FACULTAD DE INGENIERÍA
DEPARTAMENTO DE AGRIMENSURA
Degree plan:
"LAND SURVEYING ENGINEERING"

1º YEAR

1. MATHEMATICAL ANALYSIS.
   - Relations and functions.
   - Functional limit. Continuity.
   - Derivative.
   - Differential. Mean value theorem.
   - Series. Taylor and Mac-Laurin formulas. Derivative applications and variation of function analysis.
2. NUMERICAL CALCULUS.
   - Matrix operations.
   - Determinant by cofactor expansion. The L*U and Cholesky factorizations method.
   - Inverse matrix: by Gaussian elimination, using the L*U and Cholesky factorizations.
   - Solution of systems of linear equations by Gaussian elimination, using the method of L*U and Cholesky factorizations.
   - Eigenvalues and eigenvectors.
   - Plane trigonometry.
   - Operations with complex numbers.
   - Zero's Function.
   - Interpolation.
3. COMPUTING.
   - Informatics. Introduction. The PC. Programming Languages. Telematics.
   - Windows. Information maintenance. Operating environments. Information organization.
   - Office. Word text processor. Excel spreadsheet. Database. Brief notions.
   - Programming techniques. Introduction. The algorithm. The pseudocode and the structured programming. Mat Lab Applications.
   - Logic: Introduction. The language. The reasoning. Categorical syllogism. Proportional calculus.
4. ANALYTIC GEOMETRY.
   - Rectangular coordinate system.

- Vectors: linear operations. Scalar, vectorial and mixed product.
- Straight line on the plane. Different forms of the straight line equation. Parallelism and perpendicularity between straight lines.
- Plane. Forms of the equation of a plane. Parallelism and perpendicularity between planes and between straight and plane. Geometric interpretation of systems of two equations in three variables and three equation systems.
- Circumference. Conic Sections. General equations. Quadratic equation in two variables. Rotation and translation in the plane.
- Quadric Surfaces. Conicals. Quadrics. Intersection within planes.
- Quadratic equation in three variables. Rotation and translation in space.

5. TOPOGRAPHY.
- Generalities. Concepts. Definitions. Units of measurement.
- The theodolite. Description. Errors. Use.
- Methods for the measurement of horizontal and vertical angles.
- Direct and indirect distance measurement.
- Altimetry. Concept. Definitions. Reference plans. Slopes. Absolute and relative levels.
- The level: Description. Different types. Errors. Use.
- Geometric levelling.
- Eclimetric and trigonometric leveling.
- Tacheometric levelling.
- Barometric levelling.

6. BASIC GEOMETRY
- Geometric projections.
- Representation systems: dihedral system, limited projection.
- True magnitude. Surface development.
- Display.
- The ISO (A) method.
- Dimension
- Scales.
- Cuts and sections.
- Unique projection representation systems.
- Topographical surfaces.

2º YEAR

7. MATHEMATICAL ANALYSIS II
- Functions of several real variables. Differentiation.
- Multiple integrals.
- Curvilinear integrals of surface integral, derivation and integration of vector fields.

- First order and first degree differential equations.
- Complex variable functions.

8. TOPOGRAPHY II
- Wave amplification and rectification. Propagation and antennas. Modulation and detection. Transmission systems.
- Use of electronic instruments.
- Scales. Sketching.
- Planimetry: Cartesian and polar coordinate systems. Directions???
- Interseccions. To the front.Lateral. Pothenot. Hansen.
- Polygonization. Definitions. Clasification. Method, calculation and compensation. Closed polygonal surface calculation.
- Definitions. Classification. Measurement, calculation and compensation. Calculation Surface of a closed polygonal.
- Planimetry surveys: Eclimetry. Formulae. Work methodology. Tacheometry. Formulae.Work methodology.
- .Contour lines.
- Topographical drawing.
- Measurement instruments and approximate representation: Planchette, compass, eclimeters, sextants, optical squares.

9. ECONOMY
- Economy objective and content.
- Productive economic process.
- The market and the goods and services prices.
- Cost theory.
- Basic macroeconomic concepts.
- Money, credit and banking system.
- Administrative management in companies.
- Interest, capitalization and updating.
- Valuation. Rent.

10. PHYSICS I
- Particle Kinematics in one and two dimensions.
- Particle dynamics and particle systems.
- Work and energy.
- Impulse and amount of linear movement.
- Rotation kinematics.
- Rigid body dynamics.
- Statics and elasticity.
- Oscillations and waves.
- Hydrostatics. Hydrodynamics.

- Temperature and heat.

11. APPLIED MATHEMATICS
- Stochastic models: probabilities, stochastic variables, expectations, probability distributions.
- Statistical theory of decisions.
- Statistical theory of estimation.
- Samples.
- Theory of measurement errors.
- Topographic applications.
- Inferential models of regression.
- Multidimensional stochastic models.

12. ELEMENTS OF GEOLOGY AND PHYSIOGRAPHY
- The earth. Origin and constitution. Knowledge evolution.
- Concept of minerals and rocks.
- Internal and tectonic dynamics. Rock deformations.
- Meteorology knowledge. Different meteorological factors. Measuring instruments. Map representation.
- Climatology. Types of weather. Primary formulae. Applications to the Cuyo region.
- Fluvial geomorphological cycle.
- Maritime hydrography. Coast types.
- Glacial and peri-glacial modelling cycle. Regional and provincial toponymy.
- Geology applied to engineering works.
- Hydrogeology and its uses.
- Geological criteria in urban and rural planning.

3º YEAR

13. PHYSICS II

- Geometric optics.
- Physical optics.
- Electrostatics. Electric field. Gauss's Law.
- Electric potential. Electric capacitors and dielectrics.
- Electric power. Resistance.
- Magnetic field.
- Faraday-Lenz law. Inductance.
- Magnetic properties of matter.

- Alternate power.

14. APPLIED TOPOGRAPHY
- Public Works Law. Technical documentation. Contracts. Sheets and specifications.
- Paths: Constitutive and genetic elements. Planialtimetric tracings. Horizontal and vertical curves. Skateout. Longitudinal and transverse profile. Soil movements. Stakeout of works of art. Computing.
- Drains and Channels: Notions of flows. Basins and runoff. Constitutive elements and geometry. Planialtimetric layout. Topographical operations in the field. Computing.
- Electric lines: Notions of the electrical pipes lines. Law. Tension levels. Catenary. Trace choice. Planialtimetric survey.
- Tunnels: Constitutive and Geometric Elements. Planialtimetric support network design. Topographical operations .Computing
- Large bridges: planimetric support network design. Topographical operations. Computing
- Dams: Classification. Different types. Planialtimetric support network design. Digging. Galleries. Complementary installations. Topographic operations.
- Underground topography: Mining exploitation concepts. Underground lifts. Underground lift link with surface ones. Mining tunnels. Mine surveys.
- Special surveys in the industry. The surveyor in the industry. Useful instruments. Calibration. Applications.
- Geometric auscultation of works: Absolute and relative methods
- The surveyor in the project of Works: Use of cartographic background and aerial photographs. Topographic surveys for different projects. Surface digitization.

15. BUILDING ELEMENTS AND AGROLOGY
- Structure elements. Fundamental concepts of simple and reinforced concrete structures, wood and others.
- Masonry elements. Materials and forms of implementation.
- Completion works: Different types. Materials and forms of implementation.
- Carpentry: metalic, wood and others. Ironworks. Glasses.
- Installations: sanitary, electrical, gas. Used materials.
- Budget. Metric calculations. Price analysis. Financial expenses. Benefit.

- Agrology. Agricultural soil. The soil and living beings. Phytogeographic regions. Agricultural exploitation.
- Soil water. Surface and underground water resource. Infiltration. Evapotranspiration. Irrigation efficiency. Endowment.
- Irrigation in agriculture. Irrigation by surface runoff with and without slope. Mechanized irrigation. Microirrigation.
- Taxonomic classification of soils. Series. Complex. Phases. Soil maps.
- Irrigation water. Quality. Classification. Crop tolerance.
- Salinity of soils. Phreatic levels. Revenition. Drainage.

16. SURVEY NETWORKS
- Linear algebra elements. Vector spaces.
- Free and linked topographic networks.
- Parameter adjustment method: Method of variation of coordinates. The mathematical model. The stochastic model. Error ellipses.
- Triangulation. Threealteration. Triangulateration. Its adjustment by the parametric method.
- Adjustment of altimetric networks by parametric method.
- Application programs.

17. LEGAL ASPECTS OF SURVEYING I

- Human behavior ordering. The partial legal systems.
- Elements of the legal relationship. Person, thing, law, causes and forms of the legal link.
- Real rights and possessions.
- The property and its limitations.
- Special property regimes.
- Dismemberment and encumbrances of the property.
- Property protection and other real rights.

4º YEAR

18. BASIC GEOPHYSICS.

- The Earth: Main movements. Internal Constitution.
- Fundamentals of terrestrial potential. Properties. Formulae.
- Equipotential surfaces. Analysis. Formulae.
- Earth gravitational field. Geoid. Ellipsoid of revolution.
- Gravitational force measurement. Instruments used. Operation. Corrections. Anomalies. Formulae.
- Isostacy. Theories. Pett system. Airy system. Airy- Hriskanen system.

- Earth magnetic field. Origin. Components. Declination and inclination. Variations. Magnetic storms. Measurement methods. Magnetometers. Magnetic anomalies. Poissión relation.
- Paleomagnetism.

19. SURVEY PARCELLING

- Land Surveying. Survey parcelling. Definitions. Classification.
- Survey Performing. Definitions. Regulations. Links.
- The survey plane. Parts. Regulations. Registration. Demarcation.
- Particular cases. Surpluses. Denomination. Concept. Transcendence.
- Boundering. Definition. History. Urban and rural boundaries.
- Horizontal properties surveying. Legal regime. Pre-horizontality. Regulations.
- Mining ownership survey.
- Judicial survey. Judgments. Requirements. Procedures.

20. VALUATIONS:

- Generalities. Definitions. Criteria. Purpose.
- Urban land free of improvements. General and particular factors. Relative proportions.
- Irregular parcels. Minor and severe irregularities. Valuation methods. Charts.
- Square parcels. Indexes. Coefficients. Valuation method. Charts.
- Building value. Valuing factors. Depreciation. Valuing methods. Charts.
- The parcel total valuation. Different methods.
- Rural valuations. Determining factors.
- Value of different types of crops. How to determine them.
- Asset valuations.
- Special valuations. Of real rights. Of expropriations. Others.

21. GEODESY I:

- Astronomy. General concepts. Time.
- Reference systems used by Astronomy: Ecliptic, Absolute Equatorial, Local Equatorial and Astronomic Horizontal. System link.
- Geodesy: Generalities.
- Reference systems used by the Geodesy: Instant Terrestrial, Middle Terrestrial, Instant Horizontal and Middle Horizontal. System Link.
- Ellipsoid of Revolution. The normal line.

- Curves over the ellipsoid of revolution: parametrics, normal sections, geodesics and loxodromic.
- Parallel Circle Arch and Meridian Ellipse Arch.
- Theorems: Meusnier, Euler, Clairout and Guderman.
- Absolute Geodetic Positioning: Absolute Geodesic Coordinates.
- Geodesic Horizontal System: Middle Terrestrial System link.
- Vertical Deflection.
- Relative Geodetic Positioning: Relative Geodesic Coordinates. Datum.
- Absolute Geodetic System and Relative Geodetic System link. Use of three and seven parameters. Parameter Determination.

22. PARCELLING AND URBANIZATIONS:

- Planning concept and definition. Elements of the planning process.
- Urban and regional functions. Expansion and urban growth. Residential function. Commercial function. Industrial function.
- Urban infrastructure. Urban equipment.
- Suburban and rural areas.
- Subdivision of parcels. Current regulations. Alternatives. Feasibility. Pre-projects. Calculus. Plan preparation. Stakeout.
- Parceling for neighborhood construction. Regulations. Design. Pre-projects. Calculus. Planning preparation. Layout.
- Level projects for neighbourhood construction. Environmental impact due to neighborhood construction.
- Urbanization costs.
- Property valuing susceptible to be fractionated.
- Integrative practice.

23. REMOTE SENSING AND PHOTOINTERPRETATION:

- Remote perception. Introduction. Fundamental principles. Electromagnetic energy. The atmosphere. Objects. Spectral characteristics. Signature.
- Remote sensors. Classification. Features. Spectral bands and resolution. Sensitive materials. Chromatic sensitivity. The digital image. Features.
- Digital image processing. General methodology. Image types and characteristics and data base. Radiometric and geometric corrections. Image enhacement. Classification: supervised and not supervised. Geometric correction. Image Georeferencing. Digital cartography preparation and printing. Radar images: terrain digital models by interferometry.

- Photointerpretation. Principle of stereoscopic vision. Characteristics of objects in photographic images. Interpretation methodologies. Deduction process for image interpretation. Introduction to the interpretation of satellite images. Applications in the field of surveying.

5º YEAR

24. GEODESY II:

- Reduction of angles and distances to the ellipsoid of revolution.
- Geodetic transport of coordinates: direct problem and inverse problem.
- Geodetic levelling: geopotential difference in height. Geopotential dimension. Orthometric dimension. Its determination. Instruments.
- Orbital system. Keplerian elements. Local coordinates of a satellite.
- GPS global positioning system: generalities.
- Absolute positioning. Relative positioning.
- Type of GPS receivers.
- Use of the GPS navigator.
- Measurement techniques: static, kinematic, real-time navigation, etc.
- The GPS campaign.
- Compensation of GPS networks by the method of variation of coordinates.
- Application programs.
- Datum Change Application. POSGAR network.
- Other positioning systems: very long base interferometry (VLBI), Laser Distance to the moon (LLR) and laser distance to the satellite (SLR).
- The GLONAS system.

25. MATHEMATICAL CARTOGRAPHY:

- Cartographic process: Conception, parametric representation and vectorial of surfaces.
- Flat representation of surfaces. Ellipsoid of Tissot. Main directions.
- Azimuthal geographic projections.
- Cylindrical geographic projections.
- General formulas for conformal representations.
- Conformal representation of Gauss Kruger. Adaptation of the rules of the Military Geographic Institute.
- Analysis of the Gauss Kruger representation. Measurement reductions and calculations in the plane. Use and precisions. Application programs.

- General formulae for equivalent representations.
- Cartographic process. Production. Utilization.
- General rules for the preparation of a cadastral cartographic record.
- Digital Cartography.

26. CADASTRE:

- The cadastre. General concept. National and provincial laws. Organization. Registration. Cadastral Folio.
- Cadastre implementation. Methodologies. Programming. Photogrammetry and photointerpretation in the implementation.
- The parcel. Definition. Elements. Different classes. Surplus. Demarcation. Cases.
- Constitution and modification of the parcel status. Registration. Different cases. Registration update.
- Legal regime of horizontal property. Concepts. National and provincial laws. Regulation of co-ownership and administration.

27. GEOGRAPHIC INFORMATION SYSTEM (G.I.S.):

- Introduction to the theory of systems.
- The geographic data. The spatial component, the thematic component. Interrelation.
- Data structure. Vector model, Raster model. Conversions.
- System components.
- The Vectorial Geographic Information Systems.
- Information acquisition.
- Data processing. Georeferencial databases. Relational bases.
- Information search, recovery and analysis. Types of query to the system. Digital cartographic deployment.
- Spatial analysis and analysis of networks in a system.
- The Raster geographic information systems.
- Information acquisition.
- Data processing.
- Geographic Information viewers and explorers.
- Georeferenced Information Systems applications to: Territorial Cadastres, multipurpose Cadatstres, communes.
- Legal aspects related to territorial information systems.
- Land digital models (MDT)

28. LEGAL SURVEYING II:

- Legal aspects of the cadastral legislation and parcel surveying acts.

- Real-estate advertising. Real rights advertising. Cadastral advertising.
- New forms of domains: country clubs, private neighborhoods, private cemeteries, surface rights, timeshare.
- Riverside lines.
- The surveyor's judicial function.
- Expropriations.
- Successions.
- The surveyor and his professional organization. Professional carrer. Responsibility.
- Professional ethics.
- Integrative practice (legal-cadastral-valuations area).

29. PHOTOGRAMMETRY:

- Photographic image acquisition system: the metric camera. Films and filters. Calibration. Methods.
- The photogrammetric process. Projects. The photographic flight. Planning. Processing and use of frames.
- Use of isolated frames. Image rectification. Mosaics.
- Stereoscopic exploitation of consecutive frames. The photogrammetric model. Analogue and numerical photogrammetric restitution. The differential rectification.
- Capture and use of spatial data for the management of digital elevation models. Graphical representations in CAD and SIG system.
- Digital photogrammetry: the digital image. Mono and stereoscopic visualization methods. 3D measurements. Process automation and data capture. Image correlation. Digital models of terrain and orthophoto.