الجامعة التقنية الشمالية
Northern Technical University

بكالوريوس هندسة تقنيات الجيوماتكس

Bachelor's degree in Geomatics Techniques Engineering

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1. Vision and Mission Statement

Vision:

The department will be distinguished and a pioneer in the field of Surveying Techniques Engineering, providing the labor market with technical engineers who can keep up with and transfer accelerating technology in the field of Surveying and mapmaking, as well as create and find job opportunities outside the public sector for self-service and community service. These engineers will have a variety of skills, including the ability to analyzing, managing, and visualizing geographic data. With the mission of producing knowledgeable and highly skilled technical engineers, the Department of Geomatics Techniques Engineering will provide an education that is both current and progressive.

Mission:

The mission of a geomatics engineer is to utilize various technologies and techniques to acquire, analyze and interpret spatial data related to the Earth's surface and its features. Geomatics engineering combines elements of surveying, mapping, remote sensing, geograohic information system (GIS) and other geospatial technologies to gather and manage data about the Earth's physical and human-made environment.

Overall, the mission of a geomatics engineer is to leverage geospatial information to facilitate informed decision-making, resource management and sustainable development across various sectors, including engineering, urban planning, agriculture, natural resource management and disaster management.

2. Graduate Objectives:

The graduate objectives from geomatics teaching vary depending on the specific program and institution. However, here are some common objectives that geomatics education aims to achieve at the graduate level:

1. Advanced Knowledge: Geomatics education at the graduate level is designed to deepen students' understanding of the theoretical and

technical aspects of the field. It aims to provide students with advanced knowledge in areas such as geodesy, remote sensing, GIS, spatial analysis, cartography, and surveying techniques. Graduates should have a comprehensive understanding of the principles, methods, and applications of geomatics.

2. The Research Skills: Geomatics graduate programs often emphasize research and aim to develop students' skills in conducting independent research. This includes training in research design, data collection, data analysis, and interpretation. Graduates should be capable of planning and executing research projects, critically evaluating existing literature, and contributing to the advancement of geomatics knowledge.
3. Technological Proficiency: Geomatics is a field that heavily relies on technology and software tools. Graduate programs focus on equipping students with advanced technological skills necessary for geospatial data acquisition, analysis, and management. Graduates should be proficient in using specialized software, geospatial databases, programming languages, and other relevant tools.
4. Problem-solving and Critical Thinking: Geomatics education aims to cultivate problem-solving and critical thinking abilities in graduates. They should be able to analyze complex spatial problems, identify appropriate methodologies and techniques, and propose effective solutions. Graduates should have the ability to think critically, make informed decisions, and adapt to new challenges in the geomatics field.
5. Professionalism and Communication: Geomatics professionals often work in interdisciplinary teams and interact with various stakeholders. Graduate programs emphasize the development of effective communication, teamwork, and leadership skills. Graduates should be able to communicate geospatial information clearly and effectively to both technical and non-technical audiences. They should also understand the ethical, legal, and professional responsibilities associated with geomatics practice.
6. Lifelong Learning: Geomatics is a rapidly evolving field with continuous advancements in technology and techniques. Graduate programs aim to instill a passion for lifelong learning in graduates. They should be equipped with the skills and motivation to stay updated with the latest developments, engage in professional

development activities, and adapt to the evolving needs of the geomatics industry.

These objectives collectively prepare graduates to pursue careers in various sectors such as land surveying, urban planning, environmental management, geospatial analysis, research and academia, and public policy related to geospatial data.

3. General objectives of the department:

The general objectives of a geomatics department typically encompass the following:

1. Education and Training: The primary objective of a geomatics department is to provide quality education and training to students in the field of geomatics. This includes offering undergraduate and graduate programs that cover fundamental principles, theories, and practical applications of geomatics. The department aims to equip students with the knowledge, skills, and competencies needed to excel in various geospatial professions.
2. Research and Innovation: Geomatics departments emphasize research and innovation to advance the knowledge and understanding of geospatial sciences. They aim to conduct cutting-edge research in areas such as surveying, mapping, remote sensing, GIS, geodesy, and spatial analysis. The department fosters a culture of innovation, encouraging faculty and students to explore new technologies, methodologies, and applications in geomatics.
3. Techechnology and Infrastructure Development: Geomatics departments focus on developing and maintaining state-of-the-art infrastructure and facilities necessary for geospatial data acquisition, processing, and analysis. This includes access to advanced surveying instruments, remote sensing platforms, GIS software, and computing resources. The objective is to ensure students have hands-on experience with the latest tools and technologies in the field.

4. Collaboration and Partnerships: Geomatics departments aim to foster collaboration and partnerships with industry, government agencies, research institutions, and other academic departments. They establish relationships that facilitate knowledge exchange, joint research projects, internships, and professional development opportunities for students. Collaboration with external entities helps align the department's curriculum with industry needs and provides students with real-world exposure.
5. Community Engagement and Service: Geomatics departments strive to contribute to the local and global community through geospatial expertise. They aim to apply geomatics knowledge and skills to address societal challenges related to land management, urban planning, environmental conservation, disaster management, and social equity. The department encourages students and faculty to engage in community service projects and provide geospatial solutions for the betterment of society.
6. Professional Development and Lifelong Learning: Geomatics departments aim to foster the professional development of students and faculty. They provide opportunities for continuous learning, including workshops, seminars, conferences, and professional certifications. The objective is to cultivate a culture of lifelong learning and professional growth among graduates and faculty members.
7. Ethical and Professional Practices: Geomatics departments emphasize the importance of ethical and professional practices in geospatial sciences. They instill ethical values, integrity, and professionalism in students, preparing them to uphold high standards of conduct in their future careers. The department also promotes awareness of legal and ethical issues related to geomatics, including data privacy, intellectual property, and environmental stewardship.

These general objectives collectively contribute to the overall mission of a geomatics department, which is to produce competent and skilled geospatial professionals, advance knowledge in the field, and contribute to the development and application of geospatial sciences for the betterment of society.

4. Scientific and practical description:

The scientific and practical description of a geomatics department can be summarized as follows:

Scientific Description: Geomatics is a multidisciplinary scientific field that integrates principles and techniques from various disciplines such as surveying, remote sensing, geographic information systems (GIS), geodesy, cartography, and spatial analysis. It encompasses the acquisition, management, analysis, and interpretation of spatially referenced data related to the Earth's surface and its features.

The scientific foundation of geomatics lies in understanding the Earth's physical properties, geospatial measurements, coordinate systems, mathematical modeling, and data analysis. It involves the use of advanced technologies and methodologies to capture, process, analyze, and visualize geospatial data.

Geomatics employs scientific principles to study and understand the Earth's natural and built environment, including land, water bodies, infrastructure, vegetation, and other features. It focuses on spatial relationships, patterns, and processes to gain insights into phenomena such as land use, environmental changes, urban growth, natural resource management, and disaster response.

Practical Description: The practical aspect of a geomatics department involves the application of geospatial knowledge and skills to solve real-world problems. It includes the practical use of surveying instruments, remote sensing platforms, GPS/GNSS (Global Navigation Satellite System) receivers, geospatial software, and other tools to acquire, process, analyze, and visualize geospatial data.

In practice, a geomatics department is responsible for conducting land surveys, creating accurate maps and charts, analyzing satellite imagery and aerial photographs, developing GIS databases, performing spatial analysis, and generating geospatial models and visualizations. It encompasses tasks such as cadastral mapping, infrastructure planning, environmental monitoring, disaster management, transportation planning, and natural resource assessment.

The practical applications of geomatics span across various industries and sectors, including engineering, urban planning, environmental management, agriculture, forestry, transportation, telecommunications, defense, and emergency response. Geomatics professionals play a vital

role in decision-making processes, providing valuable geospatial information for effective planning, resource management, policy development, and infrastructure development.

In summary, the geomatics department combines scientific knowledge and practical applications to study and utilize geospatial data. It involves the acquisition, analysis, and interpretation of spatial information to address complex spatial problems and support informed decision-making in diverse fields.

5. Program Specification

Program code	GEO	ECTS	240
Duration	4 levels, 8 Semesters	Method of Attendance	Full Time

The Geomatics Techniques Engineering Program Specification outlines the knowledge and skills required for individuals who are interested in pursuing a career in the geomatics industry. The program focuses on developing technical expertise in the areas of Surveying, Remote Sensing, Geographic Information Systems (GIS), Cartography, Geodesy, and Geospatial Analysis. The program typically includes a mix of classroom lectures, practical training, and on-site field experience. Courses may cover topics such as Surveying Principles and design, Estimation and Quantity Surveying, Global position system, Geographical information system, Remote sensing and Radar, and Cadastral and system surveying.

Some key components of the Geomatics Techniques Engineering program specification may include:

1. **Program Aims and Objectives:** The overarching goals of the program, such as to produce graduates who are capable of utilize and mapmaking.
2. **Learning Outcomes:** A list of the specific skills, knowledge, and competencies that students are expected to acquire through the program.

3. **Course Structure:** Details on the specific courses that make up the program, including their content, delivery methods, and any prerequisites or co-requisites.
4. **Assessment Methods:** Information on how student performance will be evaluated, including the types of assessments used (e.g. exams, essays, practical assignments) and the weighting of each assessment.
5. **Resources:** An outline of the facilities, equipment, and other resources required to deliver the program effectively.

Overall, a Geomatics Techniques Engineering Program Specification serves as a guide for educators and institutions to develop and deliver a comprehensive curriculum that prepares students for a career in the Survey industry.

6. Program Goals

The program goals of geomatics technical engineering vary across different educational institutions and programs. However, here are some common program goals that can be associated with geomatics technical engineering:

1. Technical Competence: The program aims to provide students with a strong foundation in geomatics principles, techniques, and technologies. Students should develop technical skills in areas such as surveying methods, geospatial data collection, remote sensing, GIS software, spatial analysis, and geodetic computations. The goal is to equip students with the knowledge and expertise required to perform geomatics tasks accurately and efficiently.
2. Practical Experience: Geomatics technical engineering programs often prioritize hands-on learning and practical experience. The goal is to ensure that students have opportunities to apply theoretical concepts and techniques in real-world scenarios. This includes fieldwork, laboratory exercises, and project-based assignments that simulate professional geomatics tasks. Students should gain practical skills in using surveying instruments, data processing software, and geospatial technologies.
3. Problem-Solving and Critical Thinking: Geomatics technical engineering programs aim to develop students' problem-solving and critical thinking abilities. The goal is to enable students to analyze complex geospatial problems, identify appropriate methods and tools, and propose effective solutions. Students should be able

to think critically, evaluate options, and make informed decisions in various geomatics contexts.

4. Professional Skills: Geomatics technical engineering programs strive to foster the development of professional skills among students. This includes communication skills, teamwork, project management, and ethical conduct. The goal is to prepare students for professional geomatics practice, where they can effectively collaborate with colleagues, communicate geospatial information to diverse audiences, and uphold ethical standards.
5. Adaptability and Lifelong Learning: Geomatics is a rapidly evolving field with continuous advancements in technology and methodologies. The program aims to cultivate students' adaptability and a lifelong learning mindset. The goal is to equip students with the skills and motivation to keep up with emerging trends, technologies, and best practices in geomatics throughout their careers.
6. Industry Relevance: Geomatics technical engineering programs often align their curriculum with industry needs and trends. The goal is to ensure that graduates are well-prepared to meet the demands of the job market. Programs may include industry internships, guest lectures by professionals, and collaboration with industry partners to enhance students' understanding of industry practices and foster relevant skills.
7. Professional Certification and Licensing: Depending on the region or country, some geomatics technical engineering programs may aim to prepare students for professional certification or licensing exams. The goal is to ensure that graduates meet the necessary requirements to obtain professional credentials, such as becoming a licensed surveyor or GIS professional.

These program goals collectively aim to produce competent geomatics technical engineers who possess the necessary knowledge, skills, and professional attributes to contribute effectively in various geospatial industries, including surveying, mapping, GIS, and remote sensing.

1. Student Learning Outcomes

The Student Learning Outcomes (SLOs) for a Geomatics Department include. SLOs are typically designed to reflect the knowledge, skills, and competencies that students are expected to achieve by the end of their

program of study. Here are some possible examples of SLOs for a Geomatics Department:

1. Knowledge of Geospatial Concepts: Demonstrate an understanding of key geospatial concepts, including coordinate systems, spatial data structures, geodetic measurements, and remote sensing technologies.
2. Proficiency in Geomatics Tools and Software: Develop skills in using geospatial tools and software, such as Geographic Information Systems (GIS), Global Positioning Systems (GPS), and digital mapping software, to collect, analyze, and interpret geospatial data.
3. Data Collection and Analysis: Acquire the ability to collect and process geospatial data using various data collection techniques, such as surveying, satellite imagery, LiDAR, and aerial photography. Apply appropriate methods for data analysis and interpretation.
4. Spatial Data Management: Gain knowledge of spatial database management principles and techniques. Demonstrate the ability to organize, store, query, and update geospatial data in a database system.
5. Cartographic Skills: Develop skills in creating accurate and visually appealing maps and charts. Understand principles of cartography, map design, and visualization techniques for effective communication of geospatial information.
6. Problem Solving and Decision Making: Apply geomatics knowledge and skills to solve real-world problems in areas such as land management, urban planning, environmental assessment, transportation, and natural resource management. Demonstrate the ability to make informed decisions based on geospatial analysis.
7. Ethical and Professional Practices: Understand and adhere to ethical standards and professional practices in the field of geomatics. Demonstrate effective communication, teamwork, and project management skills.
8. Provide individuals with the necessary skills to accurately capture, process, and analyze imagery to create reliable and precise spatial information. This knowledge enables them to generate accurate measurements, models, and maps that are vital in various fields, including surveying, mapping, engineering, environmental monitoring, and cultural heritage preservation.
9. Provide individuals with the knowledge and skills necessary to understand, analyze, and design transportation systems and

infrastructure to ensure safe, efficient, and sustainable movement of vehicles, pedestrians, and other modes of transportation.

10. Studying cadastral surveying to equip individuals with the knowledge and skills necessary to accurately establish, define, and manage property boundaries and cadastral information. This knowledge enables them to perform cadastral surveys, contribute to land administration systems, resolve boundary disputes, support land development projects, and ensure the integrity and reliability of property ownership records.
11. Provide individuals with the knowledge and skills necessary to understand and analyze radar systems, their principles of operation, and their applications in various fields.
12. Studying GIS topics to equip individuals with the knowledge and skills to effectively use GIS technology for spatial data analysis, decision-making, and problem-solving in various domains. This knowledge enables them to acquire, manage, analyze, visualize, and interpret geospatial data, support informed decision-making processes, and contribute to the development of spatially-enabled solutions and applications.
13. Provide individuals with the knowledge and skills necessary to understand and analyze the Earth's shape, size, and gravitational field. Geodesy is the science that deals with the measurement and representation of the Earth's surface, its gravity field, and its orientation in space.
14. Equip individuals with the skills and knowledge necessary to operate, maintain, and utilize surveying instruments effectively. This knowledge enables them to conduct accurate and reliable surveys, collect quality data, and contribute to the successful execution of surveying and mapping projects in various fields, including construction, land development, infrastructure planning, and environmental monitoring.
15. Studying remote sensing is to equip individuals with the knowledge and skills necessary to effectively acquire, process, analyze, and interpret remote sensing data. This knowledge enables them to extract valuable information about the Earth's surface, monitor changes, and make informed decisions in various fields that require geospatial information.

It's important to note that these SLOs can vary across different institutions and programs. I recommend referring to the specific Geomatics Department of the educational institution you're interested in to obtain the most accurate and up-to-date information about their Student Learning Outcomes.

8. Academic Staff

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9.Credits, Grading and GPA

Credits in the Geomatics Techniques Engineering Department are following the Bologna Process with the European Credit Transfer System (ECTS) credit system. The total degree program number of ECTS is 240, 30 ECTS per semester. 1 ECTS is equivalent to 27 student workloads, including structured and unstructured workload.

Grading: Before the evaluation, the results are divided into two subgroups: pass and fail. Therefore, the results are independent of the students who failed a course. The grading system is defined as follows:

GRADING SCHEME			
Group	**Grade**	**Marks %**	**Definition**
Success Group (50 - 100)	Excellent	90 - 100	Outstanding Performance
	Very Good	80 - 89	Above average with some errors
	Good	70 - 79	Sound work with notable errors
	Satisfactory	60 - 69	Fair but with major shortcomings
	Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required
NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

Calculation of the Grade Point Average (GPA)

The GPA is calculated by the summation of each module score multiplied by its ECTS, all are divided by the program total ECTS.

GPA of 4-year B.Sc. degrees:

GPA = [(1st module score x ECTS) + (2nd module score x ECTS) + ……] / 240

10. Curriculum/Modules

Level 1 – First semester							
CODE	TITLE	T	P	C	ECTS		
NTU 100	HUMAN RIGHTS & DEMOCRECY	2			2		
GEO 101	PLANE SURVEYING	4	4		10		
GEO 102	COMPUTER ENGINEERING DRAWING	2	4		8		
GEO 103	ENGINEERING MATHEMATICS	6	0		4		
GEO 104	ENGINEERING GEOLOGY	2	1		4		
GEO 105	ADVANCED ENGLISH SKILLS	2	0		2		
T:Theoritical, P:Practical, C:Credit		16	9		30		

Level 1 – Second Semester							
CODE	TITLE	T	P		ECTS		
GEO 106	PLANE SURVEYING II	4	4		10		
GEO 107	ENGINEERING MECHANICS	4	4		8		
GEO 108	ENGINERING PHYSICS	2	0		4		
GEO 109	DESCRIPTIVE GEOMETRY	1	2		4		
NTU 102	COMPUTER PRINCIPLES	1	2		2		
NTU 103	ARABIC LANGUAGE	2	0		2		
T:Theoritical, P:Practical, C:Credit		14	12		30		

Level 2 – third semester					
CODE	TITLE	T	P	C	ECTS
GEO 201	Plain Surveying III	4	4		8
GEO 202	Estimation & Quantity Surveying	2	2		4
GEO 203	Cartography 1	2	2		4
GEO 204	Engineering Surveying	2	2		6
GEO 205	Photogrammetry 1	2	2		4
NTU 201	Computer Applications	0	2		2
NTU 203	Al-Ba'ath Party Crimes	2	0		2
T:Theoritical, P:Practical, C:Credit		14	14		30

Level 2 – Fourth Semester						
CODE	TITLE	T	P	C	ECTS	
GEO 206	Plain Surveying IV	4	4		8	
GEO 207	Fundamentals of Geographic Information System	2	2		6	
GEO 208	Estimation & Quantity Surveying 2	2	2		4	
GEO 209	Cartography 2	2	2		4	
GEO 210	Photogrammetry 2	2	2		4	
NTU 200	Advanced English Skills 2	2	0		2	
NTU 204	Professional Ethics	2	0		2	
T:Theoritical, P:Practical, C:Credit		16	12		30	