Geomatics and Topography Engineering Degree Program

Learning Outcomes

A Geomatics and Topography Engineer is the centerpiece in any urban or rural construction or development project, whether it is a simple delimitation of land or a road, bridge, commercial area, etc. She/he records and collects all the metric data of a geographical space using adequate material and equipments, taking into consideration not only distances, altitude and depths but also trees, electrical poles, walls, etc. Satellites tracking via GPS and photogrammetry have become essential tools for the surveyor expert to carry out her/his surveys. A Geomatics and Topography Engineer must be able to determine land limits to be respected, as well as legal and fiscal constraints by establishing plans and maps that can describe all the details with great precisions. She/he can also resolve disputes between owners, appraise real estate or even assess the value of agricultural land or properties. Above all, she/he must be versatile. She/he must have several skills and qualities allowing her/him to carry out different missions with great efficiency.

ESAT University has positioned itself to be a regional player when it comes to educate a highly skilled engineer in the area of Geomatic Sciences and Topography engineering. Indeed, Nowadays, being the first and unique university preparing Geomatics and Topography engineers in Tunisia stands as a national and an international challenge. The idea of creating and implementing a department of geomatics and topography engineering was due to the lack of engineers in this field in Tunisia. Based on the facts that geomatics and topography engineers have been extremely solicited worldwide and that the future need for their expertise to manage different complex projects in public and private sectors is rising, ESAT University has decided to start this new adventure in 2013. Furthermore, only the bachelor degree in Geomatics is delivered by some public higher education institutions in Tunisia.

ESAT University was established in 2003 in order to educate engineers in different areas. First promotion of engineers in Geomatics and Topography graduated from ESAT University in 2016. The Geomatics and Topography engineering program was and is still designed and compiled in accordance with the French curriculum (a total of five years). First, the student must enroll in a two year higher education program known as ***Preparatory Cycle***. The preparatory cycle program is mainly based on Mathematics and Physics. Once graduating from the preparatory school, students can register in one of the available engineering programs. The orientation at the end of the preparatory cycle is processed during the second year depending on the student choice and the orientation committee results (normally final results are available at the first week of July each academic year). Geomatics and Topography engineering registered students must take several courses related to this field of expertise. These courses are spread over three years known as the ***Engineering Cycle***.

In order to reach the learning outcomes, the curriculum is implemented with a variation of learning and teaching methods (e.g. classroom lectures, Lab workshops, field schools, professional internships, annual research projects, etc) as well as assessment methods to measure the outcomes (e.g. oral and written quizzes, exams, presentation and practice exams). Complete descriptions about learning, teaching and assessment strategies are explained later in this document. Graduates are considered to be skilled practitioners in the development and use of various spatial techniques based on modern technology to better understand, plan, organize, monitor and manage the earth we live in. The establishment of various maps and the gathering of various spatial data/information has become an urgent matter in Tunisia and worldwide. These fields drive the exploration of innovative solutions for engineering education in the field of Geomatics and Topography sciences in Tunisia, the Middle East and North Africa (MENA) region as well as all Africa.

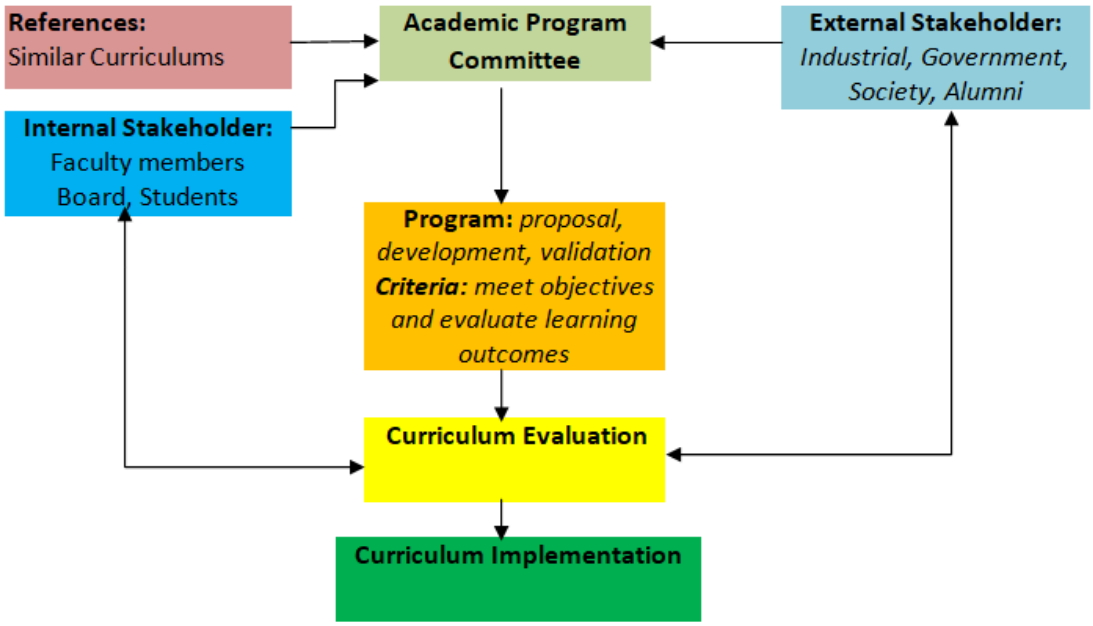

Figure 1. Program Concept, content and Implementation

At first, the curriculum is designed such that graduates with the National Engineering Diploma in Geomatics and Topography can work in several areas. This choice opens up as much as possible carrier prospects for our graduates and increases their chances of getting hired. ESAT University has been working closely with professional and also academic partners in order to evaluate the program on a yearly basis. Depending on their feedbacks, some minor adjustments mainly in workshops or professional modules content are done.

Graduates acquire the necessary knowledge and skills that can even help them work in Tunisia Office of Topography, Tunisia cadastre, and several ministries such as equipment, agriculture, etc. Furthermore, they can work in several expert surveyors' firms in Tunisia and abroad especially in France. Outstanding graduates can pursue advanced postgraduate studies abroad (Germany, Canada, France, Spain, etc.).

Program Objectives:

The Degree Program in Geomatics and Topography engineering provides students with the necessary theoretical and practical knowledge, skills and capabilities required by the geomatics and topography industry and academic research institutions. A person who graduates from the Engineering Degree Program is capable of continuing his/her studies in the field of geomatics and topography. The Degree Program combines up-to-date research knowledge and the fundamentals of geomatics and topography sciences. This up-to-date knowledge is delivered to students with modern and efficient teaching techniques.

The Degree Program in Geomatics and Topography Engineering prepares students for the needs of industries, research institutions, businesses, and public administrations within the field of Geomatics and Topography Technologies. The Engineering Degree Program covers all the major topics related to geomatics and topography sciences. Post-graduate studies are possible in each of the major topics. The main goal of the Degree Program is to educate experts who can efficiently work in teams and to provide them with a solid ground for the independent continuation of learning in the ever changing field of geomatics and topography sciences.

Overall, the Degree program targets the following objectives:

1. Preparing graduates to be able to develop their professional skills to occupy the highest positions dealing with the latest technologies in the field of geomatics and surveying sciences.
2. Preparing graduates' abilities to adapt, adjust, grow independently as well as compete globally.
3. Preparing graduates to be able to develop the chosen field of expertise, including the possibility of pursuing postgraduate studies.

Learning Outcomes:

The graduates from the Engineer degree program in Geomatics and Topography sciences have a solid foundation and expertise in the different specialties of the major. The graduates are able to work in different ways as members of a group both in domestic and international environments. The degree program learning outcomes are the following:

The graduates with the National Engineering Diploma in Geomatics and Topography:

- conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- are able to exploit scientific approaches and methods
- master thoroughly the specialties of the selected major
- Select, and apply modern design, simulation engineering and IT tools to complex engineering activities with an understanding of the limitations.
- are able to act as experts and developers in their fields of specialty during the working life

- possess good communications skills and proficiency in at least two foreign language
- possess good skills in presenting, in knowledge and capabilities in cultural and multinational aspects, team work, project work, and in leadership and management
- are ready for post-graduate studies and life-long learning
- are able to participate as Geomatics and topography experts and leaders in projects related to their field of expertise
- are able to apply what they learned in the university in real life projects
- have the necessary communication tools to participate in a in a multi-cultural project group environment.

Courses are mainly taught in French and English languages and as such, the graduates can communicate fluently using French and English languages.

Learning outcomes of the modules

Modules and Courses taught throughout the Preparatory Cycle help students acquire fundamental understanding of Mathematics and Physics. Appropriate Geomatic sciences and engineering related basic knowledge such as Geographic Information System, Meteorology, computer sciences, etc. are also acquired. Modules and Courses taught throughout the Engineering Cycle aim to help students acquire fundamental and advanced understanding of Geomatics and Topography engineering principles and practices through mathematical, methodological, numerical and experimental courses and workshops in addition to field schools. Graduates holding the National Engineering Diploma in Geomatics and Topography must have the necessary skills and competences to plan, develop and design Geomatics and surveying projects. They must be able to assess the quality of spatial data modeling, geo-processing and final products.

The content, learning outcomes and workloads of individual modules are presented in the ***module handbooks***. In addition to the learning outcomes, the module handbooks provide students with information related to the period of study, responsible teacher(s), course content, modes of study, evaluation, study materials, prerequisites for the course, etc. All the necessary information, in addition to the learning outcomes, is explained to students during the first lecture/meeting of each module. Furthermore, all the necessary information are described in a consistent manner across all official documents, websites and marketing material

The courses arranged by ESAT University for the Engineering degree in Geomatics and Topography emphasize on the following ASIIN categories:

- Formal, Algorithmic and Mathematical skills in 43.5% of courses
- Analyzing, Designing and Realizing skills in 44.5% of courses
- Technological skills in 77% of courses

- Cross subject skills in 26.5% of courses
- Methodological skills in 91.5% of courses
- Project management skills in 52% of courses
- Social and Individual skills in 47% of courses

The tables below describe the skills aimed by each course throughout the five years of study.

Table 1. Modules vs Skills targeted in the 1st year of the preparatory cycle

Level of Study	Module	Skills						
		Formal, Algorithmic and Mathematical skills	Analyzing, Designing and Realizing skills	Technological skills	Cross subject skills	Methodological skills	Project management skills	Social and Individual skills
Preparatory Cycle 1st year	Calculus	■				■		
	Algebra	■				■		
	General Physics			■		■		
	Materials			■		■		
	Mechanics		■	■		■		
	Electrical Circuits			■		■		
	Air Navigation			■		■		
	Chemistry			■		■		
	Computer Science	■	■	■		■		
	English					■	■	■
	Big Data and IoT	■		■		■		
	Meteorology			■		■		
	French					■	■	■

Table 2. Modules vs Skills targeted in the 2nd year of the preparatory cycle

Level of Study	Module	Skills						
		Formal, Algorithmic and Mathematical skills	Analyzing, Designing and Realizing skills	Technological skills	Cross subject skills	Methodological skills	Project management skills	Social and Individual skills
Preparatory Cycle 2nd year	Calculus	■				■		
	Algebra	■				■		
	General Physics			■		■		
	Engines' Technologies		■	■	■	■		
	Introduction to GIS	■	■	■		■		
	Mechanics		■	■				

	Digital Electronics							
	Digital Electronics Labwork							
	Chemistry							
	Computer Science							
	Computer Science Labwork							
	English							
	Meteorology							
	French							

Table 3. Modules vs Skills targeted in the 1st year of the engineering cycle

Level of Study	Module	Skills						
		Formal, Algorithmic and Mathematical skills	Analyzing, Designing and Realizing skills	Technological skills	Cross subject skills	Methodological skills	Project management skills	Social and Individual skills
Engineering Cycle 1st year	Applied Mathematics							
	Applied mathematics Labwork							
	General Topography							
	Cartography							
	Geographic Information Systems GIS							
	Technical English 1							
	Geodesy							
	Object Oriented Programming							
	Photogrammetry 1							
	Errors' Theory and Instrumentation							
	Data Base Management Systems DBMS							
	Economy and Management							
	Computer Aided Design CAD							
	Applied Topography							
	Spatial Data Base Management Systems SDBMS							
	Remote Sensing							
	Probability and Statistics							

	Field School							

Table 4. Modules vs Skills targeted in the 2nd year of the engineering cycle

Level of Study	Module	Skills						
		Formal, Algorithmic and Mathematical skills	Analyzing, Designing and Realizing skills	Technological skills	Cross subject skills	Methodological skills	Project management skills	Social and Individual skills
Engineering Cycle 2nd year	Spatial Data Base Management Systems 2							
	UML Modeling							
	Python							
	Urban Hydraulic Systems							
	Geostatistics							
	Topography Project							
	Photogrammetry 2							
	Thematic Cartography							
	WEB Development							
	Remote Sensing 2							
	Technical English 2							
	Geostatistics Project							
	Urban and Rural Space Layout							
	Mobile Geographic Information Systems							
	Field School 2							
	Micro Geodesy							
	Radar Remote Sensing							
	Advanced Topography							
	WEB Mapping							
	Bathymetry							
	Land and Cadastral Information Systems (LIS/CIS)							
	Computer Programming for GIS Applications							

	Personal Development							
	Communication Skills							
	Spatial Analysis							
	End of year Project							

Table 5. Modules vs Skills targeted in the 3rd year of the engineering cycle

Level of Study	Module	Skills						
		Formal, Algorithmic and Mathematical skills	Analyzing, Designing and Realizing skills	Technological skills	Cross subject skills	Methodological skills	Project management skills	Social and Individual skills
Engineering Cycle 3rd year	Lasergrammetry							
	Building Information Modeling (BIM)							
	Ground and Condominium Subdivision							
	Artificial Intelligence in GIS							
	Implantation Techniques							
	Entrepreneurship and Business Creation							
	Agile Software Development Method							
	GIS Quality Control							
	Quality Control in Topographic Projects							
	Synthesis Project							
	English/TOIIEC Preparation							
	Land and Cadastral Laws							
	Expert Surveyor/Geometer Profession							
	End of studies Dissertation / Graduation Research Project							

Skills targeted in percent of courses = Number of courses targeting the same set of skills / Total number of courses

According to ASIIN Agency "Learning outcomes" are definitions of what learners know, understand and are able to do after completing a learning process. They are defined as knowledge, skills and competences.

- "Knowledge" is the result of the processing of information by learning/studying (theory and/or factual knowledge).
- "Skills" are the ability to apply knowledge in order to carry out given tasks and solve problems (cognitive skills such as logical, intuitional and creative thinking as well as practical skills such as skillfulness and the use of methods, materials, tools and instruments).

- “Competence” is the ability to use knowledge, skills and personal, social and/or systematic abilities in a working or learning environment as well as for one's own professional and/or personal development.

Based on ASIIN Subject-Specific Criteria (SSC), Table 6 describes the correlation between these criteria and the study program learning outcomes mentioned above. Tables 7, 8 and 9 describe, respectively, the correlation between the knowledge, skills and competences and study program main topics and related disciplines.

Table 6. Intended Objectives and Learning Outcomes vs Geomatics and Topography Engineering Degree Program's Modules

ASIIN SSC	Intended Learning Outcomes (LO) of the Degree Program										Corresponding Modules
Knowledge and Understanding											
Graduates have in particular	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Fundamental knowledge of natural sciences, mathematics, and fundamentals of engineering sciences and their consolidation especially in Geomatics and Topography engineering as well as deepened practice-oriented knowledge in related subjects;	**X**	**X**	**X**	**X**							Preparatory Cycle
											Calculus, Algebra, General Physics, Materials, Mechanics, Electrical Circuits, Chemistry, Computer Science, English, Big Data and IoT, French, Digital Electronics, Introduction to GIS.
											Engineering Cycle
											Applied Mathematics, Probability and Statistics, General Topography, Cartography, Geographic Information System (GIS), Technical English, Geodesy, Photogrammetry 1, Error's Theory and Insturmentation, Data Base Management Systems (DBMS), Computer Aided Design (CAD), Remote Sensing
											UML Modeling, Python, Urban Hydraulic Systems, Geostatics, WEB Development, Technical English 2, Urban and Rural Space Layout, Bathymetry, Land and Cadastral Information Systems, Spatial Analysis.
											Ground and Condominium Subdivision, Implantation Techniques, Land and Cadastral Laws
Critical awareness of the newer findings in their discipline.			**X**	**X**	**X**	**X**	**X**				Preparatory Cycle
											Computer Science, Big Data and IoT, Introduction to GIS.
											Engineering Cycle
											Geographic, Geodesy, Photogrammetry 1, Information System (GIS), Computer Aided Design (CAD), Remote Sensing, Spatial Data Base Management Systems (SDBMS).
											Spatial Data Base Management Systems 2 (SDBMS 2), Urban Hydraulic Systems, Photogrammetry 2, Thematic Cartography, Remote Sensing 2, Urban and Rural Space Layout, Mobile Geographic Information Systems, Micro Geodesy, Radar Remote Sensing, Advanced Topography, WEB Mapping,

											Computer Programming for GIS Applications
											Lasegrammetry, Building Information Modeling (BIM), Artificial Intelligence in GIS, Agile Software Development Method, GIS Quality Control, Quality Control in Topographic Projects, Expert Surveyor/Geometer Expert.
Engineering Analysis											
Graduates are particularly qualified to	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Analyse and solve problems scientifically, which are incompletely defined and show competing specifications;	**X**	**X**	**X**	**X**		**X**	**X**				Preparatory Cycle
											Computer Science, Big Data and IoT, Introduction to GIS, Air Navigation, Meteorology.
											Engineering Cycle
											Applied Mathematics, Probability and Statistics, Error's Theory and Instrumentation, General Topography, Cartography, Geographic Information System (GIS), Geodesy, Photogrammetry 1, Error's Theory and Insturmentation, Data Base Management Systems (DBMS), Computer Aided Design (CAD), Remote Sensing, Object Oriented Programming, Geostatics
											Spatial Data Base Management Systems 2, Topography Project, Thematic Cartography, Remote Sensing 2, Geostatics Projects, Mobile Geographic Information Systems, Field School 2, Micro Geodesy, Radar Remote Sensing, Advanced Topography, WEB Mapping, Computer Programming for GIS Applications, Spatial Analysis, Photogrammetry 2, End of Year Project
											Lasergrammetry, Building Information Modeling, Artificial Intelligence in GIS, Agile Software Development Method, GIS Quality Control, GIS Quality Control, Quality Control in Topographic Projects, Synthesis Project, End of Studies Project/Graduation Research Project.
Formulate practice-oriented problems arising from a new or emerging field of their specialised subject;			**X**		**X**	**X**	**X**				Preparatory Cycle
											Computer Science, Big Data and IoT.
											Engineering Cycle
											Applied Topography, Object Oriented Programming, Field School, Spatial Data Base Management Systems.
											Spatial Data Base Management Systems 2, Topography Project, Thematic Cartography, Remote Sensing 2, Geostatics Projects, Mobile Geographic Information

											Systems, Field School 2, Micro Geodesy, Radar Remote Sensing, Advanced Topography, WEB Mapping, Computer Programming for GIS Applications, Spatial Analysis, End of Year Project.
											Lasergrammetry, Building Information Modeling, Artificial Intelligence in GIS, Agile Software Development Method, GIS Quality Control, GIS Quality Control, Quality Control in Topographic Projects, Synthesis Project, End of Studies Project/Graduation Research Project.
Use innovative methods for practice-oriented problem-solving (EUR-ACE).				**X**		**X**	**X**				Preparatory Cycle
											Computer Science, Big Data and IoT.
											Engineering Cycle
											Applied Topography, Object Oriented Programming, Field School, Spatial Data Base Management Systems
											Spatial Data Base Management Systems 2, Topography Project, Photogrammetry 2, Remote Sensing 2, Geostatics Projects, Mobile Geographic Information Systems, Field School 2, Micro Geodesy, Radar Remote Sensing, Advanced Topography, WEB Mapping, Computer Programming for GIS Applications, Spatial Analysis, End of Year Project.
											Lasergrammetry, Building Information Modeling, Artificial Intelligence in GIS, Agile Software Development Method, GIS Quality Control, GIS Quality Control, Quality Control in Topographic Projects, Synthesis Project, End of Studies Project/Graduation Research Project.
Engineering Design											
Graduates are particularly qualified to	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Develop solutions for practice-oriented and partially unusual problems also under consideration of other disciplines;			**X**	**X**	**X**	**X**	**X**				Preparatory Cycle
											Computer Science, Big Data and IoT, Introduction to GIS.
											Engineering Cycle
											General Topography, Cartography, Geographic Information System (GIS), Geodesy, Photogrammetry 1, Error's Theory and Insturmentation, Data Base Management Systems (DBMS), Computer Aided Design (CAD), Remote Sensing, Object Oriented Programming, Geostatics
											Spatial Data Base Management Systems 2, Topography Project, Thematic Cartography, Remote Sensing 2, Geostatics Projects, Mobile Geographic Information Systems, Field School 2, Micro

											Geodesy, Radar Remote Sensing, Advanced Topography, WEB Mapping, Computer Programming for GIS Applications, Spatial Analysis, Photogrammetry 2, End of Year Project
											Lasergrammetry, Building Information Modeling, Artificial Intelligence in GIS, Agile Software Development Method, GIS Quality Control, GIS Quality Control, Quality Control in Topographic Projects, Synthesis Project, End of Studies Project/Graduation Research Project.
Use their creativity to develop new and inventive practical solutions;				**X**	**X**	**X**	**X**				Preparatory Cycle
											Computer Science, Big Data and IoT.
											Engineering Cycle
											Applied Topography, Object Oriented Programming, Field School, Spatial Data Base Management Systems.
											Spatial Data Base Management Systems 2, Topography Project, Thematic Cartography, Remote Sensing 2, Geostatics Projects, Mobile Geographic Information Systems, Field School 2, Micro Geodesy, Radar Remote Sensing, Advanced Topography, WEB Mapping, Computer Programming for GIS Applications, Spatial Analysis, End of Year Project.
											Lasergrammetry, Building Information Modeling, Artificial Intelligence in GIS, Agile Software Development Method, GIS Quality Control, GIS Quality Control, Quality Control in Topographic Projects, Synthesis Project, End of Studies Project/Graduation Research Project.
Apply their scientific ability to judge in order to work with complex, technologically impure or incomplete information.				**X**	**X**	**X**					Preparatory Cycle
											Computer Science, Big Data and IoT.
											Engineering Cycle
											Applied Topography, Object Oriented Programming, Field School, Spatial Data Base Management Systems.
											Spatial Data Base Management Systems 2, Topography Project, Thematic Cartography, Remote Sensing 2, Geostatics Projects, Mobile Geographic Information Systems, Field School 2, Micro Geodesy, Radar Remote Sensing, Advanced Topography, WEB Mapping, Computer Programming for GIS Applications, Spatial Analysis, End of Year Project.
											Lasergrammetry, Building

											Information Modeling, Artificial Intelligence in GIS, Agile Software Development Method, GIS Quality Control, GIS Quality Control, Quality Control in Topographic Projects, Synthesis Project, End of Studies Project/Graduation Research Project.
Investigations and Assessment											
Graduates are in particular qualified to	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Identify, find and procure necessary information;					**X**	**X**				**X**	Preparatory Cycle
											Engineering Cycle
											Applied Mathematics, Object Oriented Programming, Computer Aided Design CAD, Applied Topography, Field School.
											Spatial Data Base Management 2, Topography Project, Photogrammetry 2, Thematic Cartography, Remote Sensing 2, Geostatistics Project, Field School 2, Advanced Topography, WEB Mapping, Computer Programming for GIS Applications, End of Year Project.
											Artificial Intelligence in GIS, Agile Software Development Method, Synthesis Project, Expert Surveyor/Geometer profession, End of Studies/Graduation Research Project.
Plan and carry out analytic, model and experimental investigations;				**X**		**X**	**X**				Preparatory Cycle
											Engineering Cycle
											Applied Mathematics, Object Oriented Programming, Computer Aided Design CAD, Applied Topography, Field School.
											Spatial Data Base Management 2, Topography Project, Photogrammetry 2, Thematic Cartography, Remote Sensing 2, Geostatistics Project, Field School 2, Advanced Topography, WEB Mapping, Computer Programming for GIS Applications, End of Year Project.
											Artificial Intelligence in GIS, Agile Software Development Method, Synthesis Project, Expert Surveyor/Geometer profession, End of Studies/Graduation Research Project.
Critically assess data and draw conclusions;					**X**	**X**	**X**				Preparatory Cycle
											Engineering Cycle
											Applied Mathematics, Object Oriented Programming, Computer Aided Design CAD, Applied Topography, Field School.
											Spatial Data Base Management 2,

											Topography Project, Photogrammetry 2, Thematic Cartography, Remote Sensing 2, Geostatistics Project, Field School 2, Advanced Topography, WEB Mapping, Computer Programming for GIS Applications, End of Year Project.
											Artificial Intelligence in GIS, Agile Software Development Method, Synthesis Project, Expert Surveyor/Geometer profession, End of Studies/Graduation Research Project.
Investigate and assess the application of new and emerging technologies in their discipline.					**X**	**X**	**X**			**X**	Preparatory Cycle
											Engineering Cycle
											Applied Mathematics, Object Oriented Programming, Computer Aided Design CAD, Applied Topography, Field School.
											Spatial Data Base Management 2, Topography Project, Photogrammetry 2, Thematic Cartography, Remote Sensing 2, Geostatistics Project, Field School 2, Advanced Topography, WEB Mapping, Computer Programming for GIS Applications, End of Year Project.
											Artificial Intelligence in GIS, Agile Software Development Method, Synthesis Project, Expert Surveyor/Geometer profession, End of Studies/Graduation Research Project.
Engineering Practice											
Graduates are in particular able to	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Combine knowledge in different fields for fast realisation and to handle complexity;	**X**	**X**	**X**	**X**		**X**	**X**			**X**	Preparatory Cycle
											Computer Science, Big Data and IoT.
											Engineering Cycle
											Applied Mathematics, Object Oriented Programming, Field School.
											Field School 2, End of Year Project.
											Agile Software Development Method, Expert Surveyor/Geometer Profession, Synthesis Project, End of Studies/Graduation Research Project
Familiarise themselves in a fast and targeted way with the new and unknown;								**X**	**X**	**X**	Preparatory Cycle
											Engineering Cycle
											Field School.
											Field School 2, End of Year Project.
											Synthesis Project, End of Studies/Graduation Research Project
Assess applicable techniques on the basis of their imminent knowledge and to assess their limits;						**X**	**X**				Preparatory Cycle
											Applied Mathematics, Computer Science, Big Data and IoT.
											Engineering Cycle
											Object Oriented Programming,

											Computer Aided Design (CAD), Applied Topography, Field School.
											Topography Project, Geostatistics Project, Field School 2, Radar Remote Sensing, Advance Topography, WEB Mapping, Computer programming for GIS Applications, End of Year Project.
											Agile Software development Method, Synthesis Project, End of Studies/Graduation Research Project
Recognise non-technical effects of engineering activities systematically and to integrate them into their actions in a responsible manner.							**X**	**X**	**X**		Preparatory Cycle
											Engineering Cycle
											Field School.
											Field School 2, End of Year Project.
											Expert Surveyor/Geometer Profession, Synthesis Project, End of Studies/Graduation Research Project
Transferable Skills											
Graduates are able to	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Fulfill all the Transferable Skill requirements of a First Cycle graduate at the more demanding level of Second Cycle;	**X**	**X**	**X**				**X**			**X**	Preparatory Cycle
											English, French
											Engineering Cycle
											Technical English 1, Field School.
											Technical English 2, Personal Development, Communication Skills, Field School 2, End of Year Project.
											Entrepreneurship and Business Creation, Expert Surveyor/Geometer Profession, Synthesis Project, English/TOIIEC Preparation, End of Studies/Graduation Research Project.
Function effectively as leader of a team that may be composed of different disciplines and levels;							**X**	**X**	**X**	**X**	Preparatory Cycle
											English, French
											Engineering Cycle
											Technical English 1, Economy and Management, Applied Topography, Field School.
											Technical English 2, Personal Development, Communication Skills, Topography Project, Geostatistics Project, Field School 2, End of Year Project.
											Entrepreneurship and Business Creation, Expert Surveyor/Geometer, GIS Quality Contro, Quality Control in Topographic Projects, Synthesis Project, English/TOIIEC Preparation, Land and Cadastral Laws, End of Studies/Graduation Research Project.
Work and communicate effectively in national and international contexts.							**X**	**X**	**X**	**X**	Preparatory Cycle
											English, French
											Engineering Cycle
											Technical English 1, Economy and Management, Field School.
											Technical English 2, Personal Development, Communication

												Skills, Field School 2, End of Year Project.
												Entrepreneurship and Business Creation, Expert Surveyor/Geometer, GIS Quality Control, Quality Control in Topographic Projects, Synthesis Project, English/TOIIEC Preparation, Land and Cadastral Laws, End of Studies Project/Graduation Research Project.

Intended Learning Outcomes

LO1	Learning Outcome 1	Have fundamental understanding of Mathematics and Physics.
LO2	Learning Outcome 2	Have appropriate Geomatic sciences and engineering related basic knowledge such as (GIS, Meteorology, computer programming, etc...)
LO3	Learning Outcome 3	Have fundamental and advanced understanding of Geomatics and Topography engineering principles and practices through mathematical, methodological, numerical and experimental courses and workshops in addition to field schools
LO4	Learning Outcome 4	Have necessary skills and competences to plan, develop and design geomatics and surveying projects
LO5	Learning Outcome 5	Be able to assess the quality of spatial data modelling, geo-processing and final products
LO6	Learning Outcome 6	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
LO7	Learning Outcome 7	Select, and apply modern design & Simulation engineering and IT tools to complex engineering activities with an understanding of the limitations.
LO8	Learning Outcome 8	Have necessary oral and written communication skills mainly in French, English, and encouraging them to be certified at the international level.
LO9	Learning Outcome 9	Be prepared for socialization, business work and scientific environments in a dynamic and global environment by building partnerships between the institution and the industry.
LO10	Learning Outcome 10	have awareness of the importance of life-long learning

Table 7. Knowledge, Skills and Competences vs Modules' Topics and related disciplines (Preparatory Cycle)

Modules' Topics and related Disciplines	Knowledge												Skills			Competences		
	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	S1	S2	S3	C1	C2	C3
Mathematics	H	H	M	M	M	M	L	M	L	L	L	L	H	L	H	H	H	M
Physics	H	H	H	H	H	H	H	L	L	M	M	M	H	L	H	H	M	M
Chemistry	H	H	H	H	M	M	L	L	L	L	L	L	H	L	H	H	M	H
Mechanics	H	H	H	H	H	H	M	L	L	L	L	L	H	L	H	H	M	H
Electronics	H	H	H	M	M	M	H	H	L	M	L	L	H	L	H	H	H	H
Computer Science	M	M	M	L	L	L	H	H	L	L	L	M	H	L	H	H	H	H
Social Sciences	L	L	M	L	L	L	L	L	H	L	L	L	H	H	M	H	L	L
Introduction to Engineering cycle	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H	H	H	H

H: High
L: Low
M: Medium

Knowledge

K1	Knowledge 1	Basic properties and results related to topological spaces and algebraic topology. Integration techniques such as substitution, partial integration, as well as polynomial division and method of partial fractions.
K2	Knowledge 2	Basic tools of linear algebra, such as linear systems solving. Knowledge about Real Pre-Hilbert Spaces and Endomorphism of Euclidean Spaces, as well as solving related mathematical problems
K3	Knowledge 3	Knowledge and understanding of scientific phenomena, facts, laws, definitions, concepts and theories, scientific vocabulary, terminology and conventions
K4	Knowledge 4	Knowledge on quantum mechanical basis of the periodic table, account for the horizontal and vertical trends for some atomic properties and know how to describe chemical bonding in small molecules
K5	Knowledge 5	Acquire thermodynamic laws, variables and functions and their practical significance.
K6	Knowledge 6	Knowledge on mechanical and materials characterization's method
K7	Knowledge 7	Electrical circuits and digital electronics knowledge
K8	Knowledge 8	Knowledge on algorithmic, C/C++ programming and graph theory
K9	Knowledge 9	Improve vocabulary, grammar and pronunciation to communicate more effectively
K10	Knowledge 10	Acquire information on coordinates, distance, Speed, estimate time of arrival, Nord direction, Track, heading, Bearing, Rhumb line, Great circle
K11	Knowledge 11	Knowledge on different meteorological phenomena that form in the atmosphere (Name of the phenomenon, process of formation and characteristics) fundamental of information systems with is a multi-component environment
K12	Knowledge 12	Fundamentals of information systems

Skills

S1	Skill 1	Effective technical skills
S2	Skill 2	Verbal and written communication skills
S3	Skill 3	Analytical and synthetics spirit

Competences

C1	Competence 1	Handling information and problem solving
C2	Competence 2	Applying logic theory to develop practical and real-life systems
C3	Competence 3	Working with tools and technologies

Table 8. Knowledge and Skills vs Modules' Topics and related disciplines (Engineering Cycle)

Modules' Topics and related Disciplines	Knowledge												Skills								
	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	S1	S2	S3	S4	S5	S6	S7	S8	S9
Engineering Mathematics	H	H	L	L	H	H	H	L	L	M	H	H	M	M	H	M	M	L	H	H	L
Programming and Data Base Management	L	L	H	H	L	M	H	L	H	H	H	H	L	L	H	H	L	H	M	M	L
Geodesy	H	H	H	H	H	H	L	H	H	H	H	L	H	L	H	H	H	M	H	L	L
Topography	H	H	H	H	H	H	L	H	M	M	H	L	H	L	H	H	H	L	H	L	L
Remote sensing and Photogrammetry	M	L	H	H	H	H	M	L	M	H	H	H	L	H	H	H	L	L	L	H	L
Cartography and GIS	H	M	H	H	H	H	H	L	H	H	H	M	L	L	H	H	L	H	L	M	L
Planning and Cadastre	H	H	H	L	L	H	L	H	L	M	M	L	H	L	H	H	H	L	M	L	L
Quality control	H	H	H	H	H	H	L	M	H	H	H	M	H	H	H	H	H	H	H	H	L
Transversal Unit	L	L	L	L	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L	L	H
Projects	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

Table 9. Competences vs Modules' Topics and related disciplines (Engineering Cycle)

Modules' Topics and related Disciplines	Competences															
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
Engineering Mathematics	M	M	L	H	L	L	M	M	L	M	M	M	M	H	L	H
Programming and Data Base Management	M	L	H	H	H	H	M	L	H	M	L	M	H	H	H	H
Geodesy	H	M	M	H	H	M	L	L	M	L	M	L	H	H	H	H
Topography	H	L	L	H	H	L	L	L	L	L	H	L	H	H	H	H
Remote sensing and Photogrammetry	H	L	L	H	H	L	H	H	L	L	L	H	H	H	H	H
Cartography and GIS	H	H	H	H	H	H	M	M	H	H	L	M	H	H	H	H
Planning and Cadastre	H	M	L	H	H	L	L	L	L	L	H	L	L	H	H	H
Quality control	H	H	H	H	H	H	H	H	H	H	H	H	L	H	H	H
Transversal Unit	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	H
Projects	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H

Knowledge

K1 Knowledge 1 Understanding coordinate systems and projection

K2 Knowledge 2 Understanding the different topographic acquisition methods

K3 Knowledge 3 Getting familiar with spatial data normalization and standards.

K4 Knowledge 4 Fundamentals of software programming and web design.

K5 Knowledge 5 Understanding photogrammetric acquisition methods and different types of used sensors

K6 Knowledge 6 Understand the different origins of acquisition error

K7 Knowledge 7 Understanding the basic spatial analysis methods and techniques.

K8 Knowledge 8 Knowledge of land and cadastral laws

K9	Knowledge 9	Understanding the geographic information systems, concepts and applications
K10	Knowledge 10	Knowledge and understanding of cartography concepts, main elements and properties
K11	Knowledge 11	Getting familiar with spatial data creation and geo-processing methods
K12	Knowledge 12	Understanding of Image processing and information extraction

Skills

S1	Skill 1	Choosing the appropriate methods and materials for topographic data acquisition
S2	Skill 2	Choosing the efficient vectors and sensors for data acquisition according to the project needs
S3	Skill 3	Apply mathematical based approaches during the spatial data geo-processing.
S4	Skill 4	Check and control the data quality during the process of acquisition and processing
S5	Skill 5	Check and verify the topographic acquisition materials precision.
S6	Skill 6	Design and modelling geographic databases
S7	Skill 7	Calculation of points' coordinates using the different topographic software tools
S8	Skill 8	Calculation of geo-referencing photos extracted from photogrammetric data acquisition
S9	Skill 9	Soft Skills (Communication, Team working, etc.)

Competences

C1	Competence 1	Make in practice the data acquisition procedures, materials and tools in different cases of studies
C2	Competence 2	Creation and interpretation of plans and maps
C3	Competence 3	Design and development of spatial data based products.
C4	Competence 4	Assessment of the quality of spatial data modelling, geo-processing and final products
C5	Competence 5	Mastering of spatial data geo-processing, tools and techniques
C6	Competence 6	Mastering the geographic database implementation and data integration
C7	Competence 7	Extraction and edition of DEM based on photogrammetric methods
C8	Competence 8	Orthophoto generation, radiometric and geometric correction and mosaicking
C9	Competence 9	Establishment of GIS
C10	Competence 10	Managing complex projects integrating multi-criteria spatial data.
C11	Competence 11	Mastering the condominium sharing and space delimitation
C12	Competence 12	Mastering point cloud classification and generating DEM and contour lines
C13	Competence 13	Mastering different programming languages and software applied to desktop, mobile and web mapping
C14	Competence 14	Plan, develop and design geomatics and surveying projects
C15	Competence 15	Be able to write optimal specification and lead engineering projects
C16	Competence 16	Planning, organization and decision making

The university president/director and director of studies are in charge of the education at the university. They manage the educational affairs and development of education in the university in cooperation with the heads of departments and the scientific committee. Regular meetings are scheduled to evaluate and discuss

education procedures and needs for development. Each department is supervised by a university teacher. The head of department assesses the degree program and helps the director and the director of studies make the right decision about the development of the degree program.

In addition to the head of departments and the scientific committee, ESAT University has some alumni, experts and industrial partners who advise the director and the director of studies about the industry needs and visions for the future. Therefore, the degree program is actively assessed, developed and reviewed to meet high standards and evolving objectives and learning outcomes of the Program. The Geomatics and Topography Engineering program structure and its orientation is validated and supported by the Ministry of Higher Education and Scientific Research and multiple public and private organisms of the Republic of Tunisia.

In order to enable continuous improvement and development of the provided educational services, regular surveys about level of satisfaction and expectations are conducted as a part of the program assessment process. The parties concerned are: students, new applicants, academic staff and other staff members. Data from regular surveys about level of satisfaction and expectations of students are reported generally during staff meeting and it is annually analysed and evaluated at the end of the academic year. The degree program is subject to minor reviews and changes on a yearly basis and to major reviews every five years.