



Geomatics Engineering –B.S.



DANESHPAJOOHAN PISHRO HIGHER EDUCATION INSTITUTE

- **COURSE CHART**
- **SYLLABUS**
- **SEMESTER CHART**

Geomatics Engineering Undergraduate Course Chart

General Courses						
Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
61-11-004	Islamic Thoughts-I	2	2	0	-----	-----
61-11-011	Islamic Thoughts-II	2	2	0	Islamic Thoughts-I	-----
61-11-003	Rite of Life (Applied Ethics)	2	2	0	-----	-----
61-11-012	Islamic Revolution of Iran	2	2	0	-----	-----
61-11-014	Analytical History of Islam	2	2	0	-----	-----
61-15-001	Persian Language	3	3	0	-----	-----
61-15-002	English Language	3	3	0	-----	-----
61-15-005	Physical Education	1	0.5	0.5	-----	-----
61-15-011	Exercise-I	1	0	1	Physical Education	-----
61-15-007	Family and Population Knowledge	2	2	0	-----	-----
61-11-008	Introduction to Constitution	2	2	0	-----	-----
61-11-013	The Holy Quran Exegesis	2	2	0	-----	-----
Total Credits		22	Note: Only one course between 'Islamic Revolution of Iran' and 'Introduction to Constitution' shall be taken.			

Science Courses						
Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
51-11-019	Mathematics-I	3	3	0	-----	-----
51-11-021	Mathematics-II	3	3	0	Mathematics-I	-----
51-11-022	Differential Equations	3	3	0	-----	Mathematics-II
51-11-031	Computer Programming	3	3	0	Mathematics-I	-----
51-11-023	Numerical Methods	2	2	0	Computer Programming, Differential Equations	-----
51-11-034	Engineering Statistics and Probability	3	3	0	Differential Equations	-----
51-22-039	Mechanical Physics	3	3	0	-----	Mathematics-I
51-22-040	Electromagnetic and Optics Physics	3	3	0	Physics-I Lab	Mathematics-II
Total Credits		23				

Geomatics Engineering Courses						
Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372020	Engineering Mathematics	3	3	0	Differential Equations	-----
1372021	Differential Geometry	2	2	0	Mathematics-II	-----
1372001	Fundamentals of Surveying	3	3	0	Mathematics-I	-----
1372002	Fundamentals of Surveying Practical	1	0	1	-----	Fundamentals of Surveying
1372003	Road and Underground Surveying	3	3	0	Fundamentals of Surveying	-----
1372004	Road and Underground Surveying Practical	1	0	1	-----	Road and Underground Surveying
1372005	Estimation Theory	3	3	0	Linear Algebra, Fundamentals of Surveying, Numerical Methods, Eng. Statistics & Probability	-----
1372006	Laser Scanners: Theory & Practical	3	2	1	Fundamentals of Surveying, Electromagnetic and Optics Physics	-----
1372007	Building Construction Methods	2	2	0	Construction Materials	-----
1671009	Linear Algebra	3	3	0	Mathematics-II	-----
1372008	Construction Materials	2	2	0	-----	-----
1372009	Pavement Engineering	2	2	0	Construction Materials, Road and Underground Surveying	-----
1372010	Cartography	2	2	0	Fundamentals of Surveying	-----
1372011	Cartography Practical	1	0	1	-----	Cartography
1372012	Geodetic Surveying :Theory & Practical	3	2	1	Estimation Theory	-----
1372013	Fundamentals of Photogrammetry	3	3	0	Fundamentals of Surveying	-----
1372014	Fundamentals of Photogrammetry Practical	1	0	1	-----	Fundamentals of Photogrammetry
1372015	Analytical Photogrammetry	3	3	0	Fundamentals of Photogrammetry, Estimation Theory	-----
1372016	Applications of Photogrammetry	3	3	0	Analytical Photogrammetry	-----
1372017	Applications of Photogrammetry Practical	1	0	1	-----	Applications of Photogrammetry
1372018	Image Processing	3	3	0	Engineering Mathematics	-----
1372019	Remote Sensing	3	3	0	Analytical Photogrammetry, Image Processing, Electromagnetic and Optics Physics	-----
1372056	Remote Sensing Practical	1	0	1	-----	Remote Sensing

1372057	Fundamentals of Geodesy	3	3	0	Fundamentals of Surveying, Mechanical Physics	-----
1372058	Geometrical Geodesy	3	3	0	Engineering Mathematics, Estimation Theory, Differential Geometry, Fundamentals of Geodesy	-----
1372059	Construction and Cadastral Surveying: Theory & Practical	3	2	1	Geodetic Surveying :Theory & Practical	-----
1373042	Physical Geodesy	3	3	0	Satellite Geodesy: Theory & Practical	-----
1372060	Satellite Geodesy: Theory & Practical	3	2	1	Geometrical Geodesy	-----
1372061	Geo-Spatial Information System	2	2	0	Fundamentals of Surveying	-----
1372062	Geo-Spatial Information System Practical	1	0	1	-----	Geo-Spatial Information System
1372046	Hydrography	2	2	0	Satellite Geodesy: Theory & Practical	-----
1372063	Geo-Spatial Analysis	2	2	0	Geo-Spatial Information System, Engineering Statistics and Probability	-----
1372064	Geo-Spatial Analysis Practical	1	0	1	-----	Geo-Spatial Analysis
1372065	Cadastrre	2	2	0	Construction and Cadastral Surveying: Theory & Practical	-----
1372066	Project Management	2	2	0	Geodetic Surveying :Theory & Practical, Applications of Photogrammetry, Construction and Cadastral Surveying: Theory & Practical	-----
1372067	Internship	4	0	4	(after passing 100 credits)	-----
Total Credits		83				

Elective Courses (not complete)						
Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372068	Applications of GIS	2	2	0	Geo-Spatial Analysis	-----
1354053	Microgeodesy	2	2	0	Geometrical Geodesy, Geodetic Surveying :Theory & Practical	-----
1372052	English for Geomatics Eng.	2	2	0	(after passing 100 credits)	-----
1372069	Urban Planning	2	2	0	Geo-Spatial Analysis	-----
1371053	Engineering Economics	2	2	0	Mathematics-I	-----
1372070	Final Project	2	2	0	(after passing 100 credits)	-----
Total Credits		12				

Total Credits (All Courses)	140
------------------------------------	-----

Mathematics-I

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
51-11-019	Mathematics-I	3	3	0	-----	-----

This course consists principally of one-variable Calculus, Functions, Derivative, Integrals, Integration Methods, Complex Numbers and Infinite Series.

Mathematics-II

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
51-11-021	Mathematics-II	3	3	0	Mathematics-I	-----

The main scope of this course is to teach the students some topics in introductory linear algebra including matrix algebra and linear transformations and multivariable calculus including multivariable functions, directional and partial derivatives, velocity and acceleration, tangent plane and normal gradient line, cylindrical and spherical coordinates, vector field and line integrals, surface integral, Green's theorem, Divergence theorem and Stoke's theorem.

Differential Equations

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
51-11-022	Differential Equations	3	3	0	-----	Mathematics-II

Introduction to Differential Equations; First Order Differential Equations; Second Order Linear Equations; Higher Order Linear Equations; Series Solutions of Second Order Linear Equations; The Laplace Transform; Systems of First Order Linear Equations.

Computer Programming

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
51-11-031	Computer Programming	3	3	0	Mathematics-I	-----

Explanation of main computer parts; The concept of software and hardware; Algorithms design and an introduction to a structured computer programming language.

Numerical Methods

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
51-11-023	Numerical Methods	2	2	0	Computer Programming, Differential Equations	-----

This course is an introduction to numerical methods for solving mathematical problems that arise in Science and Engineering. The goal is to provide a basic understanding of the derivation, analysis and use of these numerical methods. The course includes:

Error Analysis; Numerical solution of Nonlinear Equations; Interpolation, Polynomial Approximation, Curve Fitting; Numerical Differentiation and Integration; Numerical Solution of Ordinary Differential Equations; Solutions of Systems of Equations.

Probability & Statistics in Engineering

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
51-11-034	Probability & Statistics in Engineering	3	3	0	Differential Equations	-----

Analytic tools to deal with uncertainty, model the data/information, prediction and analyze of underlying systems.

This course provides elementary probabilistic and statistical concepts as well as the methods to apply them to the engineering problems.

Mechanical Physics

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
51-22-039	Mechanical Physics	3	3	0	-----	Mathematics-I

This course covers the fundamental concepts in Classical Mechanics and Thermodynamics.

Electromagnetic and Optics Physics

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
51-22-040	Electromagnetic and Optics Physics	3	3	0	Physics-I Lab	Mathematics-II

This course provides an introduction to the fundamental physics of Electricity and Optics.

Engineering Mathematics

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372020	Engineering Mathematics	3	3	0	Differential Equations	-----

Engineering mathematics is a branch of applied mathematics that concerns itself with mathematical methods and techniques that are typically used in engineering and industry. Engineering mathematics consisted principally of Fourier analysis, Partial differential equations, Complex analysis, Integral transforms and Calculus of variations. Contents covered in this course:

Fourier series, Integrals and The Fourier Transform; Partial Differential Equations; Complex Analysis; Calculus of Variations

Differential Geometry

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372021	Differential Geometry	2	2	0	Mathematics-II	-----

Some of the topics covered in this course are:

Tangent vector; Tangent bundle; Curves; Curvature and torsion; Frenet's equations; Surfaces; The fundamental forms; Curvature; Vector fields and covariant derivative; Geodesic curves; Two-dimensional Riemannian geometry; Brief coverage of the global theory of surfaces, n-dimensional Riemannian theory, space-time and Einstein's equations.

Fundamentals of Surveying

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372001	Fundamentals of Surveying	3	3	0	Mathematics-I	-----

This course provides introduction to Geomatics and Survey measurement techniques, including leveling, the use of Theodolites, and total stations. Methods of recording field data. Use of calculators to compute directions, survey errors, closures, adjustments, and area.

Fundamentals of Surveying Practical

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372002	Fundamentals of Surveying Practical	1	0	1	-----	Fundamentals of Surveying

The main objective of this course is to provide a practical introduction to the topics covered in the theoretical Fundamentals of Surveying course.

Road and Underground Surveying

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372003	Road and Underground Surveying	3	3	0	Fundamentals of Surveying	-----

Preliminary and construction surveys for highways and railroads, including calculation and field work for simple, compound, reverse, and easement curves, grade lines and slope stakes and the super elevation of curves.

Knowledge on measurement of underground structures made by mining activity (underground and surface mines), tunnels, underground nuclear power plant structures, caves and structures of geological and hydrological prospection. Principles of underground control network design and building.

Also this course provides methodology of preparation and management of underground measurements, their documentation and archiving.

Road and Underground Surveying Practical

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372004	Road and Underground Surveying Practical	1	0	1	-----	Road and Underground Surveying

The main objective of this course is to provide a practical introduction to the topics covered in the theoretical Route and Underground Surveying course.

Estimation Theory

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372005	Estimation Theory	3	3	0	Linear Algebra, Fundamentals of Surveying, Numerical Methods, Eng. Statistics & Probability	-----

The course provides a general introduction to the problem of constructing estimators for parameters in different classes of situations and models. Elements of general decision theory are also included, with loss, award, and risk functions. The topics discussed include optimal estimation for unbiased methods; equivariant estimators; minimaxity; admissibility; Bayes estimators; asymptotic optimality for likelihood based methods; and sequential estimation.

Laser Scanners: Theory & Practical

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372006	Laser Scanners: Theory & Practical	3	2	1	Fundamentals of Surveying, Electromagnetic and Optics Physics	-----

This course intends to provide theoretical and practical introduction to fundamentals of lidar acquisition, registration, processing, modeling, analysis, and verification - Use of sensor platforms for 3D acquisition - Effective data management procedures - Other imaging techniques including structure from motion and structured light.

Building Construction Methods

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372007	Building Construction Methods	2	2	0	Construction Materials	-----

This course provides an introduction to construction methods and its applications. This is a hands-on survey course which has four components: construction management, concrete/masonry, carpentry and woodworking. Students learn to use math, blueprints, building specifications, optical leveling equipment, hand tools, portable power tools, and stationary power tools in a sequence of learning activities designed for students to acquire entry level skills and knowledge of the construction industry.

Linear Algebra

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1671009	Linear Algebra	3	3	0	Mathematics-II	-----

This course provides Systems of Linear Equations, Gauss-Jordan Elimination Method, Matrix Algebra, The Inverse of a Matrix, Determinants, Cramer's Rule, Vector Spaces and Subspaces, Euclidean Spaces, Linear Transformations, The Kernel and the Range of a Linear Transformation, Spanning Sets, Independent Sets, Bases, Dimension, Eigen values and Eigenvectors.

Construction Materials

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372008	Construction Materials	2	2	0	-----	-----

Cement, aggregates, and concrete building units concrete admixtures, brick and tile, stone, ferrous and nonferrous metals, gypsum and lime, glass, bituminous materials, building papers, plastics, building boards, exterior wall materials, flooring & roofing materials, insulating

materials, acoustical materials interior finishing materials, adhesives, sealers, sealants, protective and decorating coatings.

Pavement Engineering

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372009	Pavement Engineering	2	2	0	Construction Materials, Road and Underground Surveying	-----

Stress in flexible pavements; Materials characterization; Climate and environmental effects; Sub-grade stabilization; Design of flexible pavements; Pavement distress; Flexible overlay design; Geo-grade use in asphalt overlays.

Cartography

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372010	Cartography	2	2	0	Fundamentals of Surveying	-----

Cartography is a science of communicating spatial information with maps. The purpose of this course is to learn the concepts, principles, and techniques related to maps and map making. Students are expected to develop knowledge and expertise in map types, data selection, compilation, display, design, mapping tools & production techniques, and communication.

Cartography Practical

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372011	Cartography Practical	1	0	1	-----	Cartography

The main objective of this course is to provide a practical introduction to the topics covered in the theoretical Cartography course.

Geodetic Surveying: Theory & Practical

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372012	Geodetic Surveying :Theory & Practical	3	2	1	Estimation Theory	-----

General principles of surveying- principal surveying activities- angle measurement- distance measurement- leveling- Geoids and ellipsoids- map projections- adjustment of observations- reduction of distance measurements- reciprocal vertical angles- control stations.

Fundamentals of Photogrammetry

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372013	Fundamentals of Photogrammetry	3	3	0	Fundamentals of Surveying	-----

Coordinate Systems- Photo-Coordinate System- Object Space Coordinate- Interior Orientation- Similarity Transformation- Affine Transformation- Correction for Radial-Correction for Refraction- Correction for Earth Curvature- Computing Photo-Coordinates-

Exterior Orientation- Single Photo Resection- Computing Photo Coordinates- Orientation of a Stereo pair- Model Space, Model Coordinate System- Dependent Relative Orientation- Independent Relative Orientation- Direct Orientation -Absolute Orientation.

Fundamentals of Photogrammetry Practical

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372014	Fundamentals of Photogrammetry Practical	1	0	1	-----	Fundamentals of Photogrammetry

The main objective of this course is to provide a practical introduction to the topics covered in the theoretical Fundamentals of Photogrammetry course.

Analytical Photogrammetry

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372015	Analytical Photogrammetry	3	3	0	Fundamentals of Photogrammetry, Estimation Theory	-----

Mathematical Models used in Analytical Photogrammetry, Fundamental problems (intersection, exterior, relative, absolute orientation). Aero-triangulation: Bundle and Bundle adjustment with additional parameters. This course is also about accuracy and reliability, measuring instruments, calibration and data reduction from analytical to digital photogrammetry.

Applications of Photogrammetry

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372016	Applications of Photogrammetry	3	3	0	Analytical Photogrammetry	-----

This course provides an introduction to the applications of Photogrammetry in making topographic maps, aero-triangulation, and constructional, industrial and medical projects. An overview of numerical photogrammetry is provided as well.

Applications of Photogrammetry Practical

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372017	Applications of Photogrammetry Practical	1	0	1	-----	Applications of Photogrammetry

This course provides an introduction to the applications of Photogrammetry in practice. Photogrammetry software is also discussed.

Image Processing

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372018	Image Processing	3	3	0	Engineering Mathematics	-----

The objective of this course is to provide an introduction to image processing principles, tools, techniques, and algorithms. It also includes topics in image representation, analysis,

filtering, and segmentation, and pattern recognition. Use of image processing software tools for lab assignments and projects

Remote Sensing

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372019	Remote Sensing	3	3	0	Analytical Photogrammetry, Image Processing, Electromagnetic and Optics Physics	-----

A Systematic View of Remote Sensing, Geometric Processing and Positioning Techniques, Compositing, Smoothing, and Gap-Filling Techniques, Data Fusion, Atmospheric Correction of Optical Imagery, Solar Radiation, Land-Surface Temperature and Thermal Infrared Emissivity, Canopy Biochemical Characteristics, Leaf Area Index, Fraction of Absorbed Photosynthetically Active Radiation by Green Vegetation, Fractional Vegetation Cover, Vegetation Height and Vertical Structure, Above-ground Biomass, Vegetation Production in Terrestrial Ecosystems, Terrestrial Evapotranspiration.

Remote Sensing Practical

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372056	Remote Sensing Practical	1	0	1	-----	Remote Sensing

The main objective of this course is to provide a practical introduction to the topics covered in the theoretical Remote Sensing course.

Fundamentals of Geodesy

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372057	Fundamentals of Geodesy	3	3	0	Fundamentals of Surveying, Mechanical Physics	-----

Definition of Geodesy, historical development of Geodesy, the spherical and ellipsoidal earth model, arc measurement, reference system, time systems, celestial reference system, terrestrial reference system, gravity field related reference system, the Geoid, Geodetic earth model, The rotational ellipsoid, Geodetic reference system, methods of measurement, satellite observation, GPS, geodetic astronomy, gravimetry, structure and dynamics of the earth.

Geometrical Geodesy

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372058	Geometrical Geodesy	3	3	0	Engineering Mathematics, Estimation Theory, Differential Geometry, Fundamentals of Geodesy	-----

The main objective of this course is to familiarize students with how to calculate coordinates and positioning at long distances on surfaces. Thus, they are familiar with the system of coordinates used in geodesy, elliptic geometry, conformal map projections, and mathematical models of geodesy horizontal networks and their adjustment.

Construction and Cadastral Surveying: Theory & Practical

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372059	Construction and Cadastral Surveying: Theory & Practical	3	2	1	Geodetic Surveying :Theory & Practical	-----

This course aims to provide a theoretical and practical introduction to techniques and procedures used in field engineering practices related to construction projects, and surveying instruments, topographic maps, building site layout, route surveying, precision, and closure.

This course also helps students learn about the theory and process of Cadastral surveying. This will include the laws relating to the ownership of land, cadastral surveys for the re-establishment (definition) of property boundaries and preparing plans and reports and other cadastral documentation.

Physical Geodesy

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1373042	Physical Geodesy	3	3	0	Satellite Geodesy: Theory & Practical	-----

Fundamentals of potential theory: Attraction and potential- Potential of a solid body- Harmonic functions- Laplace's equation in spherical coordinates- Spherical harmonics- Surface spherical harmonics- Legendre's functions- Legendre's functions of the second kind- Expansion theorem and orthogonality relations- Fully normalized spherical harmonics- Expansion of the reciprocal distance into zonal harmonics and decomposition formula- Solution of Dirichlet's problem by means of spherical harmonics and Poisson's integral- Other boundary value problems- The radial derivative of a harmonic function- Laplace's equation in ellipsoidal-harmonic coordinates- Ellipsoidal harmonics

Gravity field of the earth: Gravity- Level surfaces and plumb lines- Curvature of level surfaces and plumb lines- Natural coordinates- The potential of the earth in terms of spherical harmonics- Harmonics of lower degree- The gravity field of the level ellipsoid- Normal gravity- Expansion of the normal potential in spherical harmonics- Series expansions for the normal gravity field- Reference ellipsoid, numerical values- Anomalous gravity field, geoidal undulations, and deflections of the vertical- Spherical approximation and expansion of the disturbing potential in spherical harmonics- Gravity anomalies outside the earth- Stokes' formula- Explicit form of Stokes' integral and Stokes' function in spherical harmonics- Generalization to an arbitrary reference ellipsoid- Gravity disturbances and Koch's formula- Deflections of the vertical and formula of Vening Meinesz- The vertical gradient of gravity- Practical evaluation of the integral formulas.

Satellite Geodesy: Theory & Practical

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372060	Satellite Geodesy: Theory & Practical	3	2	1	Geometrical Geodesy	-----

Reference Coordinate Systems- Cartesian Coordinate Systems and Coordinate Transformations- Reference Coordinate Systems and Frames in Satellite Geodesy-

Conventional Inertial Systems and Frames- Conventional Terrestrial Systems and Frames- Reference Coordinate Systems in the Gravity Field of Earth- Relationship between CIS and CTS- Ellipsoidal Reference Coordinate Systems- Ellipsoid, Geoid and Geodetic Datum- Three-dimensional Eccentricity Computation

The Global Positioning System (GPS)- Space Segment- Control Segment- Observation Principle and Signal Structure- Orbit Determination and Orbit Representation- Structure of the GPS Navigation Data- Intentional Limitation of the System Accuracy- GPS Receivers- Receiver Concepts and Main Receiver Components- Code Dependent Signal Processing- Codeless and Semicodeless Signal Processing- Adjustment Strategies and Software Concepts- Other Error Sources Related to the Receiving- Observation Plan- Practical Aspects in Field Observations- Geodetic Control Surveys- Navigation Management, Location Based- Engineering and Monitoring, Photogrammetry, Remote Sensing, Airborne GPS.

Geo-Spatial Information System

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372061	Geo-Spatial Information System	2	2	0	Fundamentals of Surveying	-----

General GIS principles- Geospatial data models- Organization of GIS data and system functionality- Map projections and coordinate systems- Map projection principles- Common coordinate systems and datums- data exchange- raster data-vector data- image processing

Geo-Spatial Analysis Practical

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372062	Geo-Spatial Information System Practical	1	0	1	-----	Geo-Spatial Information System

The main objective of this course is to provide a practical introduction to the topics covered in the theoretical Geo-Spatial analysis course.

Hydrography

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372046	Hydrography	2	2	0	Satellite Geodesy: Theory & Practical	-----

The purpose of this course is to introduce students to hydrographic study, the need of the country to hydrography, to identify types of hydrography and in particular hydrography in order to provide navigational charts, to familiarize with the World Hydrographic Organization and regional commissions, guidelines and standards, familiarity with the Electronic depth finder and other equipment used in hydrography, basic concepts of depth measurement at sea. Concepts of determining the position of dynamics in the sea, recognition of sea water fluctuations, in particular, tides, and their measurement methods, recognition of vertical datum in hydrography, management and planning in hydrography, familiarity with hydrographic products.

Geo-Spatial Analysis

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372063	Geo-Spatial Analysis	2	2	0	Geo-Spatial Information System, Engineering Statistics and Probability	-----

The course explains digital representation and analysis of geospatial phenomena and provides foundations in methods and algorithms used in GIS analysis. Special focus is on terrain modeling, geomorphometry, watershed analysis and introductory GIS-based modeling of landscape processes (water, sediment). The course includes analysis from lidar data, coastal change assessment and 3D visualization

Geo-Spatial Information System Practical

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372064	Geo-Spatial Information System Practical	1	0	1	-----	Geo-Spatial Analysis

This course provides a practical introduction to sample GIS software, through making a Geo-Spatial database, and preparing and processing the data.

Cadastre

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372065	Cadastre	2	2	0	Construction and Cadastral Surveying: Theory & Practical	-----

Students manage scientific methods of research and development in the cadastre of real estate. Students will achieve the principles of individual and team research work, of scientific formulation of problems and design of their own Solutions. Students will be able to understand and to actively participate in relationship "research – development – operation" in the field of cadastre of real estate and land consolidation

Project Management

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372066	Project Management	2	2	0	Geodetic Surveying :Theory & Practical, Applications of Photogrammetry, Construction and Cadastral Surveying: Theory & Practical	-----

Introduction to engineering project management; Planning successful projects; Specifying, budgeting, implementing, executing, scheduling, delivery options, and closeout; Scheduling tasks and resources; Resource leveling; Common characteristics of projects; Network tools for project planning and monitoring; Cost optimization to meet project objectives; Project crashing, time-cost trade-offs; Risk analysis; Software for project planning and scheduling.

Internship

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372067	Internship	4	0	4	(after passing 100 credits)	-----

It provides practical introduction of studied courses through the university, in industrial environments.

Applications of GIS

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372068	Applications of GIS	2	2	0	Geo-Spatial Analysis	-----

The main objective of this course is to provide Geomatics Engineering students with an introduction to the increasing applications of GIS in various fields.

Microgeodesy

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1354053	Microgeodesy	2	2	0	Geometrical Geodesy, Geodetic Surveying :Theory & Practical	-----

The purpose of this course is to familiarize students with theoretical and practical concepts of the implementation of a geodetic network, including designing, implementing points, performing observations, calculations and analyzing the results. Detection of displacement vectors and network deformation analysis are also considered.

English for Geomatics Eng.

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372052	English for Geomatics Eng.	2	2	0	(after passing 100 credits)	-----

To teach words, terms, and selected texts from common sources in Geomatics Engineering, in order to develop students' knowledge and enable them to use scientific and technical Geomatics Engineering references in English.

Urban Planning

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372069	Urban Planning	2	2	0	Geo-Spatial Analysis	-----

This course provides planning aspects of highway transportation including transportation goals, transportation forecasting techniques and models, selection between alternate solutions, financing improvements.

Engineering Economics

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1371053	Engineering Economics	2	2	0	Mathematics-I	-----

This course provides the systematic evaluation of the economic benefits and costs of projects involving engineering design and analysis, economic decision-making in an environment of limited resources and uncertainty, present economy, the economy of multi-year projects,

selection among competing alternatives, sensitivity of outcomes to input parameters, before- and after-tax analysis, replacement economy, inflation, and estimation of future events.

Final Project

Course Code	Course Title	Credits	Theoretical	Practical	Pre-requisite	Simultaneous
1372070	Final Project	2	2	0	(after passing 100 credits)	-----

Teaching students how to do research, gather information, and categorize data and present results based on data.

Total	Guide		Course Title		Geomatics Engineering-B.S. Semester Chart										Semester				
	GE Geomatics Eng.	G General Course																	
	S Science	E Elective Course	Credits	Course type according to the guide															
19	Electromagnetic and Optics Physics		Mechanical Physics			Mathematics-I		Persian Language		Physical Education		Computer Programming		English Language		1			
	3	S	3	S	3	S	3	G	1	G	3	S	3	G					
17	Exercise-I		Differential Equations		Engineering Economics		Construction Materials		Fundamentals of Surveying		Islamic Thoughts-I		Fundamentals of Surveying Practical		Mathematics-II		2		
	1	G	3	S	2	E	2	GE	3	GE	2	G	1	GE	3	S			
18	Linear Algebra		Islamic Thoughts- II		Probability &Statistics in Engineering		Road and Underground Surveying Practical		Numerical Methods		Road and Underground Surveying		Fundamentals of Photogrammetry Practical		Fundamentals of Photogrammetry		3		
	3	S	2	G	3	S	1	GE	2	S	3	GE	1	GE	3	GE			
18	Building Construction Methods		Estimation Theory			Fundamentals of Geodesy		Laser Scanners: Theory & Practical		Rite of Life (Applied Ethics)		Differential Geometry		Engineering Mathematics		4			
	2	GE	3	GE	3	GE	3	GE	3	GE	2	G	2	GE	3		GE		
19	Geo-Spatial Information System Practical		Analytical Photogrammetry		Geo-Spatial Information System		Geometrical geodesy		Image Processing		The Holy Quran Exegesis		Geodetic Surveying :Theory & Practical		Pavement Engineering		5		
	1	GE	3	G	2	GE	3	GE	3	GE	2	G	3	GE	2	GE			
19	Satellite Geodesy: Theory & Practical		Construction and Cadastral Surveying: Theory & Practical		Remote Sensing Practical		Geo-Spatial Analysis Practical		Geo-Spatial Analysis		Remote Sensing		Islamic Revolution of Iran		Applications of Photogrammetry Practical		Applications of Photogrammetry		6
	3	GE	3	GE	1	GE	1	GE	2	GE	3	GE	2	G	1	GE	3	GE	
17	Family and Population Knowledge		Project Management		Analytical History of Islam		English for Geomatics Eng.		Physical Geodesy		Cadastre		Hydrography		Microgeodesy		7		
	2	G	2	GE	2	G	2	E	3	GE	2	GE	2	GE	2	E			
13	Internship		Cartography Practical			Cartography			Final Project		Urban Planning		Applications of GIS		8				
	4	GE	1	GE	2	GE	2	GE	2	E	2	E	2	E					