data Management, Queries, and Applications*** *X.1. Loading and Creating Rasters* *X.2. Raster Catalogs* *X.3. Building Custom Applications with PostGIS Raster*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab/Project Assignments* *Final Practical Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*Stuff PostGIS, 2022. PostGIS 3.3.3, dev Manual DEV (Fri 09 Dec 2022 01:40:57 AM UTC rev. c25b6a7).* *IGN, 2019. BD TOPO® Version 3.0 – Descriptif de contenu. Institut Géographique National, Saint-Mandé, Paris, France. 363 p.*

Advanced Cartography Module Handbook

Module designation	*Advanced Cartography*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE217*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Adnène KASSEBI*
Lecturer	*Adnène KASSEBI*
Language	*French*
Relation to curriculum	*This module is a continuation of Cartography, Topography, Geodesy, Photogrammetry and Remote sensing modules.* *This module is a preparation for Spatial Analyst and GIS quality control.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight factor/Coefficient	*2*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basics knowledge of Spatial Database Management System, Cartography, Geodesy and GIS is required.* *For the smooth running of this course, knowledge of the processing and correction of satellite images and aerial photos is required, the mastery of the principles of vectorization and digital cartography and the principles of topographic surveying, geodesy, coordinate systems, concept of scale, spatial database design, and GIS.*

Module objectives/intended learning outcomes	*The course covers current cartographic systems in applied geography, as well as problems relating to the creation of databases and geocoding.* *Each notion is accompanied by theoretical and practical applications.* ***Knowledge:*** *- Students understand the basic knowledge for the collection of geographical data according to the requested scale.* *- Students understand the basic knowledge of cartographic Drafting in different areas.* ***Skills:*** *- Students learn to define the basic elements for the design of spatial databases in different areas.* *- Students can carry out the processing and corrections necessary for the advanced cartographic production.* ***Competences:*** *At the end of the course, students will be able to:* *- Master cartographic language (map classification, cartographic language constraints)* *- Use the basic rules of graphic semiology (layout rules, visual variables)* *- Choose the optimal type of symbology to differentiate, compare, order and visually memorize information transcribed onto a map: qualitative, quantitative or multi-character.* *- Create and use a graphic charter (creation of new styles for point, linear and surface symbols)* *- Create and use advanced cartographic layout templates* *- Develop skills that enable them to use the map as an instrument for prospecting and intervention in a perspective of critical analysis of territorial issues.* *- Apply the most commonly used scientific exploration schemes in the context of critical or functionalist analyses, and translate them into a cartographic message, taking into account the requirements of a communication that engages the geocartographer's social responsibility.* *- Apply a cartographic approach: creation and structuring of databases, geocoding, construction of geometric bases, correlation tables, creation of cartographic documents.* *- Create atlases from point, linear and surface features (index, dynamic pages).* *- Automate map production.*

Content	**Chapter I: Map classification** **Chapter II: Cartographic language constraints** II.1. For point symbols II.2. For linear symbols II.3. For surface symbols **Chapter III: Using advanced rules of graphic semiology** III.1. Optimal symbology type III.2. Information differentiation
	III.3. Information comparison III.4. Information ordering III.5. Visual memorization of information transcribed onto a map (qualitative, quantitative or multi-character) **Chapter IV: Integration of modern concepts and interaction with spatial data** IV.1. Displaying points as diagrams IV.2. Displaying points in different colors IV.3. Displaying points in different sizes IV.4. Displaying lines in different colors IV.5. Display lines with different thicknesses IV.6. Display diagrams in zones IV.7. Display zones in different colors IV.8. Configuring point density in zones **Chapter V: Classification methods** V.1. By natural thresholds V.2. By standard deviation V.3. By equal intervals V.4. quantiles **Chapter VI: Creating and using graphic styles** VI.1. Creating new styles for point symbols VI.2. Creating new styles for linear symbols VI.3. Creating new styles for surface symbols **Chapter VII: Creating and using advanced cartographic layout models** **Chapter VIII: Skills development and critical analysis of territorial issues**
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab/Project Assignments* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Lab/Project Assignments 40%* *Final Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*

Reading list	*CADASTRE.GOUV.FR (2021). LEGENDE DU PLAN CADASTRAL.* *Hervé Parmentier (2017). Sémiologie : « définitions, usages et bonnes pratiques ».* *Standard CNIG (2017). PLAN LOCAL D'URBANISME.* *Cournav (2016). La représentation cartographique.* *Armand Colin (2016). Manuel de Cartographie.* *Guillaume Touya (2012). Le Modèle CollaGen : collaboration de processus automatiques pour la généralisation cartographique de paysages hétérogènes.* *http://www.geol-alp.com/varietes/cartes_geol.html* *https://quentinlefevre.com/projets/urban-analysing-maps-design/*

Spatial Analysis Module Handbook

Module designation	*Spatial analysis*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE218*
Subtitle, if applicable	*Multi-criteria spatial analysis*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Adnène KASSEBI*
Lecturer	*Adnène KASSEBI*
Language	*French*
Relation to curriculum	*This module is a continuation of the mathematical modules (Interpolation and Meshing), the Probability, Statistics and Geostatistics modules.* *This module is a preparation for the thematic cartography module and Online mapping (WEB Mapping).*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.* *A student must have attended at least 75% of the lectures to sit in the exams.*
Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra, Probability and Statistics) and GIS is required.* *For the smooth running of this course, knowledge of processing and correction of satellite images and aerial photos is required, mastery of the principles of vectorization, thematic cartography, geohazards, geodesy, coordinate systems, concepts scaling, design of spatial databases and quality control of geographic data.* *Have a good knowledge of Geoprocessing tools in GIS.*

Module objectives/intended learning outcomes	*This course allows participants to have a complete overview of Thematic Mapping and multi-criteria spatial analysis tools.* *Each notion is accompanied by theoretical and practical applications.* *Knowledge:* *- Students know the different multi-criteria analysis methods used in spatial analysis.* *- Students understand the concepts of spatial analysis and relation with GIS or spatial data.* *- Students understand the basic knowledge for collecting, creating geographic data for thematic mapping and multi-criteria spatial analysis.* *Skills:* *- Students are able to define which multi-criteria analysis method has been used in spatial analysis.* *- Students learn to define the basic elements for a multi-criteria spatial analysis according to the proposed models.* *- Students become familiar with thematic mapping problems and learn how to solve them.* *- Students can carry out the necessary treatments, corrections, and geoprocessing for the definition of geohazard zones and relative cartographic Drafting.* *- Students choose the most suitable multi-criteria analysis method,* *- students are able to determine the limits and disadvantages of the chosen method and try to overcome them,* *-students are able to demonstrate the effectiveness of the chosen approach on a case study.* *- Students master the use of topological rules on geographic data.* *Competences:* *- The student becomes a specialist in the field of spatial analysis applied to geographic information.* *- The student becomes capable of managing a project that integrates spatial analysis and multi-criteria spatial analysis.*

Content	***Chapter I: Historical and epistemological introduction*** *I.1 Spatial analysis as a rupture* *I.2 Spatial analysis as an "instituted" and "formalized" approach* ***Chapter II: Models, laws and theories*** *II.1 Hierarchical models: from the rank-size law to the theory of central places* *II.2 Flow models: from the gravity model to the Huff model* *II.3 Theoretical network models: small-world and scale-free networks* *II.4 Optimisation models: from Von Thünen to location-allocation models* *II.5. Models of spatial dynamics: Hägerstrand and Schelling models* ***Chapter III: Tools for spatial analysis*** *III.1 Spatial statistics* *III.2 Graph theory and network analysis* *III.3. Computer simulation*

	Chapter IV: GIS and Spatial Analysis *IV.1 Modelling and representation of geographical entities* *IV.2 Analytical Capabilities of GIS* *IV.3. Spatial analysis applied to GIS* *IV.4. Multi-criteria decision support* ***Chapter V: Multi-criteria analysis*** *V.1 General outline of the methods of multi-criteria analysis* *V.2 Spatial multicriteria analysis* *V.3 Which multi-criteria method to choose?* *V.4. Saaty's hierarchical analysis process (AHP)* *V.5. Limitations* ***Chapter VI: Integrating GIS into Multi-criteria Analysis*** *VI.1 Conceptual framework* *VI.2 Choice of multi-criteria technique* *VI.3. Specificities of spatial problems* *VI.4. Main phases of a multi-criteria mapping* *VI.5. Tools of Spatial Multicriteria Analysis* ***Chapter VII: Contribution of Spatial Multicriteria Analysis to the identification of flood risk*** *VII.1 Characterisation and evaluation of the vulnerability of the population to flooding* *VII.2 Methodology of Spatial Multicriteria Analysis for flood risk identification* *VII.3 Characteristics of the catchment area* *VII.4. Spatial multi-criteria analysis of flood risk* ***Chapter VIII: Contribution of the Spatial Multicriteria Analysis to the identification of the seismic risk*** *VIII.1. Contribution of geological mapping to the creation of the Site Effect map* *VIII.2. Contribution of the DTM to the creation of the topographic site effect map* *VIII.3. Contribution of instrumental and historical seismicity to the identification of the seismic hazard* *VIII.4. Contribution of remote sensing to the identification of seismic risk areas* *VIII.5. Geoprocessing and Creation of the Seismic Hazard Map*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab/Project Assignments* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Lab/Project Assignments 40%* *Final Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*

Reading list	*Université LAVAL, 2022. SIG et Analyse spatiale (GMT-7015). Faculté de foresterie, de géographie et de géomatique Département des sciences géomatiques.* *GRASLAND C., 2022. Analyse spatiale : formes et processus (M1). Univ. Paris 7 / M1-CARTHAGEO.* *BRGM, 2012. Complément d'explications sur les effets de site lithologiques.* *Caloz R., & Collet C., 2011. Analyse spatiale de l'information géographique. PPUR Presses polytechniques. 383 p.* *Ascough J., Rector H., Hoag D., McMaster G., Vandenberg B., Cheula A., 2011. Proposal for a classification scheme for mapping and use / land cover in Lesser Antilles Islands, Document de travail, CARIBSAT, 7p.* *Chaillat S., Bonneta M., et Semblat J.F., 2007. A Fast Multipole Method formulation for 3D elastodynamics in the frequency domain. Comptes Rendus Mécanique, 335, pp. 714-719.* *Chaillat S., Bonneta M., et Semblat J.F., 2008. A multi-level fast multipole BEM for 3-D elastodynamics in the frequency domain. Computer Methods in Applied Mechanics and Engineering, 197, pp. 4233-4249.* *Chakhar S., 2006. Cartographie décisionnelle multicritère : formalisation et implémentation informatique. Université Paris Dauphine-Paris IX. SCIENCES DES ORGANISATIONS, 288 p.* *Chakhar S., & Mousseau V., 2007. Spatial multicriteria decision making. Encyclopedia of geographic information science, p. 747-753*

Field School 2 Module Handbook

Module designation	*Field school I2*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE219*
Subtitle, if applicable	*Field trips*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Rezgui MAGTOUF*
Lecturer	*Rezgui MAGTOUF (Expert)* *Mohamed Ali YAHMADI (Expert)*
Language	*French*
Relation to curriculum	*This module presents the opportunity for the students to apply the concepts learned in class directly in the field:* *- Strengthen the skills and competences acquired during the first field trips by mastering advanced topographic survey with different techniques and materials (Setting up, linking, routing, levelling, topometric monitoring etc...)* *- prepare the student to the training sessions and the end of year/ study projects.*
Type of teaching, contact hours	*Supervision, coding and simulations* *2 hours per week*
Workload	*28 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.24*
Weight factor	*2*
Requirements according to the examination regulations	*During this course, students will:* *- Prepare a literature review of the area to be visited.* *- Apply the basic concepts seen in class for the advanced topography subjects.* *- Take notes on the work done.* *- Submit a manuscript by the deadline.* *Students must attend the field school.* *Authorized calculator* *Authorized documents* *Allowed internet access.*

Recommended prerequisites	*Having good knowledge in topography and cartograpghy.*
Module objectives/intended learning outcomes	***Skills:*** *Knowing the errors due to the instrument:* *- Evolution over time of the calibration parameters;* *- Line of sight too vertical or interrupted;* *- Degraded repeatability of the instrument. To reduce the impact of these errors, particular importance was attached to the methods used:* *- Daily monitoring of the instrument's calibration parameters;* *- Measuring in both circles of the telescope;* *- Working with a robust network that allows the detection of possible movements in the reference points.* *To enable the student to acquire the skills necessary to carry out field surveys and their layout* *- Survey a flat area and draw it up.* *- Determine elevations.* *- Draw cadastral plans.* *- Survey a property and draw the plan of the certificate of location.* *To provide the student with the skills necessary to lay out structures and their layout.* *- Lay out a road and draw its plan.* *- Lay out underground infrastructures.* *- Stake out a plot of land and lay out a building.* *- Carry out layout work in difficult terrain.* ***Competences:*** *- To be able to assessing the needs to ensure a good work in fields.* *- To be able to conduct a field survey and research.* *- Master the written technical.*

Content	***Chapter I: Knowing the errors due to the instrument*** *I.1. Calibration parameters* *I.2. Line of sight too vertical or interrupted* *I.3. Degraded repeatability of the instrument* *I.4. Monitoring of the instrument's calibration parameters* *I.5. Measuring in both circles of the telescope* *I.6. Working with a robust network* ***Chapter II: Carry out field surveys and their layout*** *II.1. Survey a flat area and draw it up* *II.2. Determine elevations* *II.3. Draw cadastral plans* *II.4. Survey a property and draw the plan of the certificate of location* ***hapter III: Lay out structures and their layout*** *III.1. Lay out a road and draw its plan* *III.2. Lay out underground infrastructures* *III.3. Stake out a plot of land and lay out a building* *III.4. Carry out layout work in difficult terrain*

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Study and examination requirements and forms of examination	*In field Work* *Dissertation/Written Report*
Final Grade Calculation	*In Field Work 25%* *Dissertation/Written Report 75%*
Media employed	*Laptop computer / Tablet / Field equipment / Notebook*
Reading list	

Microgeodesy Module Handbook

Module designation	*Microgeodesy*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE220*
Subtitle, if applicable	*Micro-Surveying*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Magtouf REZGUI*
Lecturer	*Magtouf REZGUI*
Language	*French*
Relation to curriculum	*Basic mathematical and physical knowledge is fundamental for the understanding of the Geodesy module.* *This module is very high precision surveying measurements at a relatively small scale.* *This module is a preparation for Layout technics, Ground and condominium subdivision, Topographic Projects and Quality control of topographic works is a continuation of this module.*
Type of teaching, contact hours	*2 hours / week* *Classes of 30 students*
Workload	*28 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.68*
Weight factor/Coefficient	*2*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra) is required.*

Module objectives/intended learning outcomes	*Microgeodesy is the set of operations, instruments and methods used for very high precision work, but on a relatively small scale compared to geodesy.* *Applications of Microgeodesy include deformation studies and monitoring of structures such as bridges and dams, precision alignments, industrial machinery layout and sports facility certification.* *It is used in a wide range of industries such as pulp and paper, aerospace, aluminium, steel, oil and automotive.* *Each notion is accompanied by theoretical and practical applications.*
	Knowledge: *- Understand the basic concepts of very high precision surveying measurements at a relatively small scale.* *- Understand the application areas of Microgeodesy.* ***Skills:*** *- Control and monitoring of large infrastructures: auscultation of dams, buildings, stadiums, buildings, bridges, cement works, power stations, wheat silos, oil tanks, archaeological sites, etc., in order to determine their lateral and transverse deformation over time.* *- Altimetric and planimetric connection of large infrastructures to the country's geodetic and levelling networks ... in order to control the stability of the base pillars necessary for the periodical auscultations of the works.* *- Layout of oil wells for the expansion of oil fields.* *- Layout of seismic lines.* *- Magnetic orientation of airport control towers, mosques, etc.* *- Survey of airport infrastructures.* *- Control of installations.* ***Competences:*** *The student will be able to:* *- Evaluation and qualification of a measurement.* *- Verification and calibration of various types of instrumentation used in geodesy and surveying: tapes, rangefinders, levels, theodolites, gyroscopes.* *- Preparation of the instrumentation and methods used for Microgeodesy work (deformation studies, precision alignments, precision machinery implementation, sports facility homologation, etc.).* *- Planning of measurements and pre-analysis of the accuracy related to Microgeodesy work.*

Content	***Chapter I: Introduction*** ***Chapter II: Choice of equipment and types of measurement*** *II.1. General characteristics of high precision stations* *II.2. Angle measurements (accuracy and method)* *II.3. Distance measurements with and without reflectors (range, accuracy, laser spot size and method)* *II.4. Automatic target recognition* ***Chapter III: Observations*** *III.1. Planimetric* *III.2. Altimetry* ***Chapter IV: Statistical analysis of observations*** ***Chapter V: Measurement constraints*** ***Chapter VI: Problems of fixed points*** ***Chapter VII: The quality of measurements*** ***Chapter VIII: Notions of precision and reliability*** *VIII.1. Global processing of measurements - equation of observations* *VIII.2. Calculation of standard deviations and compensation* *VIII.3. Resolution by the theory of least square* ***Chapter IX: Tutorial sessions with exercises***
Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*Jean-Baptiste HENRY (2005). Cours de Topographie et Topométrie Générale « Notions géodésiques de base ». Ecole et Observatoire des Sciences de la Terre (EOST). 65p.* *Françoise et Henri DUQUENNE (2002). COURS DE GÉODÉSIE "Généralités sur la Géodésie". ÉCOLE SUPÉRIEURE DES GÉOMÈTRES ET TOPOGRAPHES. 257p.*

Webmapping Module Handbook

Module designation	*Webmapping*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE221*
Subtitle, if applicable	*Internet and Cartography*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Adnène KASSEBI*
Lecturer	*Adnène KASSEBI*
Language	*French*
Relation to curriculum	*This module is a continuation of the WEB, Spatial Database Management System I, Database Management System and GIS modules.* *This module is fundamental to the spatial analysis and quality control modules.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Authorized calculator* *Unauthorized documents* *Not allowed internet access.*
Recommended prerequisites	*For the smooth running of this course, knowledge of WEB Language (HTML, XHTML, CSS, JavaScript), the management of WEB servers and Database servers is required.* *Some basic knowledge of Spatial Database Management System, Cartography, Geodesy and GIS is required.* *Have a good knowledge of tools in Cartography and GIS.* *- Basic knowledge of SQL.* *- Basic knowledge of PostgreSQL and PostGIS.*

Module objectives/intended learning outcomes	*This course allows participants to have a complete overview of the Internet and Cartography or WEBMAPPING, or distribution of maps via the Internet network, which is a field in full expansion thanks to the development of Open-Source solutions. Following the GNU philosophy that permits the copying, distribution of software, and modification of source code, supporting generally free programs and free use.* *Each notion is accompanied by theoretical and practical applications.* ***Knowledge:*** *- Students understand the basic knowledge of online cartography (Concept of WEB servers, Database servers and cartographic servers).* *- Students understand the basic knowledge of dissemination of spatial components (vector and Raster) via cartographic WEB solutions.* ***Skills:*** *- Students will be able to design and create a WEB Mapping application via open-source solutions available on the Internet, manage the application interface and query the geographical data stored in the Spatial Database servers.* *- Students learn to define the basic elements for online mapping.* *- Students become familiar with the open-source tools of WEB Mapping and master the resolution of problems related to the proper functioning of these.* *- Students can perform processing, execute queries, and manage the interface of the WEB Mapping application created.* ***Competences:*** *- The student becomes an expert in the field of designing WEB Mapping application according to the requirements of international standards, with any software.* *- The student can play the role of a WEB Mapping application administrator.*

Content	***Chapter I: Basics of WEB Mapping*** *I.1. Principles* *I.2. Functionality* *I.3. The architecture of a web application* *I.4. The architecture of a webmapping application* *I.5. The architecture of an AJAX webmapping solution* *I.6. Timeliness of data* ***Chapter II: Object-oriented WEB Mapping*** *II.1. Principle of web services* *II.2. OGC standards* *II.3. OGC web services clients* ***Chapter III: Service Publication Servers*** *III.1. ArcGIS Server* *III.2. MapGuide* *III.3. MapServer* *III.4. TileCache* *III.5 GeoServer* *III.6. Webmapping frameworks*
	Chapter IV: Client APIs *IV.1. Google Map API* *IV.2. OpenLayers API* *IV.3. Geoportal API*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab/Project Assignments* *Final Practical Exam*
Final Grade Calculation	*Continuous Evaluation and Lab/Project Assignments 40%* *Final Practical Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*

Reading list	*ENSG, 2020. Support de cours SIG et Webmapping (http://cours-fad-public.ensg.eu/course/view.php?id=80#section-1)* *https://gis.stackexchange.com/questions/20191/adding-basemaps-from-google-or-bing-in-qgis* *http://mappemonde-archive.mgm.fr/num8/internet/int05401.html* *https://opengislab.com/blog/2018/4/15/add-basemaps-in-qgis-30* *https://plugins.jetbrains.com/plugin/12494-big-data-tools* *https://www.aliasdmc.fr/balise/zone_html_map.html* *http://www.postgis.fr/chrome/site/docs/workshop-foss4g/doc/creating_db.html* *https://www.qgistutorials.com/en/index.html*

Bathymetry Module Handbook

Module designation	*Bathymetry.*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE222*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Mr. Amine BEN ABDERRAZEK*
Lecturer	*Mr. Amine BEN ABDERRAZEK*
Language	*French*
Relation to curriculum	*The bathymetry course can be seen as a way to broaden and deepen students' knowledge of geomatics engineering, while also preparing them for specialized roles in marine surveying and mapping. It can help students see the connections between different areas of geomatics, and how these concepts and tools can be applied to solve real-world problems in oceanography and marine resource management.*
Type of teaching, contact hours	*1.5 hours per week*
Workload	*21 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.4*
Weight Factor/Coefficient	*1*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*
Recommended prerequisites	– *Familiarity with the principles of geodesy and coordinate systems used in navigation and mapping.* – *Knowledge of basic physics, including the properties of waves and their behavior in different mediums.* – *Proficiency in mathematics, including algebra, trigonometry, and calculus.* – *Experience using geographic information systems (GIS) software and data analysis tools.*

Module objectives/intended learning outcomes	***Knowledge:*** *Principles of sound waves and their application in bathymetric surveying* *Types of bathymetric survey instruments and their advantages and limitations* *Different methods of bathymetric surveying, including single-beam and multi-beam echosounding*
	History and development of marine charts, and the role of the International Hydrographic Organization (IHO) in setting standards for chart production *Types of errors and uncertainties in bathymetric surveying and how to address them* *Geographic information systems (GIS) and their application in bathymetry and marine cartography* *Use of chart symbols and labels according to IHO standards* *Safety considerations and best practices in conducting bathymetric surveys* ***Skills:*** *Conducting bathymetric surveys using single-beam and multi-beam echosounders* *Processing bathymetric data using specialized software* *Analysing bathymetric data to create contour maps and 3D models of the seafloor* *Evaluating the quality of marine charts and identifying areas where further surveying may be needed* *Communicating effectively about bathymetric data and marine charts, both orally and in writing* *Applying critical thinking skills to evaluate and interpret bathymetric data in the context of marine charting and navigation* ***Competencies:*** *Ability to conduct bathymetric surveys safely and efficiently, following best practices and protocols* *Ability to interpret and evaluate bathymetric data and use it to create accurate and reliable marine charts* *Ability to communicate effectively with colleagues, clients, and stakeholders about bathymetric data and marine charts* *Ability to work collaboratively with others, including survey team members, cartographers, and navigators, to achieve common goals* *Ability to stay up-to-date with advances in bathymetric survey technology and chart production standards, and incorporate new knowledge and techniques into practice.*

Content	*CHAPTER I: BATHYMETRIC TECHNIQUES* *I.1. Introduction* *I.2. History of Hydrophones* *I.3. physical phenomena related to transmission and reception* *CHAPTER II: HISTORY OF HYDROPHONES* *II.1. Principle* *II.2. echosounder equipment* *II.3. Transducer characteristics and resolving power* *II.4. Bathymetric detection* *II.5. Depth calculation* *II.6. Obstacle detection* *II.7. Echo sounder resolving power*
Content	*CHAPTER III: IMPLEMENTATION AND EQUIPMENT* *III.1. Implementation* *III.2. Equipment* *III.3. Calibration* *III.4. GPS, echo sounder and probe* *III.5. The advent of computers* *CHAPTER IV: SAMPLING PERIOD AND METHODOLOGY* *IV.1. Sampling period* *IV.2. Methodological framework* *IV.3. Sampling procedure* *IV.4. Cruising speed* *CHAPTER V: ANALYSIS AND INTERPRETATION OF RECORDINGS* *V.1. Obtaining echograms* *V.2. Description of recordings* *V.3. interpretation of echograms* *CHAPTER VI: MARINE CHARTS* *VI.1. History* *VI.2. Quality standards for producing* *VI.3. International Hydrographic Organization (IHO) guidelines.* *VI.4. Techniques and tools used in bathymetric surveys,* *VI.5. Processes involved in producing accurate and reliable marine charts.*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*

Media employed	
Reading list	***Bathymetric principles and methods:*** *Textbooks or articles that provide an overview of the principles and methods used in bathymetry, including acoustic and optical remote sensing, GPS positioning, and data processing and analysis.* ***Instrumentation and technology:*** *Resources that describe the various types of bathymetric instrumentation and technology used for measuring and mapping underwater terrain, such as sonars, echosounders, multibeam systems, and LIDAR.* ***Mapping and charting:*** *Textbooks or articles that provide an overview of the history and current practices of mapping and charting the seafloor, including the production of nautical charts, topographic maps, and digital elevation models.* ***Marine geology and geophysics:*** *Resources that describe the geological and geophysical processes that shape the seafloor, including plate tectonics, sediment transport, and seafloor spreading.*
Reading list	***Bathymetric principles and methods:*** *Textbooks or articles that provide an overview of the principles and methods used in bathymetry, including acoustic and optical remote sensing, GPS positioning, and data processing and analysis.* ***Instrumentation and technology:*** *Resources that describe the various types of bathymetric instrumentation and technology used for measuring and mapping underwater terrain, such as sonars, echosounders, multibeam systems, and LIDAR.* ***Mapping and charting:*** *Textbooks or articles that provide an overview of the history and current practices of mapping and charting the seafloor, including the production of nautical charts, topographic maps, and digital elevation models.* ***Marine geology and geophysics:*** *Resources that describe the geological and geophysical processes that shape the seafloor, including plate tectonics, sediment transport, and seafloor spreading.* ***Environmental applications:*** *Resources that describe the use of bathymetry in environmental monitoring and management, such as assessing water quality, mapping benthic habitats, and tracking the movement of sediment and pollutants.* ***Case studies:*** *Articles or reports that describe specific bathymetric surveys or applications, such as mapping the seafloor of a particular region, assessing the impacts of human activities on the seafloor, or monitoring changes in seafloor topography over time.*

Land and Cadastral Information Systems Module Handbook

Module designation	*Land and Cadastral Information Systems*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE223*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Yosr BEJI*
Lecturer	*Yosr BEJI*
Language	*French*
Relation to curriculum	*This module is a continuation of Cartography, Topography, Photogrammetry, Land Law, Geodesy, Thematic Mapping, Topographic Projects, Microgeodesy and Quality control of topographic works.*
Type of teaching, contact hours	*2 hours / week* *Classes of 30 students*
Workload	*28 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.68*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*
Recommended prerequisites	*Some basic knowledge of Topography, Cartography, Geodesy and GIS is required.* *For the smooth running of this course, knowledge of the processing and Topography is required, the mastery of the principles of vectorization and digital cartography and the principles of topographic surveying, geodesy, coordinate systems, concept of scale, spatial database design, and GIS.*

Module objectives/intended learning outcomes	*The land information system comprises a set of instruments and procedures for collecting, processing, storing and managing land allocations. It is a tool designed in a participatory manner with rural communities', to improve land management in the context of their context of their resources and skills, with the support of local technical services.*
Module objectives/intended learning outcomes	*LIS procedures include the location and concerted, mapped registration of land allocations, following a sequenced process from plot identification to the installation of the allottee and documented at each stage by various land administration forms and registers (the 'land package'). The data thus collected is integrated into a local land information, management and administration system that can be easily controlled by the rural communities.* *Each notion is accompanied by theoretical and practical applications.* ***Knowledge:*** *- Students understand the basic knowledge for Organisation of land registration in Tunisia.* *- Students understand the basic knowledge of Procedures for compulsory land registration.* *- Students understand the basic knowledge for Optional land registration procedures.* ***Skills:*** *- Students learn to define the basic elements for organisation of land registration in Tunisia.* *- Possible edition of a plan or a diagram being automatic with the procedures for compulsory and optional land registration.* ***Competences:*** *- Students are able to organise land registration in Tunisia.* *- Students are able to realize procedures for compulsory land registration.* *- Students are able to realise the optional land registration procedures.*

Content	***Chapter I: Definitions*** ***Chapter II: Background*** *II.1. The creation of the land law and its relation to colonisation* *II.2. The basic principles of the land registration system* *II.3. Description of the existing land tenure system* *II.4. Organisation of land registration in Tunisia* *II.5. Land data operators* *II.6. Land stakeholders* *II.7. Optional land registration* *II.8. Optional land registration procedures* ***Chapter III: Description of the existing land tenure system*** *III.1. Organisation of land registration in Tunisia* *III.2. Land data operators* *III.3. Actors of the land domain* *III.4. Optional land registration olr* *III.5. Procedures for compulsory land registration clr* *III.6. Optional land registration olr* *III.7. Optional land registration procedures olr* *III.8. Supplementary boundary marking sbm*
	III.9. Execution of boundary marker re-establishment works mr *III.10. Execution of various topographic works vtw* ***Chapter IV: Implementation of a geographic land information system*** *IV.1. Objectives of the lgis* *IV.2. Needs to be met by the lgis* *IV.3. Summary of current land information management* *IV.4. Textual information* *IV.5. Graphic information* *IV.6. Exchange of land information between actors* *IV.7. Details of information flows exe rq cadastral* *IV.8. Details of information flows exe rq olr* *IV.9. Detail of information flows exe rq subdivision* *IV.10. Lgis design*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*

Reading list	*Patrick d'Aquino, Sidy Mohamed Seck et Mathias Koff (2014). Le système d'information sur les Attributions foncières : l'enregistrement foncier à la portée des acteurs locaux. Comité technique « Foncier & développement ».* *Koffi M., (2013). Conflits fonciers, la prévention par la régularisation », Revue Nouvel Horizon/Sénégal no 879 : http://www.hubrural.org/Publication-La-regularisation.html?lang=fr*

Computer Programming for GIS Applications Module Handbook

Module designation	*Computer Programming for GIS applications*
Module level, if applicable	*2nd year Geomatics and topography engineering cycle*
Code, if applicable	*GTE224*
Subtitle, if applicable	*Python for Geospatial, GIS Programming, Programming applied on GIS/*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Mohamed Ali El YAHMADI (Expert)*
Lecturer	*Mohamed Ali El YAHMADI (Expert)*
Language	*French*
Relation to curriculum	*Programming for GIS introduces geospatial data visualization and analysis using python. This module is of great interest since it allows GIS problem solving and it helps in decision making. This module will be useful for the artificial intelligence for GIS module.*
Type of teaching, contact hours	*2 hours / week* *Theoretical and practical works* *Classes of 30 students*
Workload	*28 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.68*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.*
Recommended prerequisites	*Students have basic knowledge in algorithms writing and have already get a course in Python programming language. They must have also basic understanding about the geospatial data.*
Module objectives/intended learning outcomes	*This course presents an overview of simple and some advanced programming utilities and libraries provided by Arcgis, QGIS and other geospatial software. Both theoretical and practical studies are offered at this course.* *At the end of this training, participants will be able to deepen their knowledge in complete autonomy.* *Among the expected outcomes of this course, those listed below:*

	Knowledge: *the students learn to:* - *List benefits of python over GIS* - *know most essential geospatial libraries* - *They understand how to read, write and visualize geospatial data using python* - *They understand how to perform simple spatial analysis using python* ***Skills:*** - *learn how to write Python scripts for ArcGIS, QGIS, and other geospatial software* - *Use the most essential geospatial libraries and how to access their existing methods.* - *knows how to conduct and automate different standard GIS-related tasks that support documentation of methods in the Python scripting environments* - *Use Python to interact with ArcGIS* - *Use Python to geocode addresses and place them on a map* - *Perform standard GIS tasks using Python, and string your code together to perform many steps in a sequence* - *Perform sampling, projection, classification of data based on different criteria* ***Competences:*** - *Students are able to write Python scripts for ArcGIS, QGIS and other geospatial software and use it to solve common data-related tasks in concrete GIS projects.* - *Students are able to perform geospatial data analysis with python based on real case studies.*

Content	*CHAP1 Arcpy and PyQGIS* *1.4. Arcpy and geoprocessing* *1.5. Arcpy and Numpy* *1.6. ArcPy and Potpourri* *1.7. PyQGIS and geoprocessing* ***Workshop1*** *CHAP2 Data analysis with python and spatial data* *4.1. Geocoding with python* *4.2. Graphs and charts* ***Workshop2*** *CHAP3 Vector data analysis* *6.1. Installation of geopandas* *6.2. Reading vector data* *6.3. Visualization of vector data* *6.4. Working with geometry* *6.5. Case study on vector data* ***Workshop3*** *CHAP4 Raster data analysis* *8.1 Rasterio installation* *8.2 Reading raster dataset*
	8.3 Visualization of raster data *8.4 Mathematical operation with raster* ***Workshop4*** *CHAP5 Advanced raster data analysis* *10.1Raster classification* *10.2Raster sampling* *10.3Raster projection* *10.4NDVI calculation* *10.5Correction on NDVI calculation* ***Workshop5***
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab/Project Assignments* *Final Practical Exam*
Final Grade Calculation	*Continuous Evaluation and Lab/Project Assignments 40%* *Final Practical Exam 60%*
Media employed	*Booklets for laboratory sessions, Whiteboard, Data show* *Computer, Python 3.6, Arcgis, QGIS, geopandas, Rasterio, internet access*
Reading list	*Python For ArcGIS, by Laura Tateosian* *Learning Geospatial Analysis with Python,3rd Edition, by Joel Lawhead*

Personal Development Module Handbook

Module designation	*Personal Development*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE225*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr. Nawel Souissi*
Lecturer	*Dr. Nawel Souissi*
Language	*French*
Relation to curriculum	*This module aims at helping the students understand and develop their personal skills to help them to identify and achieve their goals and better prepare them for the real word of work.* *This module helps students to effectively communicate, manage their time and set priorities in order to facilitate group working. Hence, this module is mainly useful for the end-of-study project.*
Type of teaching, contact hours	*1h30 hours / week* *Lecture: 1h30 per week.* *Classes of 30 students*
Workload	*21 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.4*
Weight Factor/Coefficient	*1*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*
Recommended prerequisites	*Writing and speaking French skills*
Module objectives/intended learning outcomes	***Knowledge:*** - *Students understand the meaning of personal development.* - *Students understand the meaning and importance of life coaching* - *Students get familiar with different approaches for the time and stress management Students.* ***Skills:*** - *Students learn to identify personal skills and weaknesses based on text descriptions.* - *Students learn to identify goals, plan and define priorities.*

	Competences: *- Students are able to analyse and identify their personal skills and weaknesses* *- They are able to develop their personal skills in order to boost their career* *- Students can recognize required personal skills in a job offer.*
Content	*CHAP 1: Personal Development in History* *.1. What is personal development?* *.2. Why personal development?* *.3. Who is personal development for?* *.4. When do I become interested in and approach personal development?* *.5. How to do personal development?* *CHAP 2: Different approaches to personal development* *.1. 'Personal' Development* *.2. "Transpersonal" Development* *.3. A story of energies?* *CHAP 3: What if there was another way to approach personal development?* *.1. Personal development through action* *.2. Personal development, a path or a goal?* *.3. Fear of change?* *.4. Time management? Stress management? How to get into action?* *CHAP 4: Personal Development through Life Coaching* *.5. The origins of coaching?* *.6. What are the differences between a life coach and a shrink?* *.7. Personal development and life coaching: a beautiful combination* *.8. How and why does life coaching work?* *.9. Is asking for help a sign of weakness?*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Exam*
Final Grade Calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Whiteboard* *Computer* *Data show*
Reading list	*The Engineering: Career and Personal Development Guide, A. Shiva, 2018* *PSP: A Self-improvement Process for Software Engineers, W. S. Humphry, Addison-Wesley Professional; 1st edition, 2005*

End of year project

Module designation	*End of year project*
Module level, if applicable	*2nd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE226*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr. Mohamed Khaled BOUZID / Adnène KASSEBI*
Lecturer	*Dr. Mohamed Khaled BOUZID* *Dr. Asma BEN AHMED* *Dr. Ines BOUZIDI* *Adnène KASSEBI (Expert)* *Mohamed Ali YAHMADI (Expert)* *Rezgui MAGTOUF (Expert)*
Language	*English / French*
Relation to curriculum	*Students will be able to study and develop a project, review the literature on the topic, collect and analyse the data. Students will be then able to arrange and present their findings and conclusions in front of an academic jury.* *This module is a preparation for the synthesis and final year project modules.*
Type of teaching, contact hours	*Supervision, coding and simulations* *3 contact hours per week*
Workload	*42 Hours of Self Study*
ECTS Credits/Points	*1.68*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*During the course, students will demonstrate their progress by the following activities:* *1. produce a literature review* *2. weekly meetings with the supervisor to discuss project progress* *3. record notes of their work: reading, original empirical work, Draft chapters, questionnaire responses, or other material* *4. present a work-in-progress talk* *Acquisition of the agreement of the academic supervisor to submit the manuscript within the deadline.*

Recommended prerequisites	*The students must have a valuable understanding of Geomatics and Topography modules.* *The students should have a good knowledge of report writing in French and English.*
Module objectives/intended learning outcomes	*This project provides an opportunity to pursue a project under the guidance of a supervisor. The main aims are:* *- The proposed projects are within the main geomatics and topography fields of interest: mathematical modelling, Cartography, Photogrammetry, Remote sensing, Topography, WEB Mapping and Spatial Database.* *Knowledge:* *- Learn how do review the state of the art* *- Understand the essential parts of a project report* *- Know how to use reference works.* *Skills:* *- Able to do a comparative study* *- Acquire an editorial skill* *- Find and use documentation* *- Develop teamwork skills* *- Able to write a full and detailed report.* *Competences:* *- Develop their ability to propose solutions to solve complex problems and practical issues* *- Develop their analytical skills and how to interpret results* *- They are able to work independently* *- They are able to evaluate his training or self-training needs* *- Master the written and oral technical communication*
Content	*Project overview and project methodology.* *Introduction to the research process and determination of the main axes of the study.* *Investigating the general approaches to research and designs.* *Identifying appropriate research problems; writing the problem statement and hypotheses; stating the purpose of a study.* *Collecting data and analysing them to Draw conclusions* *solution implementation.* *Assessing the validity and reliability of results.*
Study and examination requirements and forms of examination	*Project Dissertation* *Seminar*
Final Grade Calculation	*Project Dissertation 50%* *Seminar 50%*
Media employed	*Laptops/ project board*
Reading list	

A2.6 Semester 5 Modules' Handbook

Lasergrammetry Module Handbook

Module designation	*Lasergrammetry*
Module level, if applicable	*3rd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE301*
Subtitle, if applicable	*Terrestrial and Spatial Lasergrammetry*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Mohamed Khaled BOUZID / Adnène KASSEBI*
Lecturer	*Dr. Mohamed Khaled BOUZID*
Language	*French*
Relation to curriculum	*Lasergrammetry is based on the mathematical, physical concepts of Point Cloud, photogrammetry and Remote sensing.* *Lasergrammetry module is basic for the creation of topographic maps and plans. It also allows the creation of digital terrain models and digital surface modules, for spatial analysis and geohazard studies.* *This module is the final part of the acquisition and processing methods applied to spatial information.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*

Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra) and physics (Mechanics & optics), are required.* *For the smooth running of this course, knowledge of the processing and correction of aerial photos and satellite images is required, the mastery of the principles of vectorization and digital cartography and the principles of topographic surveying, geodesy, coordinate systems, concept of scale, spatial database design, and GIS.*
Module objectives/intended learning outcomes	*Lasergrammetry uses motorised digital sensors, or scanners, to capture points in coordinates by recording certain radiometric information. To capture and calculate these points in XY and Z, it is necessary to obtain distance measurements and angular values.* ***Knowledge:*** *- Students understand the basic knowledge of Lasergrammetry.* *- Students understand the 3D digitisation of an object uses a tool such as a laser scanner which generates a multitude of new notions that the surveyor must master in order to dominate the use, processing and rendering of the survey carried out.* ***Skills:*** *- Students will be able to survey points in coordinates by recording some radiometric information. Enter and calculate points in XY and Z.* *- Students will be able to create a 3D model from the corrected and georeferenced point cloud.* ***Competences:*** *- The student becomes a specialist in the processing and exploitation of Point cloud from Laser scan.* *- The student can manage a remote sensing project; either in the selection of the type of imagery related to the project's theme, or in the choice of the most efficient technique for a advancing processing of Point cloud.*

Content	***Chapter I: Preliminary definitions*** *I.1 Laser light* *I.2 Point cloud* *I.3. scanner resolutions* ***Chapter II: Classification of scanners*** *II.1 Pulse method laser scanners* *II.2 Phase shift method laser scanners* *II.3. Hybrid lasers* ***Chapter III: Technical characteristics*** *III.1 Distance accuracy* *III.2 Angular accuracy* *III.3. The laser footprint (spot)* *III.4. Classification of scanners* *III.5. Field of view* ***Chapter IV: Sources of error*** ***Chapter V: Getting Started Case Study*** *V.1 Presentation of the site* *V.2 Presentation of the Equipment* *V.3. Presentation of the settings* *V.4. Data entry* *V.4.1. Consolidation based on targets and checkerboards* *V.4.2. Consolidation based on point clouds*
	V.5. Georeferencing of the survey *V.5.1. Direct georeferencing* *V.5.2 Indirect georeferencing* ***Chapter VI: Getting started with the software*** *VI.1 Digital processing of the survey (step by step)* *VI.1.1. Creating the file* *VI.1.2. Retrieving the field data* *VI.1.3. Verification of raw scan data* *VI.1.4. Consolidation of point clouds* *VI.1.5. Georeferencing the point cloud* *VI.1.6. Certification of the consolidated point cloud* *VI.2 Case study* *VI.2.1. Presentation of the checkerboard determination methodology* *VI.2.2. Presentation of the 3D scanner survey (initially only the exterior)* *VI.2.3. Georeferencing and certification of the assembly* *VI.2.4. Creation of deliverables*

Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Practical Exam* *Final Written Exam*
Final Grade calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam and Final Written Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	ANF CNRS, 2021. Lasergrammétrie terrestre. Karst, grotte et 3D. 46 p. ALBY, E. GRUSSENMEYER, P. SMIGIEL, E., ASSALI, P. (2011). Comparaison de PhotoModeler Scanner et David Laserscanner pour l'obtention de nuages de points denses. Revue XYZ n°126, pages 37-42. PESCI, A., TEZA, G., BONALI, E., 2011. Terrestrial Laser Scanner Resolution: Numerical Simulations and Experiments on Spatial Sampling Optimization, Remote Sensing, 3, p.167-184. SOUDARISSANANE, S., LINDENBERGH, R., MENENTI, M. ET TEUNISSEN, P., 2011. Scanning geometry: Influencing factor on the quality of terrestrial laser scanning points. ISPRS Journal of Photogrammetry and Remote Sensing. 11 pages.

Building Information Modelling (BIM) Module Handbook

Module designation	*Building Information Modeling (BIM)*
Module level, if applicable	*3rd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE302*
Subtitle, if applicable	*"Introduction to Building Information Modeling (BIM) for Geomatics Students: Concepts, Skills and Applications."*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Laribi Ismail (Expert)*
Lecturer	*Laribi Ismail (Expert)*
Language	*French*
Relation to curriculum	*This module is of great interest since it presents the foundation of digital transformation in geomatics, architecture, engineering, and construction industry. It allows the students to realize better ways of working in the built world.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours=* *28 Hours of self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*
Recommended prerequisites	

Module objectives/intended learning outcomes	***Knowledge:*** - *Define what Building Information Modeling (BIM) is, the associated concepts (closedBIM, openBIM) and its fields of application, while integrating the buildingSMART approach* - *Know the components of a BIM process (EIR client specifications, BIM PEB execution plan, use cases, etc.) as well as the requirements and needs associated with them (information management, interoperability, etc.).*

	- *Formulate the advantages and disadvantages of an "openBIM" approach versus a "closedBIM" approach according to use cases.* - *Understand BIM standards and protocols, data management and BIM attributes.* - *Understand the collaboration and coordination processes in BIM.* - *Interpret information requirements (granularity: LOIN, LOG, LOD) defined and their implementation in a BIM SOFTWARE.* - *Structure a digital model to ensure correct data exchange.* - *Analyze a use case and formulate the appropriate information needs.* - *Understand the integration of geospatial data into BIM (GIS& BIM)* - *Understand maintenance and building life management using BIM data (4D, 5D, till XD…)* - *Understand the legal and contractual aspects associated with BIM, including the responsibilities and obligations of each stakeholder.* ***Skills:*** - *Understand how to model different building elements using BIM software.* - *Use reality capture and BIM modeling softwares to create 3D digital models of buildings.* - *Understand the BIM work processes and use them to effectively coordinate the various phases of the project* - *Understand collaboration and coordination processes in BIM, including conflict and issue management.* - *Integrate geospatial data into the BIM digital model.* ***Competences:*** - *Use of BIM modeling software to create 3D and 2D digital models of buildings.* - *Use the knowledge gained to create and manipulate BIM objects to model different building elements.* - *Apply BIM standards, protocols, and BIM data and attribute management processes to effectively manage project information.* - *Apply acquired knowledge of the legal and contractual aspects associated with BIM, including the responsibilities and obligations of each stakeholder, to meet legal and ethical standards.*

Content	**Module I: BIM: Process, Structure and Standards** **Chapter 1: Understanding BIM** 1.1- Factors that led to BIM 1.2- BIM Terminology 1.3- BIM Basics 1.4- BIM Information Model

1.5- BIM maturity stage

Chapter 2: Benefits of BIM

2.1- Collaboration
2.2- Poor management of information
2.3- Processes and Standards
2.4- Advantages for project managers
2.5- Benefits for Construction Professionals (AEC)

Chapter 3: Information management according to ISO 19650

3.1- Definition of specifications, components of a BIM process
3.2- Definition of information requirements (granularity LOIN, LOG, LOD)
3.3- BIM execution plan (BEP)
3.4- Interoperability and exchange of information
3.5- Common data environment (CDE)
3.6- Evaluation of project participants

Chapter 4: OPEN BIM vs Closed BIM

4.1- The building smart approach
4.2- OPEN BIM, closed BIM
4.3- IFC
4.4- MVD
4.5- IDM
4.6- DFI/bSDD
4.7- BCF
4.8- Cobie

Chapter 5: BIM capacity

5.1- BIM Deployment Challenges
5.2- Benefits of adopting BIM
5.3- Align objectives with corporate strategy
5.4- Data security

Module II: The digital & BIM model

Chapter 1: Scan to BIM & 3D Modeling

1.1- Reality capture & Scan to BIM process
1.2- 3D software mapping for BIM modeling
1.3- Familiarization with modeling tools
1.4- Introduction to Classification and Standardization
1.5- The types of geometric data used in the BIM

Chapter 2: Data Visualization and Communication in BIM

2.1- Data integration in a digital layout
2.2- Collaboration tools and data visualization
2.3- Export of BIM data
2.4- Types of renditions for data communication
2.5- Collaboration and interoperability: data validation and analysis

	Chapter 3: BIM and Project Management 3.1- Use of BIM data for project management 3.2- Introduction to planning 4D (time), 5D(cost) 3.3- BIM for the operation and maintenance of structures 3.4- Tools for analysing building performance 3.5- Energy simulation tools 3.6- How to use these tools to optimize building design **Chapter 4: Practical application** - Apply the bases acquired from previous modules for specific use cases. - Analyze a use case and formulate the need for adequate information - Be able to propose a BIM solution to meet a particular need by justifying the relevance of its use to existing methods or processes. **Module III: BIM & SIG: new horizon for smart cities** **Chapitre 1: GIS and BIM integration** 1.1- Geospatial data in BIM 1.2- How to integrate geospatial data into the digital model: tools, software, etc. 1.3- BIM & GIS for urban planning 1.4- Advantages and limitations of BIM & GIS integration 1.5- From digital twins to smart cities: principles and objectives **Chapter 2: Practical Application** 2.1- BIM and GIS data integration process 2.2- Case study and reference project
Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Practical Exam* *Final Written Exam*
Final Grade calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam and Final Written Exam 60%*
Media employed	*Booklets for case studies* *Whiteboard* *Computer* *Data show*
Reading list	

Ground and condominium subdivision Module Handbook

Module designation	*Ground and condominium subdivision*
Module level, if applicable	*3rd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE303*
Subtitle, if applicable	*Ground subdivision, condominium subdivision*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Magtouf REZGUI*
Lecturer	*Magtouf REZGUI*
Language	*French*
Relation to curriculum	*This module is a continuation of Cartography, Topography, Photogrammetry, Land Law, Geodesy, Thematic Mapping, Topographic Projects, Microgeodesy and Quality control of topographic works.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.* *A student must have attended at least 75% of the lectures to sit for the final exams.*
Recommended prerequisites	*Some basic knowledge of Topography, Cartography, Geodesy and GIS is required.* *For the smooth running of this course, knowledge of the processing and Topography is required. The mastery of the principles of vectorization and digital cartography and the principles of topographic surveying, geodesy, coordinate systems, concept of scale, spatial database design, and GIS are also mandatory.*
Module objectives/intended learning outcomes	*The condominium Management is the division of a piece of land into several properties intended to be built on. The subdivision is the result of the development of plots of land for the purpose of resale for construction.*

Module objectives/intended learning outcomes	*This urban planning operation allows, for example, a municipality to urbanise a sector of its territory by having recourse to a developer (who is generally a private promoter), who will at the same time build the viability elements such as roads and green spaces, lighting, sanitation, and will be remunerated by selling the developed plots. This avoids the need for a community to finance major investments. The area thus developed will therefore be called a "housing estate".* *Each notion is accompanied by theoretical and practical applications.* ***Knowledge:*** *- Students understand the basic knowledge for Code of land use planning and urban development and its application texts.* *- Students understand the basic knowledge of Forms and modalities of approval of subdivision files.* *- Students understand the basic knowledge for Common and undivided parts, for Divided and private parts and for Division of the building into lots.* ***Skills:*** *- Students learn to define the basic elements for Preparatory work in the office.* *- Students learn to define the basic elements for Field operations.* *- Creation of land titles at the ONCPF and updating of deferral maps at the OTC.* ***Competences:*** *- The student will be able to divide a plot of land into several properties to be built on.* *- The student will be able to Draw up specifications that define the rules of use and the easements of the subdivision (It defines the distribution of charges, parking, etc.).* *- The student will be able to write a contractual document intended to organise the relations between the co-owners.*

Content	***Chapter I: Subdivision legislation*** *I. Code of land use planning and urban development and its application texts* *I.1. The composition and functioning modalities of the Technical Commissions of allotments* *I.2. Forms and modalities of approval of subdivision files* *II. The Code of Real Rights* *II.1. Articles relating to co-ownership of buildings divided by floors (Article 85)* *II.2. Articles relating to co-ownership of buildings divided into flats (Article 102)* ***Chapter II: Co-ownership*** *I. Definitions* *I.2. Common and undivided parts* *I.2.1. Non-built-up areas* *I.2.2. Built-up areas*
	I.3. Divided and private parts *I.4. Division of the building into lots* *II. Documents constituting the file* *II.1. Subdivision project of a single building built on the parcel of land title* *II.2. Subdivision project of a group of buildings* *III. Analysis of the files* ***Chapter III: Execution of the subdivision works*** *III.1. Preparatory work in the office* *III.2. Field operations* *III.2.1. Identification of the building(s)* *III.2.2. Boundary marking* *III.2.3. Survey* *III.3. Office operations* *III.3.1. Calculation of coordinates* *III.3.2. Sketch* *III.3.3. Calculation of contents* *III.3.4. Table of contents* *III.3.5. Minutes* *III.3.6. Constitution of the file* *III.3.7. Verification of the technical file* *III.3.8. Drawing and preparation of transfer plans* *III.3.9. Verification of transfer plans* *III.3.10. Archiving the technical file at the CTA* *III.3.11. Communication of transfer plans to the ONCPF* *III.4. Creation of land titles at the ONCPF and updating of deferral maps at the OTC* ***Chapter IV: The various bodies involved in condominiums***

Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Practical Exam* *Final Written Exam*
Final Grade calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam and Final Written Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*Édouard Bergoz (2018). Les scissions de copropriété comme outil de résolution de situations complexes. CONSERVATOIRE NATIONAL DES ARTS ET METIERS ECOLE SUPERIEURE DES GEOMETRES ET TOPOGRAPHES. 72p.*

Artificial Intelligence in GIS Module Handbook

Module designation	*Artificial intelligence in GIS*
Module level, if applicable	*3rd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE304*
Subtitle, if applicable	*Artificial intelligence and applications on GIS*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Ines BOUZIDI*
Lecturer	*Dr. Ines BOUZIDI*
Language	*French*
Relation to curriculum	*This module is an introduction to Artificial Intelligence applied to GIS. It allows the students to expand the skills acquired in Topography, Cartography and probability and statistics modules by integrating advanced AI solutions for recurrent GIS classification issues, more specifically, by using deep learning models.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*
Recommended prerequisites	*For this course, algorithmic and Python programming bases are required. Some knowledge of engineer maths and image processing are also necessary. The students must have also basic understanding about the geospatial data.*
Module objectives/intended learning outcomes	***Knowledge:*** - *The students understand differences between supervised and unsupervised learning.* - *The students get familiar with the most famous deep learning models* - *The students know the existing Python libraries for Deep Learning.*

	Skills: - *The students are able to classify images based on different unsupervised algorithms.* - *The student can implement deep learning solutions using Python libraries.* - *The students learn how to implement and train a deep learning model* ***Competences:*** - *The students can identify problems involving IA* - *The students can analyse and select the more appropriate IA model based on a real case study.* - *The students are able to design and implement an entire IA solution in the field of geomatics* - *They are able to analyse the results and identify axis of improvement.*

Content	*CHAP 1: Introduction to Artificial Intelligence and Machine Learning* *1.1. Linear, non-Linear regression* *1.2. Evaluation Metrics in Regression Models* *CHAP 2: Machine learning Algorithms* *2.1 K-nearest neighbours* *2.2 Introduction to Decision Trees* *2.3 Support Vector Machine* *2.4 Evaluation Metrics in Classification* *Workshop 1* *CHAP 3: Artificial Neural Networks* *3.1. Introduction to Deep Learning* *3.2. Gradient Descent* *3.3. Backpropagation* *3.4. Vanishing Gradient* *3.5. Activation Functions* *Workshop 2* *CHAP 4: Deep Learning for Image Classification* *4.1. Fully Connected Neural Network Architecture* *4.2. Convolutional Neural Networks* *4.3. Recurrent Neural Networks* *Workshop 3* *CHAP 5: Deep learning implementation using Python Libraries* *5.1. Deep neural networks with Keras* *5.2. Deep neural networks with Pytorch* *Workshop 4* *Workshop 5*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Practical Exam*
Final Grade calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam 60%*

Media employed	*Booklets for theoretical exercises,* *Booklets for laboratory sessions* *Whiteboard* *Computer* *Data show*
Reading list	- *Machine Learning Projects, B. Boucheron and L. Tagliaferri, 2019* - *Deep Learning with Pytorch, E. stevens, L. Antiga and T. Viehmann, 2020* - *The hundred page machine Learning: http://themlbook.com/wiki/doku.php, A. Burkov, 2019* - *Python Data Science Handbook: https://jakevdp.github.io/PythonDataScienceHandbook, J. VanderPlas, O'Reilly Media, 2016*

Implantation techniques Module Handbook

Module designation	*Implantation techniques*
Module level, if applicable	*3rd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE305*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Hassen Bacha*
Lecturer	*Hassen Bacha*
Language	*French*
Relation to curriculum	*Implantation technical is based on the mathematical, physical concepts of survey.* *Implantation technical module is basic for the creation of topographic maps and plans.* *This module is the final part of the acquisition, survey and processing methods applied to spatial information.*
Type of teaching, contact hours	*Lecture: 1h30 per week.* *Classes of 30 students*
Workload	*21 contact hours* *14 Hours of Study*
ECTS Credits/Points	*1.4*
Weight factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*
Recommended prerequisites	*Some basics knowledge of mathematics (Matrix calculation, basic calculus, and linear algebra) and physics (Mechanics & optics), are required.* *For the smooth running of this course, knowledge of survey is required, the mastery of the principles of vectorization and digital cartography and the principles of topographic surveying, geodesy, coordinate systems, concept of scale, spatial database design, and GIS.*

Module objectives/intended learning outcomes	*The implantation is the operation which consists in transferring on the ground, according to the indications of a plan, the position of buildings, axes or isolated points with an aim of construction or location. Most layout Drawings are made up of straight lines, curves and isolated points.* ***Knowledge:*** *- Students understand the basic knowledge for Organisation of land registration in Tunisia.* *- Students understand the basic knowledge of Procedures for compulsory land registration.* *- Students understand the basic knowledge for Optional land registration procedures.* ***Skills:*** *- Students learn to define the basic elements for organisation of land registration in Tunisia.* *- Possible edition of a plan or a diagram being automatic with the procedures for compulsory land registration and optional.* ***Competences:*** *- Students to be able to organisation of land registration in Tunisia.* *- Students to be able to realise procedures for compulsory land registration.* *- Students to be able to realise the optional land registration procedures.*

Content	***Chapter I: LOCATION OF ALIGNMENTS*** *I.1. Drawing a perpendicular to an existing alignment.* *I.2. Drawing a parallel to an existing alignment.* *I.3. Intersecting alignment to an existing alignment.* *I.4. Unobstructed alignment.* *I.5. Alignment with obstacle.* *I.6. Extension of an alignment.* *I.7. Bypassing an obstacle.* *I.8. TP1: Layout of a road axis.* ***Chapter II: LOCATION OF POINTS IN ALATIMETRY*** *II.1. By abscissa and ordinate.* *II.2. By radiation.* *II.3. Intersection of two alignments.* *II.4. Control of a layout.* *II.5. TP2: Study of a RB.* ***Chapter III: LAYOUT OF ALTERNATIVE LINES*** *III.1. Setting up a level line.* *III.2. Levelling of layout chairs or stakes.* *III.3. Laying out earthworks.* *III.4. TP3: Layout of a steel construction.*
	Chapter IV: LOCATION OF A BUILDING *IV.1. Common buildings* *IV.2. Buildings on special foundations, engineering structures.* *IV.3. High-rise buildings.* *IV.4. Staking out slopes.* *IV.5. TP4: Setting up a site*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Practical Exam* *Final Written Exam*
Final Grade calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam and Final Written Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*Hervé BRUNEL (2007). Cours de route / université d'Orléans.* *Serge Milles (1999). Topographie et topométrie modernes.* *LAPOINTE et MEYER (1989). Topographie appliquée.*

Entrepreneurship and business creation Module Handbook

Module designation	*Entrepreneurship and business creation*
Module level, if applicable	*3rd year Geomatics engineering cycle*
Code, if applicable	*GTE306*
Subtitle, if applicable	*Project Startup*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dziri Mongi*
Lecturer	*Dziri Mongi*
Language	*French*
Relation to curriculum	*For all programmes*
Type of teaching, contact hours	*Lecture: 1h30 per week* ▪ *Lectures: 14 Hours* ▪ *Exercises and Assignments: 7 Hours*
Workload	*21 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.4*
Weight Factor/Coefficient	*1*
Requirements according to the examination regulations	*Unauthorized documents and internet access.* *A student must have attended at least 75% of the lectures to sit in the exams.*
Recommended prerequisites	*Management course*

Module objectives/intended learning outcomes	***Knowledge:*** - *Equip students with the necessary knowledge related to business creation.* ***Skills:*** - *Enable students to develop certain personal skills necessary for success in an entrepreneurial and business creation context.* ***Competences:*** - *The students to master the different tools and methods related to the creation of companies and the development of projects.*
Content	*CHAP1: The forms of entrepreneurship* *CHAP2: Socio-economic environment of the entrepreneur* *CHAP3: The idea / opportunity: the root of the project* *CHAP4: The adequacy of the creator/project couple* *CHAP5: Feasibility study of business creation (business plan)* *5.1. Commercial component (market study)* *5.2. Technical component* *5.3. Human Resources Component* *5.4. Economic and financial aspect* *5.5. Legal, fiscal and social aspect* *CHAP6: Business creation and key stakeholders*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Exam*
Final Grade calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Whiteboard, data show, laptop computer.*
Reading list	*1- Christel Tessier-Dargent, Les paradoxes de l'entrepreneuriat de nécessité : Strapontin ou tremplin ? Entreprendre & Innover 2014/1 (n° 20), pp.24 à 38.* *2- Verstracte T. et Saporta B. Création d'entreprise et entrepreneuriat. Les éditions de l'ADREG, 2006.* *3- Henri Capron, Entrepreneuriat et création d'entreprises. Facteurs déterminants de l'esprit d'entreprise. de boeck, 2000.*

Agile Software Development Practices Module Handbook

Module designation	*Agile Software Development Practices*
Module level, if applicable	*3rd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE307*
Subtitle, if applicable	*Agile methods and development techniques, Introduction to agility, Scrum Framework and Agile Methodology*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Asma Ben Ahmed*
Lecturer	*Dr. Asma Ben Ahmed*
Language	*French*
Relation to curriculum	*This module introduces the principles of agility across the software development and delivery lifecycle. It will help students deliver their projects more effectively. This effectiveness can be achieved through creating project's value incrementally in a collaborative manner. Hence, this module is mainly recommended for the end of study project.*
Type of teaching, contact hours	*1h30 hours / week* *Lecture: 1h30 per week.* *Classes of 30 students*
Workload	*21 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.4*
Weight Factor/Coefficient	*1*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *A student must have attended at least 75% of the lectures to sit for the final exams.*
Recommended prerequisites	*Prerequisites in the unified modelling language (UML) is useful but not mandatory.*
Module objectives/intended learning outcomes	***Knowledge**:* *- Understand the concept of Agility* *- Learn about agile Methods and Frameworks* *- Understand the different process models* *- Understand concepts of scrum and its framework*

	Skills: *- Apply agility concepts in a simple application* *- Set priorities of the different parts of the application* *- Work tracking, project status and metrics taking into account a sample application* *- Learn and use different design practices* *- Apply scrum concepts in a simple application* ***Competences:*** *- Develop their ability to solve complex problems and practical issues thanks to agility* *- Develop their analytical skills as well as their design thinking sets* *- Learn how to present and defend their results in front of the class* *- Master the art of developing, delivering, and sustaining complex products* *- Deliver their projects more effectively by delivering value incrementally in a collaborative manner.*

Content	Chapter I: Agile and Agility *Principles of agile methodology and the agile manifesto.* *Value and the voice of the Customer.* *Agile Methods and Frameworks* *Lean Start-Up,* *Scaling across the Enterprise.* *Culture and Mindset.* Chapter II: Leadership and Management *Traditional project management approaches vs Agile Project planning.* *Self organising teams.* *Decentralised decision-making.* *Lean Portfolio Management.* Chapter III: Software Development Processes *Process models - waterfall, prototyping, iterative, rapid, structured, object-oriented, agile* Chapter IV: Roles and Responsibilities *The changing roles of software architects, developers, testers, business analysts and manager.* *New ways of working across teams and programs. Design Integrity and Solution Intent.* *Agile ceremonies across all levels of the organisation.* Chapter V: Development Operations *Deployment Architecture - design for continuous delivery and integration,* *build automation,* *continuous test management;* *release management,* *cross platform support, extensibility,.* Chapter VI: Software Estimation and Planning *Estimation techniques.* *Agile sizing approaches* *the Fibonacci sequence,* *dog breeds. Factors that affect efforts* Chapter VII: Scrum framework (Preparation to scrum master certificate) *Scrum Definition.* *Scrum Theory.* *Scrum Values.* *Scrum Team.* *Scrum Artifacts*

Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Exam*
Final Grade calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Booklets for case studies* *Whiteboard* *Computer* *Data show*
Reading list	- *The scrum guide, Ken Schwaber and Jeff Sutherland, November 2020* - *A Literature Review on Agility,Haider, Syed Arslan & Martins, José & Khan, Soha & Mata, Nuno Neves & Tehseen, Shehnaz & Abreu, Antonio, International Journal of Entrepreneurship, 2021* - *The home of Scrum, https://www.scrum.org/*

GIS Quality Control Module Handbook

Module designation	*GIS quality control*
Module level, if applicable	*3rd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE308*
Subtitle, if applicable	*Data quality, GIS*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Adnène KASSEBI*
Lecturer	*Adnène KASSEBI*
Language	*French*
Relation to curriculum	*The GIS quality control module is the final step of treatment of data, and continuity of Mathematics, Cartography, GIS, Photogrammetry, Remote Sensing, and Spatial Analysis modules. It allows a thorough analysis of data in general: from point of view of quality and accuracy.* *This module is fundamental to assess the quality of the created topographic maps and plans.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours=* *28 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor	*3*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*
Recommended prerequisites	*Basics knowledge of mathematics, basic calculus, and linear algebra are required.* *For this course, Spatial Data Base, GIS and Python programming bases are required. Some knowledge of engineer maths and image processing are also necessary.*

Module objectives/intended learning outcomes	*To facilitate comparisons, it is essential that the results of the quality reports are expressed in a comparable way and that there is a common understanding of the data quality measures that have been used. These data quality measures provide descriptors of the quality of geographic data through comparison with the universe of discourse. The use of incompatible measures makes data quality comparisons impossible to perform. This International Standard standardizes the components and structures of data quality measures and defines commonly used data quality measures.* ***Knowledge:*** *- Students understand the basic knowledge of data quality.* *- Students understand the basic knowledge of the structure of international standard of data quality.* ***Skills:*** *- The students learn to define the basic elements, the processing phases, and the execution stages within elements of data quality.* *- Students become familiar with the problems of modelling and UML design and mastery of the know-how to solve them.* *- The students can present the good document of data quality and quality control.* ***Competences:*** *- The student is able to plan data quality control tasks.* *- The student becomes a specialist in the field of quality control and is able to understand and interpret quality reports.*

Content	***Chapter I: GIS and Spatial Analysis*** *I.1. Introduction* *I.2. Modelling and representation of geographical features* *I.3. Analytical capabilities of GIS* *I.4. GIS and spatial analysis* ***Chapter II: Data Quality*** *II.1. Introduction* *II.2. Compliance* *II.3. Normative references* *II.4. Terms and definitions* *II.5. Overview of data quality* *II.6. Components of data quality* *II.7. Data quality assessment* ***Chapter III: Topology*** *III.1. Introduction* *III.2. Elements of a geodatabase topology* *III.3. Aggregation processing* *III.4. Topologies and entity datasets* *III.5. Coordinate classifications* *III.6. Z-aggregate rankings and tolerance* *III.7. Topology rules*

	III.8. Topology validation, errors and exceptions *III.9. Presentation of subtypes* ***Chapter IV: Metadata*** *IV.1. Introduction* *IV.2. Metadata in ArcGIS* *IV.3. Creating and managing FGDC metadata* ***Chapter V: Application of Quality Control Tools*** *V.1. Introduction* *V.2. Completeness* *V.3. Logical consistency* *V.4. Accuracy of positions* *V.5. Temporal quality* *V.6. Thematic accuracy* *V.7. Measures of aggregation* ***Chapter VI: Data quality assessment and reporting*** *VI.1. Description of a dataset* *VI.2. Quality assessment process* *VI.3. Data quality reporting* *VI.4. Additional examples* ***Chapter VII: Sampling methods for assessment*** *VII.1. Lot and item* *VII.2. Sample size* *VII.3. Sampling strategies* *VII.4. Probability-based sampling* ***Chapter VIII: Basic data quality measures*** *VIII.1. Purpose of basic data quality measures* *VIII.2. Basic data quality measures for counting* *VIII.3. Basic data quality measures for uncertainty* *VIII.4. Storage of data quality measures*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Lab/Project Assignments* *Final Practical Exam*
Final Grade calculation	*Continuous Evaluation and Lab/Project Assignments 40%* *Final Practical Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*

Reading list	*ISO 19101: 2002 – Modèle de référence.* *ISO 19101–2: 2008 – Modèle de référence- imagerie.* *ISO 19103: 2005 – Langage de schéma conceptuel.* *ISO 19104: 2008 – Terminologie.* *ISO 19105: 2000 – Conformité et essais.* *ISO 19106: 2004 – Profils.* *ISO 19107: 2003 – Schéma spatial.* *ISO 19108: 2002 – Schéma temporel.* *ISO 19109: 2005 – Règles de schéma d'application.* *ISO 19110: 2005 – Méthodologie de catalogage des entités.* *ISO 19115–1: 2014 – Métadonnées – Partie 1 : Principes de base.* *ISO 19115–2: 2009 – Métadonnées – Partie 2 : Extensions pour les images et les matrices.* *ISO 19126: 2009 – Dictionnaires de Concept de caractéristiques et registres.* *ISO 19131: 2007 – Spécifications de contenu informationnel.* *ISO 19137: 2007 – Profil minimal du schéma spatial.* *ISO 19141: 2008 – Schéma des entités mobiles.* *ISO 19144–1: 2009 – Systèmes de classification – Partie 1: Structure de système de classification.* *ISO 19144–2: 2012 – Systèmes de classification – Partie 2: Métalangage de couverture du sol (LCML).* *ISO 19146: 2010 – Vocabulaires interdomaines.* *ISO 19149: 2011 – Langue sur l'expression des Droits pour l'utilisation de l'information géographique – GeoREL.* *ISO 19150–1: 2012 – Ontologie – Partie 1 : Cadre de Travail.* *ISO 19152: 2012 – Modèle du domaine de l'administration des terres (LADM).* *ISO 19153: 2014 – Modèle de référence pour la gestion numérique des Droits d'utilisation de l'information géographique.* *ISO 19155: 2012 – Architecture d'identifiants de lieu (IL).* *ISO 19156: 2011 – Observations et mesures.* *ISO 19157: 2013 – Qualité de données.* *Rodolphe Devillers, Alfred Stein, Yvan Bédard, Nicholas Chrisman, Peter Fisher and Wenzhong Shi, 30 years of research on Spatial Data Quality – Achievements, failures and opportunities, Saint-John's, 2009, 13 pages.* *Rodolphe Devillers, Yvan Bédard, Marc Gervais, Indicateurs de qualité pour réduire les risques de mauvaise utilisation des données géospatiales, Revue internationale de géomatique. Volume 14 – n° 1/2004, 25 pages* *Le "geotagging" en toute confiance, Géomatique Expert - n° 71 – Octobre-Novembre 2009, 3 pages.* *Rodolphe Devillers, Robert Jeansoulin, Qualité de l'information géographique, Paris, Hermès, 2005, 350 pages.*

Quality control in topographic projects Module Handbook

Module designation	*Quality control in topographic projects*
Module level, if applicable	*3rd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE309*
Subtitle, if applicable	*Quality control of topographic works, Data quality, topographic works*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Mohamed Ali El YAHMADI*
Lecturer	*Mohamed Ali El YAHMADI*
Language	*French*
Relation to curriculum	*This module is a continuation of Cartography, Topography, Geodesy, Thematic Mapping, Topographic Projects, Bathymetry, Microgeodesy and GIS Quality control.*
Type of teaching, contact hours	*3 hours / week* *Lecture: 1h00 per week.* *Laboratory session: 2h00 per week.* *Classes of 30 students*
Workload	*42 contact hours* *18 Hours of Self Study*
ECTS Credits/Points	*2.8*
Weight Factor/Coefficient	*3*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*
Recommended prerequisites	*Basics knowledge of mathematics, basic calculus, and linear algebra are required.* *For this course, Spatial Data Base, GIS and Python programming bases are required. Some knowledge of engineer maths and image processing are also necessary.*
Module objectives/intended learning outcomes	*To facilitate comparisons, it is essential that the results of the quality reports are expressed in a comparable way and that there is a common understanding of the data quality measures that have been used. These data quality measures provide descriptors of the quality of geographic data through comparison with the universe of discourse. The use of incompatible measures makes data quality comparisons impossible to perform. This International Standard standardizes the components and structures of topographic data quality measures and defines commonly used data quality measures.*

	Knowledge: *- Students understand the basic knowledge of topographic data quality.* *- Students understand the basic knowledge of the structure of international standard of topographic data quality.* ***Skills:*** *- The students learn to define the basic elements, the processing phases, and the execution stages within elements of topographic data quality.* *- The students can present the good document of topographic data quality and quality control.* ***Competences:*** *- The student may be ready to be an engineer, planning data quality control tasks.* *- The student becomes a specialist in the field of topographic quality control; understanding quality reports.*

Content	***Chapter I: Regulatory Context*** ***Chapter II. Errors and accuracy*** *II.1 Different errors* *II.1.1. Internal error* *II.1.2. Error specific to the legal reference network* *II.1.3. Linkage error* *II.2 Different types of Accuracy* *II.2.1. Internal accuracy class* *II.2.2. Total accuracy class* *II.3. Verification of an accuracy class* ***Chapter III: Accuracy classes*** *III.1 Safety coefficient* *III.2 Dissociation of planimetry and altimetry* *III.3. Verification of an accuracy class* *III.3.1. Choice of sample* *III.3.2. Implementation of the check* *III.4. Accuracy classes* *III.4.1. Frameworks* *III.4.2. Surveying in detail* *III.4.3. Preparation of cadastral plans* ***Chapter IV: Verification of topographic work*** *IV.1 Verification of a canvas* *IV.1.1. Choice of points* *IV.1.2. Verification of the accuracy class* *IV.2 Verification of a plan redesign* *IV.2.1. Checking the accuracy class of the plan* *IV.2.2. Verification of the boundary survey* *IV.3. Verification of an agricultural and forestry land development* *IV.3.1. Verification of the boundary survey*
	IV.3.2. Verification of the calculation of parcel contents *IV.3.3. Verification of the topographic value or accuracy class of the plan* *IV.3.4. Verification report* *IV.4. Verification of the geo-referencing of the plan* *IV.4.1. General* *IV.4.2. The accuracy class of a georeferencing* *IV.4.3. Verification of a geo-referencing carried out in-house* *IV.4.4. Verification of a georeferencing carried out by a service provider* *IV.4.5. Verification of georeferencing files*

Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Practical Exam* *Final Written Exam*
Final Grade calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Practical Exam and Final Written Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*OFFICE NATIONAL DES AEROPORTS (2019). DOSSIER D'APPEL D'OFFRES : « Contrôle et suivi des travaux topographiques du projet de construction du nouveau terminal de Rabat ». 41p.* *N'DRI Jean More (2017). SUIVI ET CONTRÔLE QUALITE DANS LE DOMAINE DES TRAVAUX PUBLICS : CAS DE LA RÉHABILITATION DE LA ROUTE AKOUPE-KOTOBI-BONGOUANOU. Institut International d'Ingénierie de l'Eau et de l'Environnement. 84p.*

English/TOEIC Preparation Module Handbook

Module designation	*English/TOEIC Preparation*
Module level, if applicable	*3rd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE310*
Subtitle, if applicable	*English*
Courses, if applicable	*English course TOEIC +EAP (English for Academic purposes)*
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Amira Gara*
Lecturer	*Amira Gara*
Language	*ENGLISH*
Relation to curriculum	*Programme English language teaching compulsory*
Type of teaching, contact hours	*1 h30 / week contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar etc.*
Workload	*21 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.4*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Students must write answers on the sheets provided (fill in the blanks).* *Neither documents nor internet access permitted.*
Recommended prerequisites	*A2 + / B1 level*

Module objectives/intended learning outcomes	The objectives of TOEIC course are: • To develop students' reading sub-skills • To develop students' listening sub-skills • To develop students' exam taking techniques and strategies • To help students revise important grammar structures and functions tested in the TOEIC. • To familiarize students with the format and timing of the TOEIC® test Learning outcomes: By the end of this course, the learners will have: 1. Developed TOEIC test taking skills by using context and vocabulary clues to infer meaning. 2. revised important grammar structures and functions tested in the TOEIC test, advanced grammar and cohesive devices 3. Developed reading strategies such as skimming and scanning. 4. Enabled students to understand a wide range of spoken English. 5. Developed a clear understanding of each component of the TOEIC test as well as its format.

	English for Academic Purposes (EAP) Reading • Use skimming and scanning techniques to get the gist of text and find specific information • Guess the meaning of new vocabulary from context • Identify structural features of a written text, for example topic sentences, points in arguments etc • Identify a different genre of text and identify their purpose • Identify an author's point of view, bias and tone • Read academic texts, make notes from them and write a summary of the text Writing • Keep a personal journal to improve fluency and reflect on learning • Write grammatically in English, with an ability to write simple sentences and with reasonable control of complex sentence structures • Write well-structured and formatted paragraphs of various types • Express ideas in a logical order • Make and take notes and write a summary of a text • Write short explanation and opinion essays Listening • Listen for a range of purposes, e.g. to predict, identify stages, answer short-answer questions etc • Listen to and follow instructions • Listen to differentiate between opinion and fact, solutions, explanations • Listen to a short talk or video and retell or write a short piece based on the listening • Listen to a short lecture and take notes, then complete a writing task based on the notes. Speaking • Communicate effectively in the classroom with other students and the teacher • Speak fluently about familiar topics • Use stress, tone and intonation to convey meaning clearly • Participate in an academic debate • Give a presentation using visual aids e.g. Powerpoint, etc. • *Listen to and follow instructions* • *Listen to differentiate between opinion and fact, solutions, explanations* • *Listen to a short talk or video and retell or write a short piece based on the listening* • *Listen to a short lecture and take notes, then complete a writing task based on the notes.*

Content	Lessons.1-5 General Business 1. Contracts 2. Marketing 3. Warranties 4. Business Planning 5. Conferences Word Review #1

	Lessons 6-10 Office Issues 6. Computers 7. Office Technology 8. Office Procedures 9. Electronics 10. Correspondence Word Review #2 Lessons 11-15 Personnel 11. Job Advertising and Recruiting 12. Applying and Interviewing 13. Hiring and Training 14. Salaries and Benefits 15. Promotions, Pensions, and Awards Word Review #3 Lessons 16-20 Purchasing 16. Shopping 17. Ordering Supplies 18. Shipping 19. Invoices 20. Inventory Word Review #4 Lessons 21-25 Financing and Budgeting 21. Banking 22. Accounting 23. Investments 24. Taxes 25. Financial Statements Word Review #5 Lessons 26-30 Management Issues 26. Property and Departments 27. Board Meetings and Committees 28. Quality Control 29. Product Development 30. Renting and Leasing Word Review #6 Lessons 31-35 Restaurants and Events 31. Selecting a Restaurant 32. Eating Out 33. Ordering Lunch 34. Cooking as a Career 35. Events Word Review #7

Content	It is interactive, experiential (Kolb's experiential model) and communicative. NB: The conception of the TOEIC course is inspired from different TOEIC resources such as Hellenic American Union 2008 - New TOEIC Syllabus.
Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Exam*
Final Grade calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Data show* *Youtube videos* *Laptop* ***Resources*** Barron's Essential Words For the TOEIC, 4th Edition by Dr. Lin Lougheed. Barron's TOEIC, 6th Edition Full-length practice tests by Dr. Lin Lougheed. Website materials: https://learnenglish.britishcouncil.org/en/grammar-exercises http://www.english-4u.de/tenses_exercises.html http://www.perfect-english-grammar.com/grammar-exercises.html https://learnenglish.britishcouncil.org/en/grammar-exercises Business materials https://www.businessenglishpod.com/2016/09/24/business-english-pod-292-english-project-management-implementing-a-plan-1/ http://www.businessenglishsite.com/ http://www.learn-english-today.com/business-english/A-business-english-contents.html https://hsp.berkeley.edu/sites/default/files/HOW%20TO%20WRITE%20AN%20ABSTRACT.pdf http://www.ukm.my/permatapintar/wp-content/uploads/2016/05/Examples-of-abstracts.pdf?fbclid=IwAR2wwFO2RCiBlcPqN-gwbU4UqgSPD19vpMZzBW0LB1sX_IFtn6oQlObTtP8 http://cw.routledge.com/textbooks/bailey/material.asp?fbclid=IwAR1jZKBg2diCAjWs_aYqVs240miXNWiu506yrS_eyJC3jIND25PDnUv_S6E https://www.du.se/contentassets/4ef9711439e54d0a8ac9a9cb5efd79ac/2018-eap-course-handbook.pdf

Land and cadastral laws Module Handbook

Module designation	*Land and cadastral laws*
Module level, if applicable	*3rd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE311*
Subtitle, if applicable	*Law*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Messis Mohamed*
Lecturer	*Messis Mohamed*
Language	*French*
Relation to curriculum	*This module aims at integrating technical and legal knowledge in the execution of surveying work. It can be used during the different projects more specifically the end of study project.*
Type of teaching, contact hours	*2 hours / week* *Lecture: 2h00 per week.* *Classes of 30 students*
Workload	*28 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.96*
Weight Factor/Coefficient	*2*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*
Recommended prerequisites	*This module is directly linked to the Ground and Condominium Subdivision module and the modules for data collection and surveying (Topography and Layout Technology).*

Module objectives/intended learning outcomes	***Knowledge:*** *The aim of this course is to teach the student:* *- The importance of land in the development process;* *- Land policy (like resource policy in general) plays a key role in economic and social development;* *- The role of real estate in understanding all the techniques (forms and methods of appraisal, appraisal and insurance, etc.) and all the legal components (civil and fiscal real estate law, etc.) in order to quickly become an experienced professional;* *- The theory of expertise: judicial, amicable, unilateral; Drafting and defence of expertise involving the integration of knowledge in geodesy, photogrammetry and law;*
	Competences: *At the end of the course, the student can:* *- Can be an expert in several fields such as: Agricultural and land expert, Real estate agent, Real estate expert, Real estate lawyer, Insurance lawyer, Land study officer, Land development manager, Agricultural business officer, Real estate consultant, Credit analyst, Real estate negotiator.* *- Be able to plan and carry out a valuation correctly.* ***Skills:*** *The course consists of a set of chapters devoted to the principles of land rights, providing an understanding of:* *- Real property rights;* *- The law of town and country planning;* *- The domain of the State;* *- Land registration;* *- Common property regime;* *- Expropriation of buildings;* *- Real estate security interests;* *- Execution on immovable property;* *- Real estate contracts;* *- Authorisations in real estate matters;* *- Real estate in private international law;* *- Updating of land titles.*

Content	***Chapter I: General*** *I.1 Presentation of land law* *I.2 Urban and regional planning law* *I.3 State property* ***Chapter II: Real rights in general*** *II.1 Property in general* *II.2 The right of ownership* *II.3. Usufruct, use and habitation* *II.4. Easements* *II.5. Emphyteusis, surface right, enzel and kirdar* ***Chapter III: Registered properties and registration procedure*** *III.1 General provisions* *III.2 Registration procedure* *III.3. Title to property* *III.4. Registration of real property rights* *III.5. Penal provisions* ***Chapter IV: Compulsory land registration*** *IV.1 Cadastre of rural properties* *IV.2 Miscellaneous provisions* ***Chapter V: Updating of land titles*** *V.1 General provisions* *V.2 Competence of attribution* *V.3. Application for updating*

	V.4. Publication of the request for an update *V.5. Update procedure* *V.6. Judgement* *V.7. The appeal* *V.8. Transitional provisions* ***Chapter VI: Application of the effect, constitutive of the registration relating to certain land titles*** ***Chapter VII: Organisation of real estate transactions*** ***Chapter VIII: Certificate of possession*** ***Chapter IX: System of State-owned agricultural property*** *IX.1. General provisions* *IX.2. Exploitation of State-owned agricultural property* *IX.3. Alienation for the purpose of regularising old land situations* *IX.4. Exchange* *IX.5. Common provisions* ***Chapter X: Title deeds*** *X.1. Common property regime* *X.2. Expropriation of immovable property* *X.3. Real estate security interests* *X.4. Execution on real estate* ***Chapter XI: Real estate law in Tunisia*** *XI.1 Land registration, "blue titles" and "Arab titles* *XI.2 Acquisition and co-ownership* *XI.3 Real estate contracts* *XI.4. Real estate authorisations* *XI.5 Real estate in private international law* *XI.6. Updating of land titles*
Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Exam*
Final Grade calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*
Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	*Imprimerie Officielle de la République Tunisienne, 2011. CODE DES DROITS REELS. 204 p.* *https://www.jurisitetunisie.com/tunisie/index/cdet/Droits_conservation.html*

Expert surveyor profession Module Handbook

Module designation	*Expert surveyor profession*
Module level, if applicable	*3rd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE312*
Subtitle, if applicable	*Mission of the surveyor*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Expert surveyor Magtouf REZGUI* *Expert surveyor Mohamed Ali El YAHMADI* *Expert Adnène KASSEBI*
Lecturer	*Expert surveyor Magtouf REZGUI* *Expert surveyor Mohamed Ali El YAHMADI* *Expert Adnène KASSEBI*
Language	*French*
Relation to curriculum	*All the modules of the Geomatics and Topography speciality are fundamental tools for the profession of the surveyor and for understanding the tasks and missions performed by the latter.* *Each subject taught will contribute to the understanding of the different chapters of this module.*
Type of teaching, contact hours	*1.5 hours / week* *Classes of 30 students*
Workload	*21 contact hours* *14 Hours of Self Study*
ECTS Credits/Points	*1.4*
Weight factor/Coefficient	*1*
Requirements according to the examination regulations	*Neither documents nor internet access permitted.* *Authorized calculator.*
Recommended prerequisites	*The knowledge of the modules of the Geomatics and Topography speciality are necessary for the understanding of this module and for the mastery of the tasks and missions of the Chartered Surveyor.*
Module objectives/intended learning outcomes	*Surveyors are the only professionals entitled to Draw up plans and topographical documents that delimit landed property and the rights attached to it.* *With technical, scientific and legal knowledge, they play a leading role in defining property.*

	Working alone or as part of a team, they participate in the construction of cities and the development of territories, while ensuring respect for the environment and the quality of the living environment. *The surveyor intervenes to define the limits of a property, to secure a real estate transaction or to develop an urban or rural area.* *The role of the surveyor is to develop territories in order to guarantee a sustainable living environment. To do this, he carries out studies and topographic work to establish the boundaries of landed property, such as plans for the division, sale and exchange of landed property or for demarcation.* ***Knowledge:*** *- Understand the basic concepts for securing property boundaries and rights.* *- Know the rights attached to land ownership.* *- Understand the administrative procedures for constructions attached to land.* *- Project management of roads and networks and project management assistance.* *- Property management.* *- Establishment and modification of co-ownership documents.* *- Carrying out real estate operations.* *- Urban planning and development.* *- Agricultural and forestry land use planning* *.* ***Skills:*** *- Measurement of land, fields, roads, etc.* *- Boundary marking.* *- Creation of topographic plans.* *- Interpretation of measurements and creation of scale Drawings.* *- Setting up urban planning documents.* *- Creation or modification of documents concerning co-ownerships.* *- Legal and technical knowledge.* ***Competences:*** *− Carrying out surveys of the environment with construction projects in mind* *− Working in diverse sectors, such as construction, property, cartography (maps), offshore engineering and exploration.* *− Assessing land due for redevelopment.* *− Surveying airports, landfill sites, mines, quarries, pipeline systems and more.*

	− *Managing and monitoring projects from start to finish.* − *Producing maps using GPS, surveying instruments, digital images and satellite photographs.* − *Analysing data using geographic information systems (GIS) and Drawing charts using computer-aided design (CAD).* − *Monitoring changes in the land during the construction process.* − *Writing reports and sharing crucial information with colleagues and clients.* − *Working in an office, with regular site visits.* − *Rigour and precision.* − *Dynamism and organisation.* − *Ability to adapt to reality.* − *Good interpersonal skills.*

Content	***Chapter I: The opportunities of the profession*** ***Chapter II: Professional development of the surveyor*** ***Chapter III: Mission of the surveyor*** ***Chapter IV: Carrying out studies and topographic work*** ***Chapter V: Guarantee of the limits and rights attached to the property*** *V.1. Boundaries and land divisions* *V.2. Studies of easements and joint ownership* *V.3. Definition of co-ownership lots in a building* ***Chapter VI: Definition of rights attached to land ownership*** *VI.1. Plans for division, sharing, sale and exchange of land* *VI.2. Plans for demarcation or demarcation of land ownership* ***Chapter VII: Buildings attached to land*** ***Chapter VIII: Administrative procedures*** *VII.1. Requesting a planning certificate for a construction* *VII.2. Constitution of a planning permission application file* ***Chapter IX: Project management of roads and networks and assistance to the project owner*** *IX.1. Design and execution of road and network works* *IX.2 Layout and control of works (bridges, buildings, etc.)* ***Chapter X: Management of real estate assets*** *X.1. Property valuation* *X.2. Rental management* *X.3. Planning, design, development and upgrading of neighbourhoods* ***Chapter XI: Drawing up and amending co-ownership documents*** *XI.1. Regulations* *XI.2. Descriptive state of division* *XI.3. Plan* ***Chapter XII: Development and urban planning*** *XII.1. Real estate operations* *XII.2. Urban planning and development* *XII.3. Land management* *XII.4. Urban planning authorisations* *XII.5. Agricultural and forestry land development* ***Chapter XIII: Practice of the profession of surveyor and delegation of public service***
Study and examination requirements and forms of examination	*Continuous Evaluation* *Midterm Exam* *Final Exam*
Final Grade calculation	*Continuous Evaluation and Midterm Exam 40%* *Final Exam 60%*

Media employed	*Data show* *Booklets for theoretical sessions, Booklets for practical sessions* *Computers* *Internet*
Reading list	– *https://www.goconstruct.org/construction-careers/what-jobs-are-right-for-me/land-surveyor/* – *https://www.geometre-expert.fr/* – *https://www.village-justice.com/articles/fiche-pratique-metier-geometre-expert,36380.html* – *https://www.enseignementsup-recherche.gouv.fr/fr/diplome-de-geometre-expert-foncier-delivre-par-le-gouvernement-dplg-46324* – *https://www.concepteursdavenirs.fr/fiche-metier/geometre-expert-technicien-geometre-geometre-topographe* – *https://bpifrance-creation.fr/activites-reglementees/geometre-expert* – *https://www.cabinetrobin.fr/presentation/qu-est-ce-qu-un-geometre-expert.php*

Synthesis project Module Handbook

Module designation	*Synthesis project*
Module level, if applicable	*3rd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE313*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Mohamed Khaled BOUZID / Adnène KASSEBI*
Lecturer	*Dr. Mohamed Khaled BOUZID* *Dr. Asma BEN AHMED* *Dr. Ines BOUZIDI* *Adnène KASSEBI (Expert)* *Mohamed Ali YAHMADI (Expert)* *Rezgui MAGTOUF (Expert)*
Language	*English / French*
Relation to curriculum	*Students will be able to arrange and present those findings and conclusions to inform a broad academic audience. Students will be then able to develop the research project, reviews the literature on the topic, and collects data and analyses the data. The depth of knowledge in that discipline is enhanced and academic skills in writing and research are refined.* *This module is a continuation of the End of Year Project module, and is a preparation for the final year project module.*
Type of teaching, contact hours	*Supervision, coding and simulations* *3 contact hours per week*
Workload	*42 Hours of Self Study*
ECTS Credits/Points	*1.68*
Requirements according to the examination regulations	*During the course, students will demonstrate their progress by the following activities:* *1. producing a literature review and securing the agreement of a project supervisor* *2. meeting with their supervisor regularly to discuss progress* *3. recording notes on their work: reading, original empirical work, Draft chapters, questionnaire responses, or other material* *4. presenting a work-in-progress talk* *5. submitting a manuscript by the specified deadline.*

Recommended prerequisites	*To know the basic knowledge of Geomatics and Topography subjects.* *Have a good knowledge of report writing in both French and English.*
Module objectives/intended learning outcomes	*This project provides an opportunity to pursue an independent project under the guidance of a supervisor. The main aims are:* *- The proposed projects are within the main geomatics and topography fields of interest: mathematical modelling, Cartography, Photogrammetry, Remote sensing, Topography, WEB Mapping and Spatial Database* ***Knowledge:*** *- Learn how do review the state of the art* *- Understand the essential parts of a project report* *- Know how to use reference works* ***Skills:*** *- Able to do a comparative study* *- Acquire an editorial skill* *- Find and use documentation* *- Develop teamwork skills* *- Able to write a full and detailed report* ***Competences:*** *- Develop their ability to propose solutions to solve complex problems and practical issues* *- Develop their analytical skills and how to interpret results* *- They are able to work independently* *- They are able to evaluate his training or self-training needs* *- Master the written and oral technical communication*
Content	*Project overview and project methodology* *Introduction to the research process and determination of the main axes of the study;* *Investigating the general approaches to research and designs* *Identifying appropriate research problems; writing the problem statement and hypotheses; stating the purpose of a study;* *Collecting data and analysing them to Draw conclusions;* *solution implementation;* *Assessing the validity and reliability of results.*
Study and examination requirements and forms of examination	*Project Dissertation* *Seminar*
Final Grade calculation	*Project Dissertation 50%* *Seminar 50%*
Media employed	*Laptops/ project board*
Reading list	

A2.7 Semester 6 Modules' handbook

End of Studies/Graduation Research Project

Module designation	*Graduation Research Project*
Module level, if applicable	*3rd year Geomatics and Topography engineering cycle*
Code, if applicable	*GTE314*
Subtitle, if applicable	*End of studies/ Graduation Research Project*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr. Mohamed Khaled BOUZID / Adnène KASSEBI*
Lecturer	*Dr. Mohamed Khaled BOUZID* *Dr. Asma BEN AHMED* *Dr. Ines BOUZIDI* *Adnène KASSEBI (Expert)* *Mohamed Ali YAHMADI (Expert)* *Rezgui MAGTOUF (Expert)*
Language	*English / French*
Relation to curriculum	*Students will be able to study and develop a research/industrial project, review the literature on the topic, collect and analyse the data. Students will be then able to arrange and present their findings and conclusions in front of an academic and industrial jury.* *This module is a continuation of the End of Year Project, and synthesis project modules.* *It is a project to evaluate the mastery of all subjects, techniques and tools seen during the years of study in the engineering cycle in Geomatics and Topography.*
Type of teaching, contact hours	*Supervision, coding and simulations* *3 contact hours per week* - *Project management, project definition in collaboration with industrial/academic supervisor(s), regular supervision, coding, simulation, implementation and validation.*
Workload	*57 Hours of Self Studies*
ECTS Credits Points	*32*
Weight Factor/Coefficent	*5*

Requirements according to the examination regulations	*Acquisition of the agreement of the academic and the industrial supervisors to submit the manuscript within the deadline.* *During the stage, students will demonstrate their progress by the following activities:* *1. producing a literature review and securing the agreement of a project supervisor* *2. meeting with their supervisor regularly to discuss progress* *3. recording notes on their work: reading, original empirical work, Draft chapters, questionnaire responses, or other material* *4. presenting a work-in-progress talk* *5. submitting a manuscript by the specified deadline.*
Recommended prerequisites	*The student must master the different modules related to geomatics and topography engineering.*
Module objectives/intended learning outcomes	The targets of the graduation Project are diverse. On the one hand, since it is the student's last activity at the university, it fulfills a purpose of synthesis of all the knowledge they have acquired throughout the different years. Besides, this knowledge must be used in a particular way, in order to solve a specific problem. Thus, students are able to demonstrate their aptitudes by applying this knowledge. On the other hand, it helps the student to mature as an engineer, giving him/her the chance of finding the solution to a similar problem as he/she might do in his/her future profession. Therefore, it also constitutes a preparation for starting work. Summing up, the final year project targets are the following: • Synthesis of knowledge. •To demonstrate the aptitude of applying the own knowledge to solve a specific problem. • To mature the knowledge. • Preparation for joining the working world. The last aim imposes some determining factors that must be taken into account. First of all, engineers must assume both material and human responsibilities. In the same way, and due to the complexity of nowadays' challenges, it is necessary both to work in multidisciplinary groups and to be able to adapt to the different scientific and technological advances. For this reason, engineers must be capable of learning and looking for information in order to solve the new problems they face in a practical, efficient and fast way. Summarizing, the current working world demands that the engineer is able to: • Assume responsibilities. • Work in a multidisciplinary group. • Adjust to the different scientific and technological advances: 1 Auto learning capacity. 2 Search of information. 3 Pragmatism.

Content	*Project Overview and Project methodology for learning;* *Introduction to the Research/Industrial Process and determining a plausible study;* *General Approaches to Research and the Designs* *Identifying Appropriate Research Problems; writing the problem statement and Hypotheses; stating the purpose of a study;* *Collecting original data and analyzing the data to Draw conclusions;* *Solution implementation and validation;* *Decisions on Design, validity and reliability of results.*
Study and examination requirements and forms of examination	*The evaluation will focus on the quality of the work (study and implementation). It will also be based on a written report and an oral presentation, so as to assess the candidate's ability to identify and highlight the main points of the study. Proficiency in the French or English language and communication skills will be an integral part of the evaluation. The note will consider the following, depending on the projects:* • *the feedback of industrial supervisors on the personal and professional attitude of the student during the final year project period,* • *the progress and the results obtained,* • *the written report,* • *the oral presentation,* • *responsiveness to questions*
Final Grade calculation	*Project Dissertation 50%* *Seminar 50%*
Media employed	*Material and Equipments of Hosting Universities and Industries*
Reading list	