## B. CONTENT OF COURSES

<table>
<thead>
<tr>
<th>General computer science 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code: IG1-1 1</td>
</tr>
<tr>
<td>Professor: Mr PAILLE J.</td>
</tr>
</tbody>
</table>

### COURSE PLAN

**Presentation of the course – General remarks on computer science**
- History, computer architecture, programs
- Possibilities, limits and perspectives of computing systems

**Mathematical tools for computer science**
- Logic, numeration and coding of numbers
- Notion of algorithms and evaluation of complexity

**Structured programming**
- Revision on Pascal language, manipulation of files
- Writing, programs documentation tests

**Operating systems**
- History, role of an operating system
- Presentation of the UNIX and DOS systems
- Control under UNIX and DOS, shell scripts, communications under UNIX
- Administration and security under UNIX, the future

**Documentation**
- How do we get information ?, How do we inform ?

**Project management**
- The analysis – design – implementation cycle
- Presentation of a method of analysis
- Presentation of the project

**Office tools**
- Spreadsheet, word processing

**Networks**
- Network architecture and model – Study of the ISO model

**Databases**
- Databases management systems models, manipulation languages, presentation of Oracle

### ASSESSMENT

- 6 applications of 2 hours 30
COURSE PLAN

Introduction
- Presentation of « modern physics »
- Dimensional analysis
- Orders of magnitude in physics

From classical mechanics to restricted relativity
- Introduction: classical principle of relativity / Measurement of the wind of ether
- Postulates of relativity
- Relativist transformation: Lorentz transform / Speed transformation
- Consequences: Relativity of simultaneity / Dilation of temps / Lengths contractions / Movement energy and quantity
- Relativist effects: Radiation of a moving particle / Doppler effect

Quantum physics
- Introduction: the quantum world / Waves and particles
- Wave/particle duality: Is light a wave ? / Is an electron a particle ?
- New concepts : Neither wave, nor particle: quants / Notion of quantum state
- Wave mechanics: L2 space/ Postulates of quantum mechanics / "Free" quanton / Quanton in a potential / Spin / Identical quants

Structure of matter
- Atoms: Hydrogen atom / Helium atom / Complex atom / Periodic classification of elements
- Molecules: molecular links / molecular spectrum
- Revision on statistical physics
- Solids: crystalline structures / electronic structure

ASSESSMENT
- 3 applications of 2 hours 30.
- 1 written exam of 2 hours 30.
COURSE OBJECTIVE

Equip students with the necessary mathematical tools and methods to study the basic technical and scientific subjects in engineering (fluids mechanics, structures mechanics, acoustics, signal processing, numerical analysis, technological subjects...). The aim of this course is to spare the teaching of these mathematical tools and methods common to all these courses to the professors who teach these basic subjects.

COURSE PLAN

Complex analysis
Complex functions of complex variables, holomorphy, Cauchy theorem, Cauchy integral, multiformity, notion of Riemann surface, analyticity, Taylor series, Laurent series, residuals, integral calculation by the method of residuals, Jordan formula.

Harmonic functions
Definition, theorem of the 2 H, properties, average, maximum principle, Poisson theorem, Dirichlet problem.

Special functions
Euler functions of the 1st species, Legendre polynomials, Weber-Hermite functions, Tchebychev polynomials, Bessel functions.

Fourier series
Definition, Fourier series of a locally summable function, of a distribution, convergence, revision on Hilbertian bases, Bessel-Parseval theorem, harmonic analysis.

General remarks on PDE of the 2nd order
Types of PDE, canonical forms, classification, homogeneity, existence and uniqueness of solutions, initial value problems, separation of variables, modal method.

Green's function
Introduction, principle of solution of a PDE, fundamental solutions, application to Laplace's equation in IR.

Integral equations
General remarks, major types of integral equations, application to the solution of PDE, example on Laplace equation and Helmholtz equation, methods to solve integral equations: method with Laplace transform, case of degenerated nucleus for homogenous or non-homogenous equations, numerical methods (collocation, double projection).

Variational methods
General remarks on variation calculation, Euler theorem, equivalence between a physical problem and a variational principle, examples, method of Ritz, introduction to the finite element method.

ASSESSMENT
- 3 applications of 2 hours 30
- 1 written exam of 3 hours

BIBLIOGRAPHY
- Analyse réelle et complexe par W. RUDIN (Masson)
- Compléments de mathématiques par A. ANGOT (Edition de la Revue d’Optique)
- Méthodes mathématiques pour les sciences physiques par L. SCHWARTZ (Hermann)
- Introduction to integral equations with applications par J.J. JARRY (Pure and applied mathematics)
COURSE OBJECTIVE

- Building the so-called "LEBESGUE" integral calculation method:
  In the specific case relating to functions defined in IR, with values in IR, compared to the
  Lebesgue measure in the general frame of measured spaces (Ritz theorem, Hölder and
  Minkowski inequalities. $L^1$ et $L^2$ spaces, Fubini, Stokes, Ostrogradski and Green change of
  variable formula)
  Laplace transform
- Brief study of some classical operational spaces Co, Cc, S, D. Introduction to the notion of
  distribution and tempered distribution. Laplace derivative and transform of a distribution.
  Introduction to the notion of Green's function.

ASSESSMENT

- 3 applications of 2 hours 30
- 2 written exams of 2 hours 30

BIBLIOGRAPHY

- Analyse réelle et complexe, Walter RUDIN, Editions Masson
- Calcul intégral (maîtrise mathématiques C2), A. GUICHARDET, Editions Armand Colin
DIFFERENTIAL CALCULUS

Code: IG1-5  ECTS credits: 2  Semester: 1
Professor: Mr GUILLERMIN

COURSE OBJECTIVE

Give students the basics of differential geometry that will allow them to go deeper into this subject later, if need be.
This presentation allows to define some mathematical elements often used in physics, such as tensors, metric invariants, differential forms, mobile bases. The aim is to exempt the professors who teach courses using differential geometry concepts from presenting these tools in detail.

COURSE PLAN

Euclidian spaces
- Coordinates systems.
- Change of coordinates.
- Euclidian space (Curve in the Euclidian space – Quadratic forms and vectors).
- Riemann's spaces (Riemann's metrics).

Théorie des surfaces
- Geometry of surface in space (Coordinates on a surface – Tangent plan - Metric on a surface – Surface area).
- Second fundamental form (Curvature of curves on a surface - Invariants quadratic forms).

Tensors
- Examples of tensors.
- General definition of a tensor.
- Algebraic operations on tensors (Permutation of indices - Contraction of indices – Tensorial product).
- Tensors of the (0,k) type (differential notation of tensors with lower indices – Alternate stress tensors of the (0,k) type – Outer product of two differential forms – Exterior algebra).
- Tensors in Riemannian space (indices up and down – Initial value of a quadratic form – The operator - Tensors in the Riemannian space).
- Effects of an application on tensors (Restriction of lower indices tensors – Tangent spaces applications).

Differential calculation on tensors
- Differential calculation on alternate tensors (Gradient of an alternate tensor – External differential of a form).
- Alternate tensors and integration theory (Integration of differential forms – Stokes formula).
- Covariant derivation (Euclidian connection – Covariant derivation of tensors of any rank - Derivation and metrics – Parallel transport of vectors - Geodesic - Connections associated to metrics).

ASSESSMENT

- 4 applications of 2 hours 30.
- 1 written exam of 3 hours.

BIBLIOGRAPHY

- « Systèmes différentiels et systèmes extérieurs » E. CARTAN, Éditions Hermann.
- « Eléments de calcul tensoriels » A. LICHNEROWICZ, Éditions Armand Colin.
- « Leçons de géométrie » M. POSTNIKOV, Editions MIR.
- « Applications of tensor analysis » A.J.MC CONNELL, Dover publications inc.

This bibliography is not exhaustive. There are many other books on these subjects.
COURSE OBJECTIVE

This course on "applied statistics" aims at presenting inference methods on the statistical model based on sampled data. Statistics are a set of methods used in data processing, and based on probabilistic hypotheses. Solid knowledge on the calculation of probabilities directly related to statistical applications is necessary to attend this course.

COURSE PLAN

Probability theory: events, sum and product of events, event algebra, notion of probability, equiprobable events and application of rules, linked events and conditional probabilities, eclectic probability axioms, total probabilities and stochastic independence
Random variables: introduction, types of random variables, repartition function, function of a random variable, mathematical expectation, generative function and Tchebychev’s inequality
Linked events and stochastic independence: introduction, joint repartition function, relation between joint and marginal laws, conditional laws of a couple, conditional expectation, conditional momentum, moment generative function, stochastic independence and law of a random variable function.
Some laws of specific probabilities
- discrete classical laws: uniformity law, Bernoulli law, trinomial law, multinomial law, negative binomial law, geometric law, hypergeometric law, Poisson law
- continuous law: uniformity law, Gamma Law, exponential law, Chi-2 law, normal law, bivariate normal law, Beta law, Student’s and Fisher’s law.
Asymptotic laws
Introduction, generative functions of asymptotic momentum, central limit theorem and some theorems on the asymptotic law.
Sampling
Notion of sampling, law of averages and empirical variance
Statistical estimation
Introduction, spot estimation, measures of comparison of estimators, sufficient estimator, empirical moments estimation method, confidence interval and some classical intervals estimation.
Statistical tests
Introduction, Neyman-Pearson test, Uniformly Most Powerful (UMP) test, maximum-likelihood-ratio test, adjustment test and comparison tests.
Statistical decision theory and Bayesian analysis
Introduction, statistical decisions, Bayesian estimation, Bayes test
Linear regression model
Introduction, simple models, multiple regression, model adjustment, regression assumptions, confidence interval and statistical tests

ASSESSMENT

- 8 applications of 2 hours 30
- 2 written exams of 2 hours 30
**Spherical Trigonometry**

<table>
<thead>
<tr>
<th>Code: IG1-9</th>
<th>ECTS credits: 2</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr TOULMONDE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

The main course objective is to gain a mastery of space through spherical and rectilinear trigonometry calculus.

**COURSE PLAN**

Revision on plane triangles: Plane triangle formulas – the 4 classical cases – non classical cases – resolution of quadrilaterals

Spherical trigonometry: Spherical triangle formulas – The 6 classical cases – rectangle triangles - usual applications.

**ASSESSMENT**

- 3 applications of 2 hours 30
- 1 written exam of 3 hours

---

**Strength of materials**

<table>
<thead>
<tr>
<th>Code: IG1-21</th>
<th>ECTS credits: 3</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr BOHUON</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

Learn the basics of materials resistance so as to be able to solve simple problems and move on to more complex problems in the best conditions.

**COURSE PLAN**

- General remarks on beams.
- Geometric characteristics of sections.
- Traction, compression
- Flexure
- Introduction to buckling
- Torsion of round bars
- Torsion of any section bars
- Calculation of displacement - Hyperstatic beam
- Hyperstatic structures. Force methods
- Contraint and deformation state - Mohr's circle
- Oscillation of elastic structures.

**ASSESSMENT**

- 5 applications of 2 hours 30
- 1 written exam of 2 hours 30
- 1 oral test

**BIBLIOGRAPHY**

- Résistance des matériaux – ALBIGES & COIN (Eyrolles)
General Computer Science 2

<table>
<thead>
<tr>
<th>Code: IG1-1</th>
<th>ECTS credits: 2</th>
<th>Semester: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Professors: Mr PAILLE-BRINGUIER</td>
</tr>
</tbody>
</table>

COURSE PLAN

- See General Computer Science 1

ASSESSMENT

- 3 applications of 2 hours 30
- 1 project
- 1 oral presentation

Numerical Analysis

<table>
<thead>
<tr>
<th>Code: IG1-6</th>
<th>ECTS credits: 3</th>
<th>Semester: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Professor: Mr MONTFORT</td>
</tr>
</tbody>
</table>

COURSE PLAN

Introduction
- Usefulness and limitations of numerical methods
- First definition of numerical analysis
- Problems to solve
- Development in Taylor's series

Numerical integration
- Method of approximation by collocation, interpolation and extrapolation methods: Lagrange polynomial forms; Neville-Aitken algorithm, interpolation abscisses optimal choice. Use of orthogonal polynomials: Tchebychef's polynomials, Richardson's extrapolation
- Numerical integration: trapezoid method, Simpson's method, Newton-Cotes' method, Romberg's method, Gauss' method

Differential equations integration
- Introduction
- Cauchy's problem
- Euler's method
- Taylor's method
- Runge-Kutta's method
- Multi-step method
- Differential equations systems
- Higher order equations

Resolution of partial derivative equations: the finite difference method
- Calculation of derivatives
- Second order partial derivative equations
- Numerical analysis of finite difference schemes

Matricial numerical analysis
- Resolution of an equation linear system
- Conditioning of a linear system
- Method of calculation of initial and vector values of a matrix

Method by finite elements
- Principle of the method by finite elements (or weighted method residuals) - Galerkin's method
- Isoparametric elements
- Choice of other weight functions
- Mixed limits conditions
- Advantages and drawbacks of the finite elements method

ASSESSMENT

- 3 applications of 2 hours 30
- 1 written exam of 3 hours
Applying of Laser processes

<table>
<thead>
<tr>
<th>Code: IG1-7</th>
<th>ECTS credits: 0</th>
<th>Semester: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Professor: Mr CHERBIT</td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

Access to advanced technologies in laser topography.

**COURSE PLAN**

- Revision on laser
- Geometric properties of the laser beam
- Topographic applications: location, centring, alignment, guidage

Geomorphology

<table>
<thead>
<tr>
<th>Code: IG1-13</th>
<th>ECTS credits: 1</th>
<th>Semester: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Professor: Mr PERSON</td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

This course is an introduction to the concepts of geomorphology and is designed to enable an engineer-geographer to:

- Understand the preoccupations and language of the specialists who work in team to realise civil engineering projects
- Understand the degree of stability and permanence of current soil forms, which make their description even more important
- To better analyse the forms of soils, which has an influence on the quality and method of representation

**COURSE PLAN**

**First part: global aspect**

- General remarks, description of the earth: terminology, internal constitution of the globe
- Geomorphology: factors, erosion, classification of geomorphologic facts
- Geomorphologic analysis: documents to use, analysis
- The Paris basin: the quaternary and tertiary periods, the Paris basin formations

**Second part: details on some subjects**

- General remarks: geomorphology, various aspects, erosion – agents and factors
- Forms of relief linked to water running: superficial waters flow, definitions, types of flows, rivers
- Ice forms: glaciers, ice deposits, glaciary forms
- Desert morphology – Wind morphology: characteristics of desertic areas,
- Coast morphology: agents of coast erosion, genesis of coast forms, types of coasts, coast forms

**ASSESSMENT**

- 2 applications of 2 hours 30
- 1 visit

**BIBLIOGRAPHY**

- Cours de géomorphologie de l’université de Lausanne
- Précis de géomorphologie, M. DERRUAU
- Publications diverses IGN
- Documentation interne ENSG
COURSE OBJECTIVE
Give students the essential parameters for the elaboration of a road project (essential characteristics: plan, longitudinal section…) and to make them aware of the various aspects of road projects (integration, environment, security…)

COURSE PLAN
General remarks:
- The road: its status, functions and equipment
- Constitutive elements of a platform
- Notion on interchanges, intersections, crossroads
- Fundamental parameters of road projects
- Association, trace, cross section and longitudinal section
- Introduction to superelevation
- Crossroad
- Geometry
- Notion of traffic light controlled crossroads
- Notions of weaving
After these technical aspects, a look at the environmental dimension and road sharing:
- Fight against transport noise, the various tools and some notions on noise
- Fight against speed, security improvement, the road and the landscape, plants and lisibility
- Environmental study methodology

ASSESSMENT
- 4 applications of 2 hours 30
- 1 oral test

BIBLIOGRAPHY
- List of SETRA and CETUR publications
- A number of books (ICTAAL – ICTARN – ICTAURU – Carrefours à feux… Prise en compte du paysage).
COURSE OBJECTIVE

Presentation of public communication networks and other networks together with their constraints and issues.

COURSE PLAN

Definition of Public communication networks and other networks
- Their objectives
- Reasons for grouping road networks and other networks
- Their role in urban planning operations
- Their integration in the environment

The communication network
- Road network, equations of movement of a vehicle and resulting geometrical parameters (bead seat radius grade line and plan, superelevation, braking distance, visibility, project geometry, study of a grade line and horizontal alignment scheme, conception of pavements (flexible and rigid), environment protection, noise protection, plot hold (studies of cross-sections)
- Pedestrianized area, cycle lanes, new conceptions

Drinking water supply system
- Design
- Written exam, catch system, waterworks system, tanks, etc...calculations, safety measures (fire, boosting), etc...
- Economic study – detail study of a reservoir
- Water protection : comments on « water Act »
- Scheme « rough out »

Sewerage system
- Conception, written exam, calculation
- New conceptions (detention tank, European directives... « water protection »
- Disposal to river : pollution control, flood control

Other networks
- EDF, GDF, Pet T, lighting, etc...
- Safety measures, siting measures

Public communication network project development
- From scheme to final certificate (CCTP, CDAG etc...)
- Impact assessment, October 1977 and following acts, regulation and content of impact assessment
- Security measures, P.H.S.
- Quality : QAP (short brief)

Remarks:
The course will only present the effect of vehicles movements on geometrical parameters, as the values of the latter are given in Mr Chanteloup's lectures.
The impact study, announced in the preceding chapters – in particular the one on public roads – is integrated in the project as well as P.H.S. and Q.A.P.

ASSESSMENT
- 3 applications of 2 hours 30
- 1 oral test

BIBLIOGRAPHY
- Guide pratique des V.R.D. (Ministère de l’équipement)
- La pratique des V.R.D., édition du Moniteur des travaux publics
Research techniques

<table>
<thead>
<tr>
<th>Code: IG1-48</th>
<th>ECTS credits: 0</th>
<th>Semester: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr MOREL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

- Make engineers aware of the interest of applied research in the industry
- Present training through research at ESTP

**COURSE PLAN**

- The approach
- Research in the industry
- Training through research
- Research at ESTP
- Innovative projects in companies

Topometry

<table>
<thead>
<tr>
<th>Code: IG1-24</th>
<th>ECTS credits:</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr BALARD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

The most usual application of topometry consists in establishing the frame necessary to the realisation of plans by the production of a set of points of reference in a coordinates system. The precision of the coordinates needed usually depends on the scale of the plan. But topometric techniques include a wider range of uses from the geodesic network (even if they have largely been replaced by spatial techniques) to the micro network (structures, industrial controls), where required precisions can be strict.

The main objective of this course is to make students aware of the precision reached; it focuses on the many systematic errors that can be generated by these techniques. This aspect is thus favoured (rather than pure classical topometric calculation) as we think that it is better suited to the role of the engineer, even if in most cases this precision is not necessary.

**COURSE PLAN**

- Introduction
- Lambert’s representation
- Faults – errors
- Centerings
- Distance measurement
- Altitude measurement
- Determination process by angle measurement
- Adjustment (least-square method)
- Benchmark change (plane)

**ASSESSMENT**

- 4 applications of 4 hours
- 1 written exam of 3 hours
- 1 project
- 2 papers at home

**BIBLIOGRAPHY**

- Topométrie: théorie des erreurs. Géodésie par J.J. LEVALLOIS (Eyrolles)
- Topographie générale par R. D’HOLLANDER (Eyrolles)
- Publications diverses I.G.N. (documentation interne ENSG)
COURSE OBJECTIVE

Enable the student to:
- Through the theoretical course:
  - Understand how the theodolite and level work, instrumental errors and the mechanisms or operations to correct them, and discover digital equipment (electronic tacheometer, GPS system and local geographical information management systems).
- Through the tutorials:
  - Become familiar with the various angle and/or length measurement instruments, by realising works in the frame of elementary topographic operations.
  - To understand more easily the courses they will have to attend later in the same field thanks to a concrete approach of topography.

This course should not to be regarded as a general topography course.

COURSE PLAN

- The theodolite. Setting up at a station
- Horizontal angle measurement, reiteration, round of horizontal angles, precision
- Distance measurement. Chaining. Paralactic measurement
- Vertical angle measurement. Trigonometrical levelling
- Plane table survey
- Experimental study of the theodolite, measurement of specific elements, instrumental error calculation
- Levelling. Level change measurement. Level with separate bubble, automatic level, precision level, digital level
- Classic tacheometer, electronic tacheometer
- Digital survey without paper or pencil (direct transfer from the measuring instrument to the computer).

GPS system
- Presentation of the GPS system (classroom)
- GPS field observations (real time and delayed results)
- Densification of a local network of control points by GPS

ASSESSMENT

- 10 tutorials of 4 hours
COURSE PLAN

Nature – societies relations
- Environment,
- Planning,
- Biodiversity/Planning.

Analytic assessment and sector objectives of the PNE (national plan for the environment)
- Air pollution,
- Continental waters,
- Coastal waters,
- Waste,
- Security, industrial environment and risks,
- Noise,
- Control of products,
- Protection of Nature and landscape policy,
- Urban ecology.

The “Earth” system
- Abiotic components,
- Living components,
- Stable and unstable environments,
- Man dependence on nature.

Environment in industrialised societies
- Natural risks,
- Risks related to human activities,
  The country:
  Medium mountains and country desertification,
  Humid areas,
  Constraints and risks in urban environment – Urban ecology:
  Coasts – mountains, planning and environment.
- The exposure to risks plan – a preventive tool.

Environment in developing countries
- Natural risks in developing countries,
- Urban growth and environment in developing countries,
- Pollutions, technological risks and waste in developing countries,
- Agriculture and environment in developing countries,
- Government projects.

ASSESSMENT
- 1 paper of 4 hours in which students are asked to make a synthesis on the «environment and planning» dossier that has been given to them and to make proposals on the same subject.
- 2 applications of 2 hours 30
Astronomy
Code: IG1-23   ECTS credits: 1   Semester: 2
Professor: M. TOULMONDE

COURSE PLAN

Introduction:
- Definition of astronomy
- Astrometry

The earth in motion
- Movement of the earth around the sun
- Disrupted movement
- Earth diurnal motion

Celestial, terrestrial and local coordinate system
- Equatorial coordinate system
- Terrestrial coordinate system
- Local coordinate system
- Celestial sphere
- Astronomical triangle

Time scales:
- Introduction
- Notion of time scale
- International Atomic Time (IAT)
- GPS time
- Universal time (UT)
- Calendars

Astronomic determinations:
- Determination of azimuth
- Astronomic position determination

Unit systems:
- Astronomic system
- Astronomic unit system

ASSESSMENT
- 1 application of 4 hours
- 1 written exam of 2 hours

Computer technics for Surveying
Code: IG1-25   ECTS credits: 1   Semester: 2
Professor: Mr BARGY

COURSE OBJECTIVE
Apply general computer science knowledge to topography and cartography.

COURSE PLAN
2 sessions on consoles (4 hours + 2 hours).
Reading, transformation of files and rewriting of transformed files in topography and cartography.
- Exchanges Formats. Ex: ASCII => DXF
Data Exchange Between Graphic Data and descriptive data, GIS set up (Thematic, quantitative...)

ASSESSMENT
- 2 applications of 3 hours
- 1 project
**Surveying Instruments 2**

**Code: IG1-26**
**ECTS credits: 3**
**Semester: 2**
**Professor: Mr NATCHITZ**

**COURSE OBJECTIVE**
See topographic instruments 1

**COURSE PLAN**
See topographic instruments 1

**ASSESSMENT**
- 12 tutorials of 4 hours
- 1 oral test

**Mechanics of Incompressible Fluids**

**Code: IG1-27**
**ECTS credits: 2**
**Semester: 2**
**Professor: Mrs TOUZE-FOLTZ**

**COURSE OBJECTIVE**
Give basic notions on hydraulics and general equations.
Equation applied to pressure line fluid flow calculation.

**COURSE PLAN**
- General notions: fluid, viscosity, pressure, fluid compression, fluid kinematics
- Hydrostatics, general equation, Archimede’s theorem, resultant force
- Hydrodynamics, mass conservation, hydrodynamics of perfect fluids, Bernoulli’s equation, Euler’s equation
- Head loss in pipeline under pressure: linear, singularities, dimensional analysis theorem, Reynolds experience, linear mass loss coefficient, examples
- Euler’s theorem applications: broken line, convergence, current duct section
- Laminar flow in pressure line

**ASSESSMENT**
- 3 applications of 2 hours 30
- 1 written exam 2 hours 30

**BIBLIOGRAPHY**
- L’hydraulique générale et appliquée de M. CARLIER, éditions Eyrolles
- Manuel d’hydraulique générale de A. LENCASTRE, éditions Eyrolles
- Mémento des pertes de charge, coefficients des pertes de charge singulières et de pertes de charge par frottement de IDEL’CIK I.E., éditions Eyrolles
- Aide mémoire d’hydraulique urbaine de J. BONIN, éditions Eyrolles
- Cours d’hydraulique de B. NEKRASSOV, éditions de Moscou
- Eléments d’hydraulique de A. CAUVIN et H. GUERRE, éditions Eyrolles
COURSE OBJECTIVE

Make students familiar with the use of computerised topographic tools. This course is not a repetition of topographic concepts already presented in other courses but a way to make students discover the complete operating process from data acquisition to the transfer towards computers. Students will have to master the different types of instruments (total stations, bar-code levels, GPS) and be able to use them all equally.

COURSE PLAN

Total stations : 3 applications
- Presentation of various total stations (device precision level, CG/CD)
- Structure of a field journal (data format and internal parametring)
- Data retrieval and transfer to a computer (with or without software)

Electronic levels: 1 application
- Presentation of various bar-code levels (device precision level)
- Data retrieval and transfer to a computer (with or without software)

GPS receivers : 1 application
- Introduction to the use of a GPS receiver in RTK
- TPS data compilation with GPS data

ASSESSMENT

- 5 applications of 4 hours
Laboratory: Topography

<table>
<thead>
<tr>
<th>Code: IG1-50</th>
<th>ECTS credits: 2</th>
<th>Semester: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr Villesuzanne</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

Implementation of topographic methods.
Calculation methods used in the typical land surveyor tasks.

**COURSE PLAN**

**Application 1**
- Notions on measurement units, general form of the earth, the NGF network, the RGF, Lambert's projection and topographic processes
- Elements of topometric calculation and practical exercises: the topometric circle, station « Go » calculation, grid bearing transmission, transformation of polar and rectangular coordinates (P<>R and plane triangle resolution.

**Application 2**
- Calculations for the solution of trigonometric problems, bearing transmission and transformation of coordinates P<>R.

**Application 3**
- Calculation of coordinates (E,N) of the general control network of a multiple (4 or 5 sights) intersection point
- Alternative: calculation of a point of multilateration

**Application 4**
- Calculation of coordinates (E,N) of the general control network intersection point
- Alternative: calculation of an intersection point

**Application 5**
- Observation and altitude calculation of coordinates through the fast Cholesky method of levelling

**Application 6**
- Use of planetable: goniometric method traverse, intersection point, resection point, detail point lever
- Complements depending on possibilities: round of horizontal angles with a precision theodolite

**Application 7**
- Layout of a land lot, a new alignment and a projected construction

**Application 8**
- Layout of a clothoid and an annular brick arch, control lever

**Application 9**
- Complete tacheometric lever: polygonization, detail points, local level points x,y and H level points.

**Application 10**
- Tacheometric lever calculation (use of Excel and data transfer programs)
- Plane with level curves

**ASSESSMENT**

- 10 tutorials of 5 hours
COURSE OBJECTIVE

This course has two objectives. First, a practical one: teach students how to use the AUTOCAD computer-aided design software because they will need it in the course of their studies. The second aim is to present the basic principles behind all CAD software, and thus offer them a method that will enable them to rapidly understand and use the different types of CAD systems they will inevitably come across during their professional career.

COURSE PLAN

Introduction to CAD
- Modelling in 2D and 3D
- Calculations and simulation
- Exchange of computerised data
- Some fundamental concepts
- "Object" space and "paper" space

Introduction to AUTOCAD
- Autocad screen
- Control entry
- Use of "Blocks"
- The layer structure of Autocad models

This course is based on a great number of exercises. Students work in groups of two.

ASSESSMENT

- 6 applications of 3 hours
- 1 written exam of 3 hours
- 1 project on floppy

APPRENTICESHIPS BY TRAINING

COURSE OBJECTIVE

Organise first-year engineering students first contact with work on building sites, make them discover the difficulties and constraints of realisation and implementation of civil engineering techniques.

COURSE PLAN

- Workshop n°1 = Beams
- Workshop n°2 = Civil engineering
- Workshop n°3 = Water conveyance - Decontamination
- Workshop n°4 = Road

ASSESSMENT

- 1 application of 8 hours.
**General Accounting**

<table>
<thead>
<tr>
<th>Code: IG1-42</th>
<th>ECTS credits: 2</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr GEAY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

Understand the role of the accounting function and of the function in the company and acquire the basic vocabulary. Understand the main mechanisms of general accounting.

**COURSE PLAN**

**General presentation of the accounting system:**
- Management systems and tools; general accounting and other types of accounting.
- The balance sheet: notion of statement, employment, resources, risks.
- Income statement: consumption and production.
- Link between operations, funds and balance sheet.

**The mechanisms:**
- Operating principles, theory of accounts.
- The accounting plan.

**Operations Result:**
- Operating costs.
- Reserve and provisions.
- Stocks problems.

**Elements of financial analysis:**
- Analysis of the result: added value, earnings before interest, taxes, depreciation and amortization, ...
- Balance sheet equilibrium, financial structure ratios.
- Profitability and productivity.

**ASSESSMENT**

- 5 applications of 2 hours 30
- 1 written exam of 2 hours 30

---

**Land Law**

<table>
<thead>
<tr>
<th>Code: IG1-45</th>
<th>ECTS credits: 1</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mrs ROMANET</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE PLAN**

**Property law**
- Chapter 1: Classification of property and rights: real, personal and intellectual rights, corporeal and incorporeal property, movables and immovables
- Chapter 2: Property right: supremacy of the property right, challenge of the property right, modes of acquisition of the property right

**The lease contract**
- Chapter 1: Conclusion of the lease contract: conditions of form, conditions of content, moving in, the tenant's duties, the tenant's rights
- Chapter 2: The lease: transfer of renting rights, payment problems, eviction
- Chapter 3: The end of the lease contract: Renewal and right to renewal, leave

**ASSESSMENT**

- 1 written exam of 1 hour 30.
COURSE OBJECTIVE

To ensure that students can speak, understand and write English as best as possible.

COURSE PLAN

- Introduction to technical English through the study of six texts on topography, general building and concrete.
- Revision of basic grammar through multiple choices questionnaires, grammatical translation from French into English and other grammatical exercises.
- Introduction to commercial English through the study of company organisation, automation, advertising and marketing, transports, employment, training, work conditions and internationalisation.
- Writing a first CV.
- Writing letters on general subjects.
- Preparation to the TOEFL (Test Of English as a Foreign Language): compulsory in the 2nd year.
- Various activities with a pedagogic aim such as general knowledge and culture games, vocabulary games and showing of films in English without subtitles and BBC shows followed by a control to ensure that students have understood.

At the beginning of the academic year, students are divided into groups according to their level.

ASSESSMENT

Each student receives two grades: an application grade (coefficient 2) and a paper grade (coefficient 3).

The application grade is the average of the following grades
- An attendance and participation grade.
- Two grammar tests common to all groups.
- One or two oral tests according to the group.
- Two or three written tests according to the group.

At the end of the year, there is a written assignment of two hours common to all groups of all levels in which students have to:
- Answer in English to technical and commercial questions.
- Write a letter in English
- Write an essay

BIBLIOGRAPHY

Learning to manage (Editions Nathan, 1994)
Writing skills

<table>
<thead>
<tr>
<th>Code: IG1-41</th>
<th>ECTS credits: 1</th>
<th>Semester: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr DULAC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COURSE OBJECTIVE

Teach students to write in a clear and precise style the main documents they will have to use during their professional career: business letters, reports, accounts, as well as memorandums, information or synthetic notes, or internal notes.

COURSE PLAN

- Introduction: presentation of various documents, and of their specificity.
- Correspondence: the different types of letters, presentation and writing of a letter, example analysis.
- Reporting: general remarks, characteristics, the different types of reports, presentation and written exam of a report, analysis of examples.
- Accounts: the various types of accounts, minutes, analysis of examples.
- The qualities of a professional style: it is clear and precise, easy and concise, simple and objective.
- Conclusions.

ASSESSMENT

3 papers in which students must apply these rules and write in a clear, precise, easy, and concise style...

Basic Law

<table>
<thead>
<tr>
<th>Code: IG1-43</th>
<th>ECTS credits: 1</th>
<th>Semester: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr BOUANGUI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COURSE OBJECTIVE

Give students the basics of labour law, teach them how to apply them through resolution of practical cases, and invite them to actualise them, on their own, by taking an interest in the news.

COURSE PLAN

- History of social law: from the revolution to the law on the 35-hours of work per week
- Sources of social law: national, European Union, international and professional standards
- Control of the application of labour law: industrial tribunal and labour inspectorate
- Employment: the work contract, the various types of contracts and their content, especially non-competition clauses (decision of 10 July 2002).
- Execution of the work contract: trial period, expression rights in the company and Internet, modification of the work contract, disciplinary sanction, suspension of the work contract
- The end of the work contract: resignation, retirement and dismissal
- Staff representatives: staff representative, union representative, workers' council
- Conflict situations: strike and lock-out
- Security in the workplace: hygiene and security, with an emphasis on the asbestos issue and the presumption of responsibility affirmed by recent jurisprudence; penalties

ASSESSMENT

- 1 written exam of 2 hours.
Social Legislation
Code: IG1-44  ECTS credits: 1  Semester: 1
Professor: Mrs DU CHARLAT

COURSE OBJECTIVE
Give students a practical and theoretical knowledge of labour law with the aim to master its rules and practical application.

COURSE PLAN
- History of labour law.
- Sources of labour law.
- Administrative organisation.
- Industrial tribunal.
- Hiring.
- Choice of a work contract.
- Individual dismissal; resignation; retirement.
- Economic dismissal.
- Staff representatives.
- Strike; lock out: collective conflicts.
- Professional training.
- Unemployment; aid to employment.

ASSESSMENT
- 1 written exam of 2 hours

BIBLIOGRAPHY
- Lamy social,
- Droit du travail, droit vivant de J. Emmanuel Ray.

Professional Structures & Application to Urban Planning
Code: IG1-47  ECTS credits: 2  Semester: 2
Professors: Mr GEORGE and Mr MOULIN

COURSE PLAN
- Professional structures and the profession of surveyor
- Introduction to urban planning

ASSESSMENT
- 1 project: individual work and report
- Oral presentation in public with the other students of the class attending
- 2 visits
- 1 report
COURSE OBJECTIVE

- Improve linguistic skills, introduce technical and commercial vocabulary.
- Invite to communication (letters, discussion on the telephone, etc.)
- Confront students with economic, political, cultural and social realities of German-speaking countries.
- Encourage students to seek internships in German-speaking countries or to plan a stay in the frame of academic exchanges.
- Invite students to prepare the German language exams offered by the French German Chamber of Commerce or by the Goethe Institute.

COURSE PLAN

- Beginners level: Lernziel Deutsch ch. 1-15;
- Intermediate level: revision of general grammar notions, basic and everyday vocabulary, introduction to technical and commercial vocabulary.
- Advanced level: style exercises, extension of vocabulary, translation from French into German, technical and commercial vocabulary, preparation to language exams.
- Exercises: commercial letters, applications, motivation letter.
- Economic subjects: market social economy, commerce, types of companies, raw materials, European Union (structure).

ASSESSMENT

- 1st semester: 2 written exams + participation and attendance / 1 paper for all level groups
- 2nd semester: 2 written exams + participation and attendance / 1 thesis – oral presentation

BIBLIOGRAPHY

Lernziel Deutsch I, Deutsch – kein Problem;
Bautechnik-Grundkurs
Unternehmen Deutsch, Geschäftskommunikation;
Journaux: Vocable en allemand, VDI-Nachrichten, IWD, etc.
Films, vidéos (Alles Gute etc.).
COURSE OBJECTIVE

Know the basic grammar to be able to express oneself using everyday language. Possess enough vocabulary to understand and make oneself understood in everyday life situations. Acquire notions of technical vocabulary. Be able to locate Spanish-speaking countries, and know their political and social environment. Be able to write a CV, a motivation letter in Spanish. Revision and refresher courses for students in the advanced group.

COURSE PLAN

Beginners level
- Basic grammar: article, noun, adjective, pronoun, verb (present, past, future, imperative, subjunctive).
- Vocabulary: basic vocabulary, introduction to technical vocabulary, introduction to translation.
- Conversation: everyday life situations, presentation, asking for information at: the bank, the post office, be able to buy, conversation on the telephone, family life, hostel, street, etc...
- Notions of Hispanic culture: physical, political and social environment in Spanish-speaking countries.
- Remark: the final exam will be different from that of the advanced group.

Advanced level
- Grammar: complete grammatical revision with oral and written exercises.
- Vocabulary: revision of basic and everyday vocabulary, learning of technical vocabulary, basic translation.
- Conversation: revision of basic conversational structures, introduction to oral presentation, analysis of texts.
- Hispanic culture: physical, political and social environment of Hispanic countries. News from the Spanish-speaking world.
- CV, motivation letter.
- Technical subjects:
  - wastewater,
  - railways,
  - environment,
  - pollution,
  - subterranean water,
  - the wonders of the world,
  - the CV and motivation letter,
  - the car industry,
  - aviation,
  - shipbuilding,
  - building, civil engineering.

Encourage preparation to one of the exams of the Chamber of Commerce.

ASSESSMENT

There will be two grades, one corresponding to the final paper, and the second to the participation during courses for 1/3, oral expression for 1/3, and midterm exams for 1/3.
### COURSE OBJECTIVE

It is a standard or common Arabic course, the language read, written and spoken in all the countries of the Arabic world.

The aim of this course is to enable students to acquire a modern, useful and practical Arabic vocabulary, as a means of communication, with Arabic-speaking persons, in France or in Arabic-speaking countries and, finally, to make it easier for them to discover the Arabic and Islamic civilisation, through written texts.

For beginners:
- acquisition of basic language mechanisms,
- oral expression,
- learning of the Arabic alphabet and writing.

### COURSE PLAN

Each class is usually divided into 3 periods:
- the first, lasting about twenty minutes, is dedicated to oral expression, in Arabic only, using figurines and a felt board to illustrate the text in the form of a dialogue. The lesson is presented in this way and repeated several times.
- Students immediately reproduce the dialogue through questions and answers.
- Once the text is globally understood, the second stage begins. It consists of a thorough study of the text in a linguistic, and grammatical perspective.
- The third stage comprehends the reading of the text, followed by oral and written application exercises.

### ASSESSMENT

- 1 written exam during classes.

### BIBLIOGRAPHY

- volume 1: dialogues, grammaire, exercices et liste de formules de politesse, ainsi que des proverbes arabes, les plus significatifs et les plus répandus,
COURSE OBJECTIVE

Thanks to a partnership with the Ecole Normale Supérieure de Cachan in the field of languages teaching, ESTP students can attend Chinese classes. They are divided into two groups of different levels.

In the beginners' group, no prior knowledge is required. The aim is to acquire the basic structures of the everyday language.

The second level group is designed for students who already have basic language notions that need to be improved through the practice of oral and written expression.

ASSESSMENT

Continuous assessment: written and oral tests during classes.

COURSE OBJECTIVE

Thanks to a partnership with the Ecole Normale Supérieure de Cachan in the field of languages teaching, ESTP students can attend Italian classes. They are divided into two groups of different levels.

In the beginners' group, no prior knowledge is required. The aim is to acquire the basic structures of the everyday language.

The second level group is designed for students who already have basic language notions that need to be improved through the practice of oral and written expression.

ASSESSMENT

Continuous assessment: written and oral tests during classes.
Japanese

<table>
<thead>
<tr>
<th>Code: IG1-88 1</th>
<th>ECTS credits: 1</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code: IG1-88 2</td>
<td>ECTS credits: 1</td>
<td>Semester: 2</td>
</tr>
</tbody>
</table>

Professor: Mrs TSCHUDIN-FUKUI

**COURSE OBJECTIVE**

Introduction to the Japanese language:
- acquisition of basic vocabulary and structures,
- mastering of the two syllabic alphabets and introduction to the use of kanji (Chinese characters).

**COURSE PLAN**

Progressive acquisition of hiragana then katakana (46 signs each). Work on basic structures based on the textbook, grammatical explanations, written and oral application exercises.

Use of videos to make students familiar with everyday life expressions:
- greetings, asking for information, etc...
- in the second semester, introduction to Chinese characters.

**ASSESSMENT**

- Dictation to ensure that students master the two syllabic alphabets, and later the characters
- Translation of short sentences from French into Japanese as assignments
- Oral test in class

**BIBLIOGRAPHY**

Japanese for today, Édition GAKKEN - Tokyo
Kanji to kana, W. HADAMIZKY, Édition MAISONNEUVE - Paris (dict. écriture)
Mémento des kanji, J.C. MARTIN, Édition FRANSORIENT - Paris
Manuel de japonais (2 vol.), K. KUWAE, Édition ASIATEQUE - Paris

Russian

<table>
<thead>
<tr>
<th>Code: IG1-89 1</th>
<th>ECTS credits: 1</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code: IG1-89 2</td>
<td>ECTS credits: 1</td>
<td>Semester: 2</td>
</tr>
</tbody>
</table>

Professor: Mrs JARSKY

**COURSE OBJECTIVE**

Thanks to a partnership with the Ecole Normale Supérieure de Cachan in the field of languages teaching, ESTP students can attend Russian classes. They are divided into two groups of different levels.

**ASSESSMENT**

Continuous assessment: written and oral tests during classes.
Extra-curricular, individual or collective activities, can be, for prospective engineers, an occasion of personal development in:
- personality and maturity,
- the taste for entrepreneurship,
- the sense of responsibility and initiative,
- organisation and communication skills,
- opening on the rest of the world.

In this sense, they contribute to the general training of the prospective engineer.

**ORGANISATION**

At the end of the academic year, engineering students who believe they enter into the category defined above write an activity report. This report must be individual. However, in the case of collective activities, several individual reports can be gathered in a unique document starting with a collective synthesis on the work.

The first aim of the activity report is to give information. Yet, it must not be only an account, but the occasion for the writer to reflect on his personal action, to compare the results obtained with his objectives, without forgetting that the activity must be appreciated above all in its "formative" dimension.

This report is evaluated by a professor of the school and may lead to an oral interview.

**ASSESSMENT**

- 1 report

**Fine Arts**

<table>
<thead>
<tr>
<th>Code: IG1-96</th>
<th>ECTS credits: 1</th>
<th>Semester: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professors: Mrs PICARD and Mrs MARLAT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

Develop student curiosity and ability to create, develop their sense of aesthetics, make a link between art and technique.

**ASSESSMENT**

Realisation of a "work of art" and participation in proposed work.
Internet in Civil Engineering

Code: IG1-14  
ECTS credits:  
Semester: -  
Professor: Mr LE BOUCHARD

COURSE OBJECTIVE

Introduce engineering students to the integration of new information and communication technology in the building process.

COURSE PLAN

Collaborative work:
- data communication,
- electronic management of documents, codification,
- « web » tools for collaborative work.

Electronic communication:
- means of communication assessment
- Internet exchanges,
- mobility and security
- electronic signature.

"On line" information:
- knowledge management,
- facilities management,
- e-commerce,
- electronic call for tenders.

ASSESSMENT

Individual research and analysis on current subjects regarding one of the three modules taught, or on a subject directly treated during classes.

General Mathematics (Parallel Admission)

<table>
<thead>
<tr>
<th>Code: IG1-12 1</th>
<th>ECTS credits: 5</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code: IG1-12 2</td>
<td>ECTS credits: 5</td>
<td>Semester: 2</td>
</tr>
</tbody>
</table>

Professor: Mr BLANCHARD

COURSE OBJECTIVE

First year of engineering refresher course in a school where most students are admitted after a competitive entrance examination and one or two years of preparatory classes.

COURSE PLAN

- Revision and exercises and tests: limits, study of functions, calculation of primitives; application to mechanics
- Multiple integrals and application to inertia (mechanics)
- Numerical series
- Integer series
- Fourier's series (brief study of these three last points)
- Laplace's transform; application to differential equations (if enough time left)

ASSESSMENT

- 12 applications of 2 hours
- 4 papers of 3 hours
**COURSE OBJECTIVE**

Understand the basic physical concepts of rivers hydrology and applied hydraulics.
Give civil engineers the basic tools to solve simple problems in hydrology and hydraulics.
The experiments aim at applying the theoretical knowledge given in lectures and to show students the effective complexity of some phenomena characteristic of close conduit flow and open-channel flow.

**COURSE PLAN**

**Lectures**

**Hydrology**
- Interest, rains, evaporation
- Tanks, low water
- Annual throughputs, tank management

**Hydraulics**
- Open-channel flow hydraulics: basics, specific energies, gradually varied uniform flows, singularities, backwater levels coupling, crossing water surface routing.
- Closed conduit hydraulics, pumps, water-hammer

**Subterranean hydraulics**
- General equations, subterranean water
- Dams, forces linked to flow

**Tutorials**

Presentation of facilities, rapid revision of some essential theoretical notions, appointment of each group of students to one work post.

The main manipulations involve:
- Rectangular channel, water discharge measurement: pygmy current meter, sharp-crested weir, standing wave flume
- Closed conduit flow measurement: volumetric water meter, pitot tube, differential pressure device, rotameter and electromagnetic flowmeter
- Closed conduit roughness factor research (turbulent flow, continuous flow, rough flow).
- Trace of pump characteristics (delivery, net pumping head, power output, efficiency). Use of optical tachymeter, water level gauge, diaphragm pressure gauge, mercury manometer, press).

Complementary explanations are given to all measurement posts during the session.

**ASSESSMENT**

- 4 applications of 2 hours 30
- 2 tutorials of 4 hours
- 1 written exam of 2 hours 30
COURSE OBJECTIVE

Discover the photographic principles which lead to air photograph.

COURSE PLAN

- Silver image
- Sensitometry
- Camera
- Black and white and colour emulsions
- Air photograph

ASSESSMENT

- 2 applications of 2 hours 30
- 1 written exam of 2 hours 30
- 1 visit
- 1 oral test

BIBLIOGRAPHY

- Physique et chimie photographique – GLAFKIDES
COURSE OBJECTIVE

Give students the basics of photogrammetry.

COURSE PLAN

Introduction
- Definition of photogrammetry
- Applications of photogrammetry

Metric camera
- Constitution of an aerial camera
- Auxiliary equipment
- Calibration

Stereoscopy and parallax
- Stereoscopy
- Stereoscopic parallax or x parallax

Measurement and reduction of photogrammetric coordinates
- Photogrammetric coordinates systematic errors
- Scale of a vertical photograph
- Relief displacement on a vertical photograph

Orientation theory
- Interior orientation
- Exterior orientation

Stereoscopic plotter

Planning of a photogrammetric project
- Flight plan
- Cost estimate

Aerial triangulation
- Aerial triangulation data acquisition
- Calculation of aerial triangulation

Orthophotography
- Classification of orthophotography systems
- Stereo-orthophotography

ASSESSMENT

- 3 applications of 2 hours 30
- 5 tutorials and 1 report
- 1 written exam of 2 hours 30
- 1 project and 1 oral presentation
- 1 oral test
Microtriangulation

<table>
<thead>
<tr>
<th>Code: IG2-42</th>
<th>ECTS credits:</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr MONVOISIN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COURSE OBJECTIVE

Introduce students to monitoring.

COURSE PLAN

- Monitoring objective
- Forced centering systems
- Jobstring

Mastering of error theory and least square method is a pre-requisite.

ASSESSMENT

- 1 application of 2 hours 30
- 1 project realised during the tutorials sessions

Aerial triangulation

<table>
<thead>
<tr>
<th>Code: IG2-15</th>
<th>ECTS credits:</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr MONVOISIN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ASSESSMENT

- 1 project
- 1 oral presentation
COURSE PLAN

Cadastre history, missions and organisation
- Definitions, origin, major reforms
- The different missions
- Cadastre organisation

Cadastral papers
- Cadastral plan and other plan versions
- Literal documentation
- The MAJIC 2 database

Legal and domanial notions
- Law records
- Elements on land advertisement
- Domanial notions

The technical work of the cadastral survey
- General remarks
- Cadastral plan set up
- Checking and coordination of large scale field mapping

Real estate appraisal
- Built-on properties
- Non built properties
- Update

Cadastral "conversation"
- Basic principles
- Plan update
- Literal documentation update

The new orientations
- Computerised cadastral plan (PCI)
- GPS (positioning by satellites)
- Some elements on the French geodesic network
- The cadastre in Europe and elsewhere

ASSESSMENT
- 1 application of 2 hours 30
- 1 written exam of 1 hour 30
- 1 visit


**Surveying Calculation**

**Code:** IG2-17  
**ECTS credits:** 5  
**Semester:** 1  
**Professor:** Mr. OUSSET

---

**COURSE OBJECTIVE**

Theory and practice of urban trace

---

**COURSE PLAN**

**Revisions**
- Comparative study of some topographic methods
- General trace methods
- Accidental errors, theoretical distributions of position errors
- Measurement of lengths
- Radiation and radiation precision
- Correlation, insertion, bearing
- Go definition and use
- Least square method
- Helmert transform

**Urban trace structure**
- Urban trace definition, detail ground control trace, general remarks
- Operations, complementary triangulation
- Traverse network
- Known coordinates traverse, closed traverse

**Detailed trace**
- Method and application
- Freehand sketch
- Alignments, pseudo abscisses and ordinates
- Capacity calculation
- Joint ownership
- Built properties trace
- Electronic tacheometer crossroad trace

**Tacheometric heighting**
- Municipal road system profile
- Street axis longitudinal profile
- Cross-section

**Elements of subterranean topometry**

**Computer aided processing**
- Field data acquisition
- Desk calculations
- CAD

**Sittings**
- Definitions
- Sitting distances, angle aperture
- Isolated point setting, arc of circle setting
- Camber
- Clothoid siting

---

**ASSESSMENT**

- 17 applications of 4 hours
- 1 written exam of 2 hours 30

---

**BIBLIOGRAPHY**

- Cours de cadastre, de l’IGN
- Topographie générale (d’Hollander)
- Topométrie générale (Ecole polytechnique de Montréal)
COURSE PLAN

- Introduction
- Reinforced concrete constitutive materials
- Current regulations
- Steel-concrete association
- Reinforced calculation assumption
- Simple tension
- Unconfined compression
- Simple bending
- Shearing strain
- Compensated bending
- Current building elements
- Prestressed concrete
- Metallic building

ASSESSMENT

- 10 applications of 2 hours 30
- 1 written exam of 2 hours 30
- 1 oral test
Surveying Calculation and Computing

<table>
<thead>
<tr>
<th>Code: IG2-52</th>
<th>ECTS credits: 2</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr NATCHITZ</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

Learn how to use topographic calculation software (calculations and geo-codification).
This course is not a repetition of topographic notions already taught in the other courses but a discovery of the architecture of computerised calculation systems in topography.
The students will have to master data transfer, calculation protocols and the implementation of geo-codification.

**COURSE PLAN**

- **Data formats**
  - Understanding manufacturer data formats,
  - Routine creation and formats decryption,
  - Data conversion for spreadsheet analysis.
- **Architecture of topographic calculation systems**
  - Software step calculation analysis,
  - Software practical case study.
- **Introduction to geo-codification**
  - Basic principles,
  - Example on software.
- **Use of geo-codification**
  - Geo-codification trace processing,
  - Introduction to digital elevation model (DEM) preparation.
- **Project: Creation of a geo-codification (2 sessions)**
  - Creation of codification symbols,
  - Setting link tables

**ASSESSMENT**

- 6 applications
- 1 project

---

Research Techniques

<table>
<thead>
<tr>
<th>Code: IG2-62</th>
<th>ECTS credits: 0</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr MOREL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

- Make engineers aware of the interest of applied research in the industry
- Present training through research at ESTP

**COURSE PLAN**

- The approach
- Research in the industry
- Training through research
- Research at ESTP
- Innovative projects in companies
COURSE OBJECTIVE

Give students the basics of building techniques as well as study the physical phenomena related to thermic comfort, sound insulation and people safety.

COURSE PLAN

General remarks and building processes
- Presentation of the actors of building. Civil and criminal liabilities, decennial and biennial responsibility arrangements
- Basic documents
- Construction load to exert
- The various infrastructure building processes and representation of buildings

Sound insulation
- Theoretical study (units, addition of sound sources, A weighting)
- Different types of insulation (aerial, shock, exterior protection equipment)
- Consequence on building processes and materials used

Heat insulation
- Heat loss on opaque and glass walls
- Heat loss by air change
- Coefficient GV, G1, BV
- Consequences on materials used
- External walls

Protection of people against fire
- Fire triangle
- Reaction and resistance to fire
- Notions of fire regulations
- Applications

ASSESSMENT

- 4 applications of 2 hours 30
- 1 written exam of 1 hour 30
- 1 project

BIBLIOGRAPHY

- Les DTU, Editions CSTB
- Les règlements de sécurité, Editions du journal officiel
- Précis de bâtiment, Editions DUNOD
**Underground Topography**

**Code:** IG2-7  
**ECTS credits:** 1  
**Semester:** 2  
**Professor:** Mr DUBREUIL

---

**COURSE OBJECTIVE**

- Become familiar with the subterranean environment  
- Explain the role of the topographer in the realisation of works  
- Show the necessity of coordination between the various actors

**COURSE PLAN**

- Environment  
- Structures building processes  
- Injections and their consequences  
- The topographer’s role  
- Observations of a building structural damage  
- Investigation and collapse measurement

**ASSESSMENT**

- 1 written exam of 2 hours 30

---

**Satellite positioning Techniques**

**Code:** IG2-8  
**ECTS credits:** 4  
**Semester:** 2  
**Professor:** Mr BALARD

---

**COURSE OBJECTIVE**

The aim of this course is to give prospective engineers the necessary theoretical basis to understand and use global satellite positioning systems (GNSS). This course is essentially based on the study of GNSS systems operating principle and architecture, as well as their various uses in geomatics and in other fields.

**COURSE PLAN**

- Basic principles and components of satellite positioning systems  
- Structures of signals  
- Sources of errors: description, modelling and correction  
- Observations processing  
- Applications in topography

**ASSESSMENT**

- 4 applications of 4 hours  
- 1 written exam of 2 hours 30  
- 1 project
COURSE OBJECTIVE

Understand, choose and use the GPS positioning technique. Theoretical recording of general geodesy, presentation of structures, systems and plane representations.

COURSE PLAN

General remarks:
- Definitions, geodesy objectives and methods
- History, surfaces of reference

Physical geodesy: basics
- Earth field of gravity, tides, level surfaces
- Geoid and astonomic coordinates

Physical geodesy: associated techniques
- Spatial techniques, gravimetry
- Levelling (altitude types, geometric and trigonometric levelling)
- Astronomy (aims, techniques used, results)

Geometrical geodesy
- Spheric geodesy, ellipsoid of revolution geometry
- Radius of curvature, arc of meridian, isometric latitude
- Geodesic local index mark, ellipsoid of revolution geodesic
- Ellipsoid models

The geoid couple – Ellipsoid:
- Initial state, astronomic and geodesic trihedron
- Vertical deviation, fundamental point
- Laplace's representation

Plane representations:
- The earth, a cartographic object
- Problems of surface representation
- Classifications of representations, Lambert constant of the cone
- Universal transverse Mercator grid

Systems of reference:
- Coordinates systems, altimetric systems
- Transformations of coordinates
- The systems used in France

Terrestrial geodesic techniques:
- Types of measurements, network location
- Processing

ASSESSMENT

- 4 applications of 2 hours 30
- 1 written exam of 1 hour 30

BIBLIOGRAPHY

- Support de cours IGN
COURSE OBJECTIVE

Make students discover the various materials and algorithms used in graphic data processing in topography and cartography.

COURSE PLAN

Digitalisers and acquisition methods:
- Presentation of digitalisers
- HELMERT transform and control (menu, cursor tablet)
- Vector-based digitalisation, topology calculation, surface entities recognition

Plotters and design methods
- Presentation of plotters (multiple pen plotter, roll plotter, flatbed plotter, electrostatic plotter, ink-jet plotter, …), languages (HPGL, HPGL2, RTL …)
- Design algorithms: convex or concave window overlay, filling (hatching, solid, …), hierarchy (non superposition, priorities)

Interactive graphic standards:
- Zoom, panoramic (transformations)
- Segmentation (visibility, priority, detectability …)
- Segments identification (Picking)

RASTER images processing (files, BIT-MAT):
- Acquisition (scanner, digital camera …)
- Image compression algorithms
- Printing formats (vector and RASTER data superposition)

ASSESSMENT

- 6 applications of 3 hours
- 1 written exam of 1 hour 30

BIBLIOGRAPHY

- Infographie II de Philippe SCWEIZER, Presses Polytechniques ROMANDES
- La réalisation de logiciels graphiques interactifs (CEA, EDF, INRIA), Editions EYROLLES
- Les images BIT-MAP (Formats, Impression, Traitement), de Steve RIMMER, Editions DUNOD
- Le Format TIFE et ses modes de compression de Christian MONTEIX, Editions EYROLLES
COURSE OBJECTIVE

When observing an urban landscape, we rarely think about the urban planning rules and customs which gave birth to it. Who has the idea to spontaneously associate these two words: landscape and regulation?

The essential objective of this course is to make engineering students familiar with urban planning rules.

Among all the subjects that make up the urban planning code, four important subjects will be studied in this course. The course plan is based on these four themes.

COURSE PLAN

Local development plan

Description of the content of a local development plan (PLU) which finds its origin in the Solidarity Urban Renewal Act of December 2000. The main objective is to understand the organisation of a building operation on a piece of land in accordance with the 14 articles of the law. In other words, the aim is to make an analysis of the occupation development of a lot from which urban filling originated.

Various aspects will be examined: density and purpose, morphology, architecture, heritage, parking lots, unbuilt spaces…

Mixed development zone

A mixed development zone is based on an operational procedure that, in a relatively short period of time, profoundly changes the aspect or occupation of a part of a town territory. The aim is to study the file for the creation of a ZAC (commercial area), first by analysing the current situation, then by designing a development project based on concrete cases.

Intervention tools

Urban option: this tool exists in cities that have a POS (PLU), or comprehensive development area map, and is used for the realisation, for the interest of all, of urban planning actions or operations. The mechanism of the declaration of intent to alienate (DIA) will be fully described.

Use of land rights monitoring

Urban planning requirement, building permit, demolition permit, work certificate…

ASSESSMENT

- 1 application of 2 hours 30
- 1 oral test

BIBLIOGRAPHY

- Code de l’urbanisme
- Ouvrages cités en cours
COURSE OBJECTIVE

The land surveyor plays an essential role for many clients in rural areas and especially for town councils that do not have permanent technical services. Nowadays, rural areas need, as much as urban areas, to build and maintain the equipment and structures necessary to develop a good level of economic and social activity. Therefore, prospective engineers must know the nature of these equipment and structures as well as their legal, economic and social environment.

COURSE PLAN

- Rural areas in France: geography, socio-economic, ecological and agronomic notions
- Rural planning and management setup general procedure; clients and main actors; the legal and financial frame
- The various types of zoning in rural areas; legal tools for the protection of fragile spaces
- Tourism and forest development; the road system in rural areas
- Replotting
- Rural applications of remote sensing in France and abroad

ASSESSMENT

- 1 application of 1 hour 30
- 1 oral test
COURSE OBJECTIVE

Transmit the essential notions for building facilitator and management activities.

COURSE PLAN

Notions of acts of merchant and applicable rules.

Building facilitator and management activities in the law
- Field of application of the 2 January 1970 act
- Rules for the practice of this activity: professional ability, financial guarantee, insurance, professional card, functions ability.
- Professional practice legal obligations, agreements, remuneration, responsibility

Condominium
- Field of application of the condominium status
- Division of a building in condominium
- Co-owners rights and obligations
- Condominium operations
- Sale of plots

Tenancy relationship
- Common law lease, closing, contracting parties obligations, assignment and sublease, extinguishment
- Commercial leases: coverage, occupancy, term, assignment, rent, renewal, cancellation procedure
- Living and mixed leases in the 6 July 1989 act
- The professional lease
- Special leases and short term occupancy agreements

Estate sales
- Preparatory contracts, preliminary contracts, priority agreements
- Building sales, conclusion, effects
- Sales forms
- Building purchase financing

ASSESSMENT

- 3 applications of 3 hours
- 1 written exam of 2 hours 30
COURSE OBJECTIVE

The objective of this course is to teach students how to use Autolisp to make some Autocad road tasks easier and to design more complex programs that might be useful in their future profession. The aim is not to become specialists in programming but rather advanced users of Autocad in its programmatic dimension of intermediary level. A good knowledge of Autocad is essential.

COURSE PLAN

It is necessary to begin by a lecture on programming in order to acquire the basics for an efficient use. The course is divided into two chapters: one concerning the programming tool in itself and an other on the basic methodology of use.

Presentation of the tool and its functions:
Enable to understand the Autolisp language and its use. The aim is to give the basics that will be later put into practice.

Programming methodology:
Methodology is the most important stage in the programming learning process. Autolisp work methods are presented in a pragmatic way.

ASSESSMENT

- 5 applications
- 1 student project: it is the essential part of the pedagogic program. Its aim is to imply the student in the process presented during theoretical classes.
  - Choice of the project: a non exhaustive list of projects is given. Some of the projects can be undertaken in groups of two or three students. The rules and objectives are also specified.
  - Implementation of the algorithm: Aid for writing the program algorithm while following a strict logic to be able to write the code more easily and quickly.
  - Writing of the code: Aid for the writing of the program code so that it can be read easily by a third person. Tests and debugging: once the program is written, it is submitted to various tests, to control its validity. Aid to debugging.
- 1 oral presentation
COURSE OBJECTIVE

Practice of complete urban trace operations (in Robinson): planimetry, altimetry, design on Autocad.

COURSE PLAN

Tacheometric trace:
- 1:1000 scale plan
- 1:200 scale parcel plan
- Link between altimetry and levelling network

Levelling study:
- Double levelling
- Checking of 5 benchmarks of the levelling of France
- Determination of 6 other benchmarks

ASSESSMENT

- 22 applications of 4 hours
- 1 project
- Grade for a complete report (field journals, graphic prints, synthesis, calculations, …)

Industrial Research Project

From the second year, students can, if they wish to, work on the development of an industrial project in partnership with a technical expert, a company and a supervisor from the school. This project is integrated in the cycle of studies. It can be the subject of the second year internship, continue in the third year and come to its conclusion with a TFE (end-of-studies work). Various teams of students can work on the same project until it is concluded. The realisation of the project consists of two stages: a bibliographic research stage and a development stage. Participation to such a project is a first discovery of applied research.

COURSE OBJECTIVE

Know the environment in which the land surveyor works.

COURSE PLAN

- Organisation of the profession of land surveyor
- Land surveyors' clients
- Costs of a land survey company (introduction to management)
- Questions and answers with the students on the profession of land surveyor
Communication Skills

<table>
<thead>
<tr>
<th>Code: IG2-30</th>
<th>ECTS credits: 2</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr DENOUN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

The second year focuses on interpersonal communication in its social and professional dimensions: its objective is to be able to lead or take part in any interview related to a management situation.

**COURSE PLAN**

Each work group comprises a maximum of fifteen students so as to ensure the quality of exchanges.
- **First stage**: express oneself
- **Second stage**: present oneself
- **Third stage**: listen and transmit
- **Fourth stage**: interview (one day class, with the support of a camcorder)

**ASSESSMENT**

- 5 applications of 4 hours

---

**English 1 & 2**

<table>
<thead>
<tr>
<th>Code: IG2-31-1</th>
<th>ECTS credits: 2</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code: IG2-31-2</td>
<td>ECTS credits: 2</td>
<td>Semester: 2</td>
</tr>
<tr>
<td>Professor: Mr DE LINARES</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

To ensure that when students leave the school they can understand, write and speak English as best as possible.

**COURSE PLAN**

- Study of technical newspapers articles
- Revision of grammar basics through translation and grammar exercises
- Writing of commercial and motivation letters, writing of CV
- Study of telecommunications, advanced technology, banks and energy
- Intensive preparation to the TOEFL including three preparatory tests
- Various activities with a pedagogic objective such as competitive games on general knowledge and culture, vocabulary games and showing of films in English without subtitles and of BBC programs followed by a control on comprehension.

**ASSESSMENT**

Students are assessed on the basis of three grades: an application grade, coefficient 2, a written exam, coefficient 1.5 and the grade obtained at the institutional TOEFL in March, coefficient 1.5. The application grade is an average based on:
- A grade for attendance and participation.
- An oral test.
- One or two other written tests according to the group.
- The grades obtained at the preparatory tests for the TOEFL.

At the end of the year there is a written exam of two hours common to all groups.
Social Law
Code: IG2-36
ECTS credits: 1
Semester: 1
Professor: Mr CHEVALIER

COURSE OBJECTIVE
Discover social law in its practical dimension

COURSE PLAN
- Sources and control of labour law
- The various contracts
- Workforce lending, subcontracting and illegal work
- Criminal liability
- Work duration
- Paid holidays
- Modification of the contract
- Disciplinary law (except work contract breaking off)
- Work contract breaking off
- Work accident – transport accident
- Staff representatives

ASSESSMENT
- 1 written exam of 2 hours 30

General Economics
Code: IG2-32
ECTS credits: 2
Semester: 2
Professor: Mr GABRIEL

COURSE PLAN
- Economic definitions and introduction to the concept of interdependence: the market and economic flows
- Production and productivity
- Consumption, savings and income
- Money and the mechanisms of the financing of the economy
- Growth, employment and unemployment in a sustainable development perspective

ASSESSMENT
- 1 oral test.

BIBLIOGRAPHY
- "Introduction à l’économie politique" Alain Euzéby ; éditions PUG ; 1999
- "Économie Générale" Eric Bosserelle ; Hachette Supérieur ; 1998
- "Productivité et régulation (processus de valorisation différentielle du travail et théorie de la répartition" Florent Gabriel ; éditions l’Harmattan ; Paris ; 2000
COURSE OBJECTIVE

Global overview of the current approach of the management of risks concerning man, his goods, his environment.
Have a general idea of the requirements of quality management in civil engineering.

COURSE PLAN

Lectures:
- History of Quality and HSCT
- Definitions
- References
- Responsibility and surveillance

Analysis of requirements in smaller groups:
- Responsibilities
- The ISO 9002 standard
- Legal requirements (PPSPS, delegation)

Case study:
- Preparation of the answer to an offer (company)
- Preparation of offers analysis (client, project manager)

Case study:
- Analysis of an offer
- Preparation of a building site in a quality management perspective
- Preparation of a building site in an HSCT perspective

ASSESSMENT

- 1 written exam of 1 hour 30
German

<table>
<thead>
<tr>
<th>Code: IG2-81-1</th>
<th>ECTS credits: 1</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code: IG2-81-2</td>
<td>ECTS credits: 1</td>
<td>Semester: 2</td>
</tr>
</tbody>
</table>

Professor: Mrs DICKINSON

**COURSE OBJECTIVE**

- Improve linguistic skills, introduce technical and commercial vocabulary.
- Invite to communication (letters, discussion on the telephone, etc.)
- Confront students with economic, political, cultural and social realities of German-speaking countries.
- Encourage students to seek internships in German-speaking countries or to plan a stay in the frame of academic exchanges.
- Invite students to prepare the German language exams offered by the French German Chamber of Commerce or by the Goethe Institute.

**COURSE PLAN**

- The beginners of last year join the intermediate group.
- Intermediate group: revision of grammar basics, basic and everyday vocabulary, introduction to technical and commercial vocabulary.
- Advanced group: style exercises, new vocabulary, translation from French into German, technical and commercial vocabulary, preparation to languages examinations.
- Exercises: notes, reports, descriptions.
- Economic issues: energy (problems), technique of environment, commerce, information highways, communication in the workplace.
- Technical subjects: building projects in Europe, urban planning (history), machines and automation

**ASSESSMENT**

- 1 written exam of 2 hours common to all level groups and accounting for 50 % of the annual grade.
COURSE OBJECTIVE

Beginners group:
Keep the student interest the Hispanic language and culture alive. Help him to express himself and make himself understood. Renforcer the cultural knowledge acquired in the 1st year.

Advanced group:
Improve students written and oral expression through grammar exercises and essays. Widen their knowledge of the Spanish-speaking world, on the cultural, political, economic level, etc.

COURSE PLAN

Beginners group
- Grammar: revision of the 1st year program, subjunctive, conditional, agreements.
- Vocabulary: everyday vocabulary, technical vocabulary, translation of everyday sentences.
- Conversation: be able to communicate in everyday life, introduction to oral presentation.
- Hispanic culture: revision of the 1st year, news of the Hispanic world, the 16th century, the precolombian civilisation, the conquest of America, Don Quichote, El Cid, Goya.

Advanced group
- Grammar: structural exercises.
- Vocabulary: chosen and advanced vocabulary in all fields, commercial and technical vocabulary, revision of written structures, CV, motivation letter for job applications.
- Conversation: improvisation on everyday life situations, oral reports, comment on the news, text analysis, oral presentations.
- Hispanic culture: history – Spanish dynasties, literature – the beginnings, the 18th century, the 98 generation, painting – Velazquez, Murillo, El Greco, Picasso, Dali, Miro, Botero.
- Technical subjects:
  - CV, motivation letter, job interview,
  - Spanish civil engineering companies,
  - Environment,
  - Pollution,
  - Underground waters,
  - The wonders of the world,
  - The history of railways in the Hispanic world,
  - Structures,
  - Computer science,
  - Aviation in the Hispanic world,
  - Building, civil engineering and industry professionals.
- Methods used: exercises notebook, selected texts, commercial book, video – reports, films, 6H, audio – cassettes from the national Spanish radio.

ASSESSMENT

There will be 2 grades: the first for the written examination at the end of the year. The second for the participation in class for 1/3, oral expression for 1/3, and midterm exams for 1/3.
COURSE OBJECTIVE

It is a standard or common Arabic course, the language read, written and spoken in all the countries of the Arabic world.

The aim of this course is to enable students to acquire a modern, useful and practical Arabic vocabulary, as a means of communication, with Arabic-speaking persons, in France or in Arabic-speaking countries and, finally, to make it easier for them to discover the Arabic and Islamic civilisation, through written texts.

For beginners:
- acquisition of basic language mechanisms,
- oral expression,
- learning of the Arabic alphabet and writing.

COURSE PLAN

Each class is usually divided into 3 periods:
- the first, lasting about twenty minutes, is dedicated to oral expression, in Arabic only, using figurines and a felt board to illustrate the text in the form of a dialogue. The lesson is presented in this way and repeated several times.
- Students immediately reproduce the dialogue through questions and answers.
- Once the text is globally understood, the second stage begins. It consists of a thorough study of the text in a linguistic, and grammatical perspective.
- The third stage comprehends the reading of the text, followed by oral and written application exercises.

ASSESSMENT

- 1 written exam during classes.

BIBLIOGRAPHY

- volume 1: dialogues, grammaire, exercices et liste de formules de politesse, ainsi que des proverbes arabes, les plus significatifs et les plus répandus,
### Chinese

| Code: IG2-86 1 | ECTS credits: 1 | Semester: 1 |
| Code: IG2-86 2 | ECTS credits: 1 | Semester: 2 |

Professor: Mr ZHANG

**COURSE OBJECTIVE**

Thanks to a partnership with the Ecole Normale Supérieure de Cachan in the field of languages teaching, ESTP students can attend Chinese classes. They are divided into two groups of different levels.

In the beginners' group, no prior knowledge is required. The aim is to acquire the basic structures of the everyday language.

The second level group is designed for students who already have basic language notions that need to be improved through the practice of oral and written expression.

**ASSESSMENT**

Continuous assessment: written and oral tests during classes.

### Italian

| Code: IG2-87 1 | ECTS credits: 1 | Semester: 1 |
| Code: IG2-87 2 | ECTS credits: 1 | Semester: 2 |

Professor: Mrs PILIA

**COURSE OBJECTIVE**

Thanks to a partnership with the Ecole Normale Supérieure de Cachan in the field of languages teaching, ESTP students can attend Italian classes. They are divided into two groups of different levels.

In the beginners' group, no prior knowledge is required. The aim is to acquire the basic structures of the everyday language.

The second level group is designed for students who already have basic language notions that need to be improved through the practice of oral and written expression.

**ASSESSMENT**

Continuous assessment: written and oral tests during classes.
Japanese

<table>
<thead>
<tr>
<th>Code: IG2-88 1</th>
<th>ECTS credits: 1</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code: IG2-88 2</td>
<td>ECTS credits: 1</td>
<td>Semester: 2</td>
</tr>
</tbody>
</table>

Professor: Mrs TSCHUDIN-FUKUI

COURSE OBJECTIVE

Introduction to the Japanese language:
- acquisition of basic vocabulary and structures,
- mastering of the two syllabic alphabets and introduction to the use of kanji (Chinese characters).

COURSE PLAN

Progressive acquisition of hiragana then katakana (46 signs each). Work on basic structures based on the textbook, grammatical explanations, written and oral application exercises.
Use of videos to make students familiar with everyday life expressions:
- greetings, asking for information, etc...
- in the second semester, introduction to Chinese characters.

ASSESSMENT

- Dictation to ensure that students master the two writing systems, and later the characters
- Translation of short sentences from French into Japanese as assignments
- Oral test in class

BIBLIOGRAPHY

Japanese for today, Édition GAKKEN - Tokyo
Kanji to kana, W. HADAMIZKY, Édition MAISONNEUVE - Paris (dict. écriture)
Mémento des kanji, J.C. MARTIN, Édition FRANSORIENT - Paris
Manuel de japonais (2 vol.), K. KUWAE, Édition ASIATEQUE - Paris

Russian

<table>
<thead>
<tr>
<th>Code: IG2-89 1</th>
<th>ECTS credits: 1</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code: IG2-89 2</td>
<td>ECTS credits: 1</td>
<td>Semester: 2</td>
</tr>
</tbody>
</table>

Professor: Mrs JARSKY

COURSE OBJECTIVE

Thanks to a partnership with the Ecole Normale Supérieure de Cachan in the field of languages teaching, ESTP students can attend Russian classes. They are divided into two groups of different levels.

ASSESSMENT

Continuous assessment: written and oral tests during classes.

French as a Foreign Language

<table>
<thead>
<tr>
<th>Code: IG2-80 1</th>
<th>ECTS credits: 1</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code: IG2-80 2</td>
<td>ECTS credits: 1</td>
<td>Semester: 2</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVE

Extra-curricular, individual or collective activities, can be, for prospective engineers, an occasion of personal development in:
- personality and maturity,
- the taste for entrepreneurship,
- the sense of responsibility and initiative,
- organisation and communication skills,
- opening on the rest of the world.

In this sense, they contribute to the general training of the prospective engineer.

ORGANISATION

At the end of the academic year, engineering students who believe they enter into the category defined above write an activity report. This report must be individual. However, in the case of collective activities, several individual reports can be gathered in a unique document starting with a collective synthesis on the work.

The first aim of the activity report is to give information. Yet, it must not be only an account, but the occasion for the writer to reflect on his personal action, to compare the results obtained with his objectives, without forgetting that the activity must be appreciated above all in its “formative” dimension.

This report is assessed by a professor of the school and may lead to an oral interview.

ASSESSMENT

- 1 report
**COURSE OBJECTIVE**

A *discovery internship*, compulsory and lasting at least one month, must be done during the summer recess between the first and second years of study. The main objective of this internship is to enable the engineering student to have a first contact with professional life and to evaluate his faculty of adaptation, thanks to a first real experience in a company. The best way to reach this objective is to do an internship in a field of activity with a direct link with the essential courses of the school.

**DISCOVERY INTERNSHIP REPORT**

The discovery internship report comprehends ten to twenty pages focusing, after a brief description of the company, on the analysis of the intern's action in the tasks given to him, as well as the open-mindedness and curiosity he displayed in this activity, without forgetting the physical and human environment.

**REPORT ASSESSMENT**

The corrector assesses the work based on the quality of the analysis of the intern's action, on the expression clarity and precision as well as on the formal presentation.

If the grade obtained is above 12, it is indicated on the 2nd year transcript of results and a bonus is given. The difference between the number of points above 12 and 12 is multiplied by two and added to the year overall average.

**Strength of Materials (Parallel Admission)**

<table>
<thead>
<tr>
<th>Code: IG2-92</th>
<th>ECTS credits: 1</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr POULAIN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

This course, made up of 10 sessions, is compulsory for students admitted according to qualifications and are designed only for them.

**COURSE PLAN**

- Fundamental definitions and principles in materials resistance
- Mechanical properties of materials: concrete, steel, ground
- Stress exerted on bent isostatic straight girder: examples
- Geometric characteristics of the resistant section; main axes
- Constraints distribution around a point: Môhr circle
- Constraints and deformations in beams under moment bending and shearing strain; kern
- Brum formulae:
  - Internal potential theories.
  - Theorem of Castigliano and Bertrand de Fontviolent.
  - Displacement and rotation calculation.
  - Isostatic and hyperstatic systems.
- Cantilever beams
- Influence lines and shearing strain and bending moment envelope curve in isostatic beams
- Non deformable systems on elastic support
COURSE OBJECTIVE

The aim of this set of 6 sessions is to recall the principles concerning the information of the public, to propose rules for consultations and to present reflections and illustrations in the field of communication on large-scale projects. Texts from the bibliography and audio and visual documents will be studied, people with an experience in communication and dialogue will make contributions. Students must be aware of information, dialogue and consultation requirements in their practice and acquire some essential points of reference in a time when the role of the media is ever more important and when the concepts of sustainable development and democratic participation are becoming essential.

COURSE PLAN

Modes of communication on public works
- Client information, advertising, modes of communication
- Users-citizens’ expectations and dialogue
- Consultations, surveys, polls, local referendums
- Consultation modes and public debate
- Sensitive information, crisis, prevention and emergency communication
- Negotiation and co-decision.

From public utility to sustainable development
- The public utility surveys and procedures
- Examples of the A16 et A51 highways works
- Collective interest, individual interests and general interest compromises
- Sustainable development

Consultation and public debates (some examples)
- Case of harbour extension (Le Havre, Nice) or airport creation (Notre-Dame-des-Landes)
- Linear infrastructures: THT electrical lines, A32, Lyon highway and railway bypass

Public debate actors
- Politicians, experts and technicians, administrations
- The project manager and engineers in the public debate
- Operators and role of companies in project realisation
- People involved and associations

Decision and consultation
- Hesitations concerning a new airport in the Paris basin

The media and large-scale projects
- Relations with the press and the media
- Journalists’ points of view on communication and dialogue

ASSESSMENT

Each student chooses a theme for a brief paper (5 to 7 pages) (problem raised by the operation, information and communication actions, evaluation or expected results), with a public oral presentation and discussion.
PLAN DU COURS

Lecture
- Object of topography
- Problems of plane representations of geoids
- Angle measurement: material, processes
- Coordinate calculation and polygonal compensation
- Setting out

Tutorials
- Equipment presentation
- NIKON electronic tacheometer triangle trace (by groups of three students)
- Automatic level levelling exercise (by groups of three students)
- Commented correction of exercises

ASSESSMENT

- 2 applications of 4 hours
### PLAN DU COURS

The first part is dedicated to operational security in general. It lasts 2 x 3 hours and includes:
- Definition of objectives and organisation of an operational security study,
- Preparation of data for the realisation of a preliminary risk analysis:
  - Life cycle,
  - Mission profile,
  - Functional analysis,
  - Technical arborescence.
- Preliminary risk assessment:
  - Approach by function,
  - Approach by element.
- Processing of unwanted events,
- Introduction to AMDEC (failure mode, effects and criticality analysis),
- Introduction to fault trees,
- Synthesis of an operating safety study,
- Follow-up of operating study resulting actions.

The second part is dedicated to an application to road tunnels. It lasts 2 x 3 hours and comprehends:
- Presentation of the specificities linked to this type of works, and of the constraints,
- Presentation of the main past accidents and their lessons,
- Presentation of the system of reference concerning regulations,
- General presentation of security files and of their content, according to the structure life stage, then specific presentation of 2 key elements in a security file:
  - Comparative Risk Assessment (ACR) linked with the transportation of dangerous goods (TMD),
  - Specific Danger study (ESD).

The tools used in these studies are studied.
The material used in class consists of a set of transparencies.

### ASSESSMENT

- At the end of this course, the level reached by the students is assessed through a questionnaire and practical exercises.

---

### COURSE OBJECTIVE

Develop student curiosity and ability to create, develop their sense of aesthetics, make a link between art and technique.

### ASSESSMENT

Realisation of a "work of art" and participation in proposed work.
Business Ethics
Code: IG2-73  ECTS credits:  2  Semester: 2
Professor: Mr AUCOUTURIER

COURSE PLAN
- Ethics, moral standards, deontology
- Ethics, corporate policy and strategy
- Ethics, commerce: sales and purchase
- Ethics, production
- Ethics, finance, management
- Ethics, international
- Ethics, environment
- Ethics, staff management
- Ethics, communication
- Ethics, law

ASSESSMENT
- 1 written exam of 2 hours

Marketing Management
Code: IG2-98  ECTS credits: 1  Semester: 2
Professor: Mr GRUAT

COURSE OBJECTIVE
Marketing belongs to the field of management but the word is rarely used in civil engineering; yet, marketing is present in products offer, prices policies, communication, brands, customer satisfaction. The aim of this course is to develop basic marketing concepts based on examples taken in the civil engineering sector.

COURSE PLAN
- Segmentation and industrial chain in civil engineering
- Market analysis
- Elaboration of the marketing strategy
- Product development and innovation
- Prices policy
- Communication and brands
- Distribution
- Operations between marketing and sales
- Customer satisfaction through quality, service and value

ASSESSMENT
Case study: development of a self-placing concrete at the international level
COURSE OBJECTIVE

At the end of the course, students must know the basics of
- value (price formation)
- equilibrium and interdependence between the markets
and the standard of reference for competition analysis, as well as the analysis of the different types of conceivable markets.

COURSE PLAN

- Consumption behaviour
- Economic rationality
- Modelling of production
- Concept of socio-economic optimum
- The efficient market as the less costly way to reach an optimum: value, equilibrium
- The various types of markets possible: analysis of the forms of economic competition.

Intensive Programme

<table>
<thead>
<tr>
<th>Code: IG2-61</th>
<th>ECTS credits:</th>
<th>Semester: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: University of Florence</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
COURSE OBJECTIVE

Give the necessary technical and technological elements for the design of water conveyance and purification projects, and the rules for their realisation. First, we will see agglomerations networks (urban hydraulics), then agricultural networks (drainage, irrigation), and finally rivers, streams, rivers and outlets management and regulation.

COURSE PLAN

- Water needs and resources, at the national level and at the town level. Seasonal and daily variations. Crest segment coefficient.
- Water origin and quality, purification plants.
- General plan of a water distribution networks
- Development of watering places: sources, infiltration galleries
- Wells, drillings
- Modern trends.
- Pumping stations.
- Location, equipment (machines, engines, control). Booster pumps.
- Tanks. Various types. Building, equipment. Networks without tanks
- Purification networks. Water to drain (effluents), different types, flow and pollution. General design, main and secondary works. Lift station.
- Pressure systems
- Wastewater purification. Various methods, general plan of a modern plant. Case of industrial waters
- Exploitation of networks: operating mode, automated management and electronic surveillance, leakage in networks

ASSESSMENT

- 3 applications of 2 hours 30
- 1 project
- 1 oral presentation
- 2 reports
- 1 oral test
- 2 visits
Agricultural Economics

<table>
<thead>
<tr>
<th>Code: IG3-3</th>
<th>ECTS credits: 1</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Ms DROGUE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ASSESSMENT

- 1 written exam of 2 hours

Land Valuation and Agronomical Bases

<table>
<thead>
<tr>
<th>Code: IG3-4</th>
<th>ECTS credits: 3</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr MESSIEZ-POCHE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COURSE PLAN

Markets, operators, methods
- Markets
- Operators: the expert (definition, role), the expert status
- Methods: systematic approach (example: evaluation research on urban forests), analytic approach of property evaluation, actual cash value, expertise operations (survey operations, survey reports)

Survey report plan:
- Preamble or mission
- Survey operation
- Evaluation or notice
- Adjuster's fees

Products
- Farming land market: general remarks, characteristics of the farming land market
- Validity factors
- Farming land evaluation methods
- Agricultural buildings evaluation
- Land to build
- Buildings
- Commercial buildings
- Land survey

Words and concepts of land survey

ASSESSMENT

- 3 visits
- 1 oral test
COURSE OBJECTIVE

Give students the essential parameters for the elaboration of a road project (essential characteristics: plan, longitudinal section…) and to make them aware of the various aspects of road projects (integration, environment, security…)

COURSE PLAN

General remarks:
- The road: its status, functions and equipment
- Constitutive elements of a platform
- Notions on interchanges, intersections, crossroads
- Fundamental parameters of road projects
- Association, trace, cross section and longitudinal section
- Introduction to superelevation
- Crossroad
- Geometry
- Notion of traffic light controlled crossroads
- Notion of weaving

After these technical aspects, a look at the environmental dimension and road sharing:
- Fight against transport noise, the various tools and some notions on noise
- Fight against speed, security improvement, the road and the landscape, plants and lisibility
- Methodology for an environmental study

ASSESSMENT

- 24 applications of 4 hours and one of 2 hours including:
  - one to control that all students know how to define a straight line, a circle and place a clothoid
  - one on longitudinal section calculation
  - one that corresponds to a micro project (development of a diversion, of an interchange)
- 1 project
- 1 oral test

BIBLIOGRAPHY

- Liste des publications du SETRA et du CERTU
- Un certain nombre d’ouvrages (ICTAAL – ICTARN – ICTAVRU – Carrefours à feux…Prise en compte du paysage)
COURSE OBJECTIVE

- Give students the basics of G.I.S (Geographic Information System)
- Allow them to see the difference between C.A.D. and G.I.S.
- Be able to help the final users to express their needs and build a data model

COURSE PLAN

Introduction on G.I.S
- What is G.I.S?
- Why are G.I.S used?
- Who uses G.I.S?

Origin of data in G.I.S
- Graphic data (trace, digitalisation, photogrammetry, exchange formats)
- Alphanumerical data (descriptive data)
- Data quality and precision

Cartographic data models
- Vector data (Spaghetti, network topology…)
- RASTER data

Links between geometric and descriptive data
Analysis of a G.I.S application for cadastre and grounds rights management
- Needs, data, management and results (cards, reports, letters…)

ASSESSMENT

- 4 applications of 2 hours 30
- 1 written exam of 2 hours 30

BIBLIOGRAPHY

- Les données dans les systèmes d’informations géographiques – Paul ROUET, éditions HERMES
- Guide économique et méthodologique des GIS – Michel DIDIER et Catherine BOUVEYRON, éditions HERMES
- Les GIS mise en œuvre et application – Henri PORNON, éditions HERMES
**COURSE OBJECTIVE**

The aim of this course is to make students familiar with basic remote sensing notions. After a brief presentation of remote sensing applications, basic notions on image pre-processing (corrections) and image processing will be presented.

**COURSE PLAN**

**Introduction:**
- Definition, fields of research, references, etc …

**Electromagnetic radiation:**
- The electromagnetic wave
- Radiometric quantity
- The electromagnetic spectrum
- Atmospheric windows
- Spectral signatures

**Acquisition:**
- Satellites
- Sensors
- Geometric resolutions

**Satellite images:**
- Data capture and storage
- Image formation
- Radiometric and geometrical alterations
- Radiometric and geometrical corrections

**Display and processing:**
- Colour compositions
- Indexes calculation
- Image enhancement
- Filtering
- Images classifications and analysis

**ASSESSMENT**
- 1 application of 2 hours
- 1 written exam of 1 hour
- 1 project: rapid discovery of images display and processing
**Lasergrammetry**  
**Code: IG3-8**  
**ECTS credits:**   
**Semester: 1**  
**Professor: Mr NATCHITZ**

**COURSE PLAN**
- 2 lectures of 1 hour 30 to present the theory of systems
- 3 applications of 4 hours:
  - 1 application on scatter plot treatment
  - 1 application on laser measurement
  - 1 application on data processing and realisation of a project

**ASSESSMENT**
- 3 applications of 4 hours
- 1 project: scatter plot final processing and creation of the final 3D model (about 10 hours of individual work)

**Industrial Research Project**  
**Code: IG3-63**  
**ECTS credits:** (2)  
**Semester: 1**

From the second year, students can, if they wish to, work on the development of an industrial project in partnership with a technical expert, a company and a supervisor from the school. This project is integrated in the cycle of studies. It can be the subject of the second year internship, continue in the third year and come to its conclusion with a TFE (end-of-studies work). Different teams of students can work on the same project until it is concluded. The realisation of the project consists of two stages: a bibliographic research stage and a development stage. Participation to such a project is a first discovery of applied research.

**Communication Techniques**  
**Code: IG3-20**  
**ECTS credits:** 1  
**Semester: 1**  
**Professor: Mr DENOUN**

**COURSE OBJECTIVE**

The objective is to enable prospective engineers to determine what the companies want in terms of management style. The aim is to be able to find one's place in a professional management typology.

**COURSE PLAN**

First session
- The company as a group of people
- Analysis and solution of a case study
- Corporate typology from a managing point of view

**Second session**
- The recruitment process

**ASSESSMENT**
- 2 applications of 4 hours
COURSE OBJECTIVE

Understand the basics of management control to improve the dialogue with the function specialists and to better co-ordinate one's action with the company global objectives. Master the notions of balance sheet and income statement.

Be able to identify the main strengths and weaknesses of a civil engineering company with the help of these two documents.

COURSE PLAN

Management control:
- Place and missions of management control in the company
- Budget planning and forecasts in the company
- Analysis of investments returns
- Missions that tend to increase production in the company

Financial management:
- Introduction of the notions of income statement and balance sheet based on concrete examples
- Presentation of the balance sheet
- Presentation of the income statement
- Main financing modes in a company
- Simulation of the evolution of the balance sheet and income statement of a company during a few months from the day of its creation.

ASSESSMENT

- 3 applications of 2 hours 30
- 1 written exam of 2 hours

BIBLIOGRAPHY

- Le Contrôle de Gestion Ardouin, Schmidt – PUBLI –UNION
- Management Control Systems Antony, Dearden - IRWIN
**COURSE OBJECTIVE**

- Application of urban planning, currently in a phase of mutation: land unit right to build.
- Known examples: AFU (land structure), housing estate
- Other tools for territory development.

**COURSE PLAN**

- General remarks on applied urban planning: new cities (antic cities, Yamoussoukro in Ivory Coast, Brasilia, Bastides royales)
- Application of the right to build
- A product: housing estate (definition, design, application)
- Other procedures: undeveloped property case, special cases
- A tool: the Association Foncière Urbaine (AFU, urban land association) ; definition ; design ; management ; application
- Other planning tools: objective contract and PDU (Urban Displacement Plan)

**Visits:**
- One-day trip to Evry, a new city: meeting with the director of the district architecture council, visit of some neighbourhoods, discussion with architects.
- One-day visit of a county town: contacts with the town representatives (realisation of town equipment and urban planning operations), visit of highway tollgate (the biggest in Europe): discussion with Cofiroute representatives.

**ASSESSMENT**

- 6 applications of 3 hours
- 1 project
- 1 oral presentation
- 1 report for each visit
- 1 oral test
- 2 visits

**BIBLIOGRAPHY**

- Code de l’urbanisme
- Documentation sur les villes nouvelles
- Créer une carte ville Evry (Le Moniteur)
- Etude pratique des plans de villes – Raymond Unwin
- Rome impériale et l’urbanisme dans l’Antiquité – Léon Homo
- Les AFU – Jacques Breton
COURSE OBJECTIVE

Present to the students the organisation of the various hardware, operating systems and software available for the realisation of a computing centre.

COURSE PLAN

Presentation of central processing units and their components
- MS WINDOWS, PC
- UNIX, workstations

Brief presentation on peripherals
- Printers
- Plotters, digitalisers
- Data backup

Software
- Topographic calculation
- CAD
- GIS

Networks
- Hardware
- Topology
- Operating method

ASSESSMENT

- 1 visit
COURSE OBJECTIVE

Define the role of the manager of a small or medium-size company, particularly the role of the land surveyor as company manager. Training is usually very technical but one must not forget that the manager of a small or medium-size company is at the same time a technician and a manager.

COURSE PLAN

- Presentation of the profession of land surveyor (legal study)
- Land survey companies strategies
- Financial management of a land survey company
- Accounting and financial statement for management
- S.E.L. (legislative studies services)
- The land surveyor's role as company manager (we will focus on this aspect during the whole course)
- Advantages and drawbacks of the various modes of practice
- Notions on labour law
- Applications: building a forecasted balance sheet,
- Implementation of a management tool suited to a small land survey company

ASSESSMENT

- 2 applications of 2 hours 30
- 1 written exam of 2 hours 30
COURSE OBJECTIVE

To ensure that when students leave the school they can understand, write and speak English as best as possible.

COURSE PLAN

- Study of technical newspaper articles.
- Updating of the CV written in the 2nd year, motivation letter.
- Presentation of the job application process, of companies, of international trade and of the European Union.
- Interview simulations.
- Study of two texts on civil engineering contracts.
- Various activities with a pedagogic objective such as competitive games on general knowledge and culture, vocabulary games and showing of films in English without subtitles and of BBC programs followed by a control on comprehension.
- Grammar and phrases revision using multiple choices questionnaires.

At the beginning of the academic year, students are divided into groups of different levels.

In brief, our common aim is to make English courses as diverse, as pleasant and as less boring as possible, so that students attend because they like it and not because they are forced to.

ASSESSMENT

Each student receives two grades, one application grade (coefficient 2) and one written exam grade (coefficient 3).

The application grade is the average of: one attendance and participation grade, one oral test, one or two other written tests according to the group, one grade for the interview simulation.

At the end of the year, there is a written exam of two hours common to all groups in which the student will have to answer to comprehension questions on a technical newspapers article and write an essay on a current issue.

BIBLIOGRAPHY

Learning to Manage (Editions Nathan, 1994).
OBJECTIVE OF THE 2ND YEAR INTERNSHIP

It is compulsory to do a three months professional internship during the summer recess between the second and third years of study. The internship must enable the engineering student to compare his theoretical studies with the corporate reality and at the same time to assume his first managing responsibilities. The intern will have to be in charge of an effective work related to the most important subjects taught in the school and his future career as an engineer. Whatever task he might be given, the intern must hold an engineering or managing position equivalent to the one he will hold on completion of his studies. This internship must be done on a corporate building site, or in a manufacture workshop, or more generally in all kind of services with a direct link to production or research activities. If these conditions are met, it can also be done in an administration or in a technical public service, in France or abroad.

THE INTERNSHIP REPORT

The internship report is an essential part of the internship and of the studies: on the one hand, it is the occasion to assess this experience inside a company by encouraging the engineering student to reflect on his action when faced with concrete problems and to show that he was able to apply what he learnt during his studies. On the other hand, the student will have to present and analyse his actions in the various fields of technique, human relations and management: the internship report must not be an account of his activities.

It comprises, in introduction, a general presentation of the company and the building site, of the workshop or service where the internship took place.

Illustrations (sketches, photos...) are an essential part of the technical presentation.

Security must be a constant preoccupation for a prospective manager. This issue must appear in all reports, the security dimension being interwoven with the technical development. The subjects tackled can be linked with one or more concrete problems relating to the worker's security on a site or in a workshop.

Quality must also be a constant preoccupation during the internship and be handled in a separate chapter in all reports. The student will have to observe how the concepts of quality management are integrated in the company operations and make any useful remarks and suggestions on this subject.

REPORT ASSESSMENT

The corrector assesses the work based on the quality of the analysis of the intern's action, on the personal dimension of his conclusions, on the expression clarity and precision as well as on the formal presentation.

In the specific case of the civil engineering and building majors, the internship report is given two separate grades: one for the general presentation and the technical aspect, the other for the security aspect. The final grade, a minimum of 12 is required for the award of the degree, is the average of these two grades with a weighting of 3 for the general and technical component and 1 for the security component.
OBJECTIVE OF THE T.F.E.

During their third year of study, all students must realise an end-of-studies work (T.F.E.) with a three-month active phase which takes place during the last quarter of study in a company.

The objective is to confront their knowledge with corporate realities, while ensuring an harmonious transition between school and professional life.

The theme of the T.F.E. is usually proposed by the host company. There is a wide range of possible themes: in practice, all corporate services that employ engineers and that do not fall into the restrictive definition of the compulsory internship done between the second and third years can be involved. Nevertheless, the theme must conform to the objective of the school, that is to call for what was taught during classes without restriction to the technical dimension, and also handle the issue of the factors of constraint on the company operations.

Possible subjects can be chosen among the following categories, the list is not exhaustive: deepening research paper, applied research work, technical projects, architecture and urban planning studies, production management and organisation, computer science, market studies...

T.F.E. REPORT

The study is accompanied by a T.F.E. report, corrected by a professor of ESTP and studies councillor.

This report is a technical note, similar to those that engineers usually write in their professional activity. It is therefore completely different from the second year professional internship report.

Because of the wide range of subjects presented, this document can take any form. Yet, it must define the problem studied (the question asked, the problem that must be solved, initial data, the link with previous studies...) as well as the methodology (initial or intermediate hypotheses, domains of validity, limits...), include a bibliography listing all the sources used as well as a table of content. A brief summary of one page, at the beginning, must allow the reader to understand rapidly the nature of the subject and the main ideas of the study.

ORAL PRESENTATION OF THE REPORT

The T.F.E. is subject to an oral presentation of not more than thirty minutes in front of a board of examiners which comprehends:
- The engineer in charge in the company,
- The professor and studies councillor in the school,
- The school Director of studies,
- Possibly, other persons.

ASSESSMENT OF THE T.F.E.

At the end of the oral presentation, a unique and final grade, for the report and the oral presentation, is given to engineering students. The T.F.E. grade is taken into account in the third year average and is weighted as required by the study plan. The T.F.E. cannot be validated if the grade is inferior to 10. In that case, the student must either present a complement to his report, or do a new T.F.E., according to the decision of the oral presentation board of examiners.
COURSE OBJECTIVE

- Improve linguistic skills, introduce technical and commercial vocabulary.
- Invite to communication (letters, discussion on the telephone, etc.)
- Confront students with economic, political, cultural and social realities of German-speaking countries.
- Encourage students to seek internships in German-speaking countries or to plan a stay in the frame of academic exchanges.
- Invite students to prepare the German language exams offered by the French German Chamber of Commerce or by the Goethe Institute.

COURSE PLAN

Last year beginners enter the intermediate group.

Intermediate group: revision of basic grammar notions, basic and everyday vocabulary, introduction to technical and commercial vocabulary.

Advanced group: style exercises, vocabulary extension, translation from French into German, technical and commercial vocabulary, preparation to language exams.

Exercises: notes, reports, descriptions.

Economic subjects: energy (problems), environment, commerce, information highways, communication in the work place.

Technical subjects: building projects in Europe, urban planning (history), machines and automation.

ASSESSMENT

Two written exams and two oral tests each year, a written exam common to all groups accounting for 50 % of the annual average.

MATERIAL AND PEDAGOGIC METHODS

Two written exams and two oral tests each year, a written exam common to all groups accounting for 50 % of the annual average.
Spanish

<table>
<thead>
<tr>
<th>Code: IG3-8-1-82</th>
<th>ECTS credits: 2</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mrs MOUNET</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

**Beginners group:**
Keep the student interest the Hispanic language and culture alive. Help him to express himself and make himself understood. Widen the cultural knowledge acquired in the 1st year.

**Advanced group:**
Improve students written and oral expression through grammar exercises and essays. Widen their knowledge of the Spanish-speaking world, on the cultural, political, economic level, etc.

**COURSE PLAN**

**Beginners group**
- **Grammar:** revision of the 1st year program, subjunctive, conditional, agreements.
- **Vocabulary:** everyday vocabulary, technical vocabulary, translation of everyday sentences.
- **Conversation:** be able to communicate in everyday life, introduction to oral presentation.
- **Hispanic culture:** revision of the 1st year, news of the Hispanic world, the 16th century, the pre-colombian civilisation, the conquest of America, Don Quichote, El Cid, Goya.
- **Methods used:** ELE – Editions SM 2ème niveau, video – Espana y America al habla – until lesson 12 – Viaje al espanol – Selected texts.

**Advanced group**
- **Grammar:** structural exercises.
- **Vocabulary:** chosen and advanced vocabulary in all fields, commercial and technical vocabulary, revision of written structures, CV, motivation letter for job applications.
- **Conversation:** improvisation on everyday life situations, oral reports, comment on the news, text analysis, oral presentations.
- **Hispanic culture:** history – Spanish dynasties, literature – the beginnings, the 18th century, the 98 generation, painting – Velazquez, Murillo, El Greco, Picasso, Dali, Miro, Botero.
- **Technical subjects:**
  - CV, motivation letter, job interview,
  - Spanish civil engineering companies,
  - Environment,
  - Pollution,
  - Underground waters,
  - The wonders of the world,
  - The history of railways in the Hispanic world,
  - Structures,
  - Computer science,
  - Aviation in the Hispanic world,
  - Building, civil engineering and industry professionals.
- **Methods used:** exercises notebook, selected texts, commercial book, video – reports, films, 6H, audio – cassettes from the national Spanish radio.

**ASSESSMENT**

There will be two grades. One for the final written exam. The second for the participation in class 1/3, oral expression 1/3, and midterm exams 1/3.
COURSE OBJECTIVE

It is a standard or common Arabic course, the language read, written and spoken in all the countries of the Arabic world. The aim of this course is to enable students to acquire a modern, useful and practical Arabic vocabulary, as a means of communication, with Arabic-speaking persons, in France or in Arabic-speaking countries and, finally, to make it easier for them to discover the Arabic and Islamic civilisation, through written texts.

For beginners:
- acquisition of basic language mechanisms,
- oral expression,
- learning of the Arabic alphabet and writing.

COURSE PLAN

Each class is usually divided into 3 periods:
- the first, lasting about twenty minutes, is dedicated to oral expression, in Arabic only, using figurines and a felt board to illustrate the text in the form of a dialogue. The lesson is presented in this way and repeated several times.
- Students immediately reproduce the dialogue through questions and answers.
- Once the text is globally understood, the second stage begins. It consists of a thorough study of the text in a linguistic, and grammatical perspective.
- The third stage comprehends the reading of the text, followed by oral and written application exercises.

ASSESSMENT

- 1 written exam.

BIBLIOGRAPHY

  - volume 1 : dialogues, grammar, exercises and polite phrases, as well as the most representative and widespread Arabic proverbs,
**COURSE OBJECTIVE**

Thanks to a partnership with the Ecole Normale Supérieure de Cachan in the field of languages teaching, ESTP students can attend Chinese classes. They are divided into two groups of different levels.

In the beginners' group, no prior knowledge is required. The aim is to acquire the basic structures of the everyday language.

The second level group is designed for students who already have basic language notions that need to be improved through the practice of oral and written expression.

**ASSESSMENT**

Continuous assessment: written and oral tests during classes.

---

**COURSE OBJECTIVE**

Thanks to a partnership with the Ecole Normale Supérieure de Cachan in the field of languages teaching, ESTP students can attend Italian classes. They are divided into two groups of different levels.

In the beginners' group, no prior knowledge is required. The aim is to acquire the basic structures of the everyday language.

The second level group is designed for students who already have basic language notions that need to be improved through the practice of oral and written expression.

**ASSESSMENT**

Continuous assessment: written and oral tests during classes.
Japanese

Code: IG3-8-1-88  ECTS credits: 2  Semester: 1
Professor: Mr TSCHUDIN-FUKUI

COURSE OBJECTIVE

Deepening of the first year work, new vocabulary, study of more complex structures, acquisition of about a hundred Chinese characters.

COURSE PLAN

With the help of audio and video material (video, audio-cassettes, etc), practice of conversation in everyday life situations: work, leisure, tourism, family life, shopping, etc. Presentation of the Japanese society with this method.

ASSESSMENT

- Dictation to ensure that students master the two syllabic alphabets, and later the characters
- Lessons, translation from French into Japanese and Japanese into French (at home),
- Oral continuous assessment and written exam at the end of the year.

BIBLIOGRAPHY

"Japanese for today", Edition GAKKEN – Tokyo,
"Kanji to kana", W. HADAMIZKY, Edition MAISONNEUVE – Paris,
"A Dictionary of Basic Japanese Grammar", S.Makino & M.Tsutsui, Tokyo, The Japan Times,

Russian

Code: IG38-1-89  ECTS credits: 2  Semester: 1
Professor: Mrs JARSKY

COURSE OBJECTIVE

Thanks to a partnership with the Ecole Normale Supérieure de Cachan in the field of languages teaching, ESTP students can attend Russian classes. They are divided into groups of different levels according to their prior knowledge of the language.

MODE OF ASSESSMENT

Continuous assessment: written and oral tests during classes.

French as a Foreign Language

Code: IG3-80-1  ECTS credits: 1  Semester: 1
Innovation and Intellectual Property Law

Code: IG3-91  ECTS credits: 1  Semester: 1
Professor: Mr COLETTE

COURSE PLAN
- Protection of operational creations
- Protection of aesthetics creations
- Protection of distinctive signs
- Transfer of technology
- Economic intelligence

ASSESSMENT
- 1 written exam of 2 hours 30

Off Shore

Code: IG3-92  ECTS credits: 2  Semester: 1
Professor: Mr QUENELLE

COURSE PLAN

Presentation of Off-Shore:
- Oil, gas, the sea
- Energy companies, entrepreneurs
- The three stages of realisation,

Fixed platforms:
- Definition, different types of platforms
- Study, manufacturing, installation

Submarine pipelines:
- Definitions,
- Manufacturing, coating,
- Installation,
- Wired-in decompression chamber - trends.

Deep offshore – pathology
- New support types, challenges,
- Illnesses, accidents, remedies
- Accidents / incidents case studies:
  - Piper X disaster
  - Sleipner disaster

Jobs – training
- Assessment using multiple choices questionnaires
- Jobs – mobility – training
- Meeting / presentation with « alumni »
COURSE OBJECTIVE
Give engineering students general information on building management activities (technical and services) which are an interface between building and building management.

COURSE PLAN
- Real estate
- Built property management
- Site management
- Support functions
- Real estate services and company structures
- Real estate exploitation prospective
- Real estate services and shortage economy

ASSESSMENT
- 3 applications of 2h
- 1 written exam of 2h
COURSE OBJECTIVE

The aim of this course is to make prospective engineers familiar with the use of modern codes of calculation by finite element. But, before using such a calculation code, it is essential to make an appropriate evaluation of its possibilities and above all of its limits. This course therefore describes the elementary approximation principle used by this method in a first part and then, in a second part, its practical application when using Effel.

COURSE PLAN

Lectures
- Introduction
- Revision on basic theorems (virtual work principle)
- Displacement map approximation – notions on form functions
- Study of unidimensional, bidimensional and tridimensional elements
- Displacement map calculation
- Review on constraint and deformation states
- Elementary characteristics
- Assembly and resolution
- Notions on modal dynamic analysis and buckling

Practical applications with EFFEL
- Plane beams with constant moment of inertia
- Reticulated structures made up of bars
- Horizontal portal frame integrating wind and snow problems (NV65)
- Modelling setting in plates and shells
- Metallic industrial building modelling (use of copy functions)
- Search for proper models using simple modelling

ASSESSMENT
- 6 applications of 3 hours

---

Introduction to Audit Methodology

COURSE PLAN

MISSION AND FUNCTION OF THE AUDITOR:
Audit methodology:
(Introduction – Materiality threshold – Risk based approach – Process review – Result in terms of materials and techniques used)
Organisation of a mission:
(the steps – Roles and responsibilities in the audit team)
Your position:
(Qualities expected from an auditor – The engineer's « added-value »)

ASSESSMENT
- 1 written exam of 2 hours 30
COURSE OBJECTIVE

The aim of this set of 6 sessions is to recall the principles concerning the information of the public, to propose rules for consultations and to present reflections and illustrations in the field of communication on large-scale projects. Texts from the bibliography and audio and visual documents will be studied, people with an experience in communication and dialogue will make contributions. Students must be aware of information, dialogue and consultation requirements in their practice and acquire some essential points of reference in a time when the role of the media is ever more important and when the concepts of sustainable development and democratic participation are becoming essential.

COURSE PLAN

Modes of communication on public works
- Client information, advertising, modes of communication
- Users-citizens' expectations and dialogue
- Consultations, surveys, polls, local referendums
- Consultation modes and public debate
- Sensitive information, crisis, prevention and emergency communication
- Negotiation and co-decision.

From public utility to sustainable development
- The public utility surveys and procedures
- Examples of the A16 et A51 highways works
- Collective interest, individual interests and general interest compromises
  - Sustainable development
Consultation and public debates (some examples)
- Case of harbour extension (Le Havre, Nice) or airport creation (Notre-Dame-des-Landes)
- Linear infrastructures: THT electrical lines, A32, Lyon highway and railway bypass

Public debate actors
- Politicians, experts and technicians, administrations
- The project manager and engineers in the public debate
- Operators and role of companies in project realisation
- People involved and associations

Decision and consultation
- Hesitations concerning a new airport in the Paris basin

The media and large-scale projects
- Relations with the press and the media
- Journalists' points of view on communication and dialogue

ASSESSMENT

Each student chooses a theme for a brief paper (5 to 7 pages) (problem raised by the operation, information and communication actions, evaluation or expected results), with a public oral presentation and discussion.
Management - Strategy

Code: IG3-98  ECTS credits: 2  Semester: 1
Professor: Mr CAMINADE

COURSE PLAN

Opening
- Presentation and organisation of the module
- Characteristics of the various opportunities on the market: careers in groups, small and medium-size companies. Become a freelance worker?
- Distribution of the TMS questionnaire

What will be my style as a manager?
- Presentation of the various types of managers according to their work preferences
- Mapping the student population
- Individual results of the TMS questionnaire
- Major orientations for each student

Emotional intelligence
- Presentation of the work of Daniel Goleman on emotional intelligence by one or more teams.
- Debate on this subject and lessons for everyone

Executive Leadership
- Presentation of the work of Elliott Jacques on leadership and management by one or more teams.
- Debate on the main types of organisations and management relations.

Competitive advantage
- Presentation of the work of Gary Hamel by one or more teams
- Debate on the consequences for individual and corporate strategic choices.

Synthesis
- Summary of the main points. Debate on individual reports.

ASSESSMENT

Students are assessed through a presentation on one of the collective subjects or an individual report on one of the themes studied.

Transport Design Systems

Code: IG3-64  ECTS credits: 2  Semester: 1
Professor: ENPC

Management of Urban Transport Systems

Code: IG3-65  ECTS credits: 2  Semester: 1
Professor: ENPC

Urban Mutations

Code: IG3-66  ECTS credits: 3  Semester: 1
Professor: ENPC
**Market and Firm Microeconomics**

<table>
<thead>
<tr>
<th>Code: IG3-99</th>
<th>ECTS credits: 2</th>
<th>Semester: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor: Mr MUNIER</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVE**

At the end of the course, students must know the basics of:
- value (price formation)
- equilibrium and interdependence between the markets
and the standard of reference for competition analysis, as well as the analysis of the various types of conceivable markets.

**COURSE PLAN**

- Consumption behaviour
- Economic rationality
- Modelling of production
- Socio-economic optimum concept
- The efficient market as the least costly way to reach an optimum: value, equilibrium
- The various types of markets possible: analysis of the forms of economic competition.

**Report on Extra Curricular Activities**

<table>
<thead>
<tr>
<th>Code: IG3-90</th>
<th>ECTS credits: 2</th>
<th>Semester: 1</th>
</tr>
</thead>
</table>

**COURSE OBJECTIVE**

Extra-curricular, individual or collective activities, can be, for prospective engineers, an occasion of personal development in:
- personality and maturity,
- the taste for entrepreneurship,
- the sense of responsibility and initiative,
- organisation and communication skills,
- opening on the rest of the world.

In this sense, they contribute to the general training of the prospective engineer.

**ORGANISATION**

At the end of the academic year, engineering students who believe they enter into the category defined above write an activity report. This report must be individual. However, in the case of collective activities, several individual reports can be gathered in a unique document starting with a collective synthesis on the work.

The first aim of the activity report is to give information. Yet, it must not be only an account, but the occasion for the writer to reflect on his personal action, to compare the results obtained with his objectives, without forgetting that the activity must be appreciated above all in its "formative" dimension.