**MSc Mining & Civil Engineering**

**List of courses offered in English in the framework of the Master programme Earth Science and Environment**

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| **Semester** | **Cours** | **ECTS** |
| **S8 - SPRING**15 January 2019 – 6 July 2019 | Mining Field Trip | 2,5 |
| Mineral Processing and Mining Congress | 2 |
| Applied GIS and Remote Sensing | 2 |
| Foundations | 1,5 |
| Modeling | 1,5 |
| Ground support and earth berms | 1,5 |
| Case study, geotechnics and engineering geology | 1,5 |
| Offshore Geohazards and Geotechnics | 1 |
| French as Foreign Language | 2 |
| **TOTAL** | **15,5** |
| **S9 FALL**3 September 2018 – 14 January 2019 | Mineral exploration concepts | 2 |
| Field School Mineral Exploration | 3 |
| Mining Modeling SURPAC | 2 |
| Ore deposits, In-depth Metallogeny versus Geometallurgy | 2 |
| Mineral Processing | 1,5 |
| Geophysics for geotechnical applications | 1 |
| Practical geotechnics | 4 |
| Geotechnical Works | 2 |
| Team Project Geotechnics | 12 |
| Team Project Mineral Resources | 12 |
| French as Foreign Language | 2 |
| **TOTAL** | **31,5** |

NB: The prerequisites in the course syllabi mention the courses at UniLaSalle. Courses with equivalent content taken at the partner university are accepted.

Last update : 17/02/2020

Course syllabi

[**Mining Field Trip** 3](#_Toc513191659)

[**Mineral processing & Mining Congress** 4](#_Toc513191660)

[**Applied GIS and Remote sensing** 5](#_Toc513191661)

[**Foundations** 6](#_Toc513191662)

[**Modeling** 7](#_Toc513191663)

[**Ground support and earth berms** 8](#_Toc513191664)

[**Case study geotechnics and engineering geology** 9](#_Toc513191665)

[**Geohazards and offshore geotechnics** 10](#_Toc513191666)

[**French as Foreign Language** 11](#_Toc513191667)

[**Mineral exploration concepts** 13](#_Toc513191668)

[**Field School Mineral Exploration** 14](#_Toc513191669)

[**Mining Modeling SURPAC** 15](#_Toc513191670)

[**Metallogeny** 16](#_Toc513191671)

[**Mineral Processing** 17](#_Toc513191672)

[**Geophysics for geotechnical applications** 18](#_Toc513191673)

[**Practical geotechnics** 19](#_Toc513191674)

[**Geotechnical Works** 20](#_Toc513191675)

[**Team Project Geotechnics** 21](#_Toc513191676)

[**Team Project Mineral Resources** 22](#_Toc513191677)

[**French as Foreign Language** 23](#_Toc513191678)

# **Mining Field Trip**

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| **Geology** |

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| **4th Year GeologySemester 8** |

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| **Program information** |

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| **GG4204** |

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| **Mining Field Trip** |

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| **2017-2018** |

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| **(Ecole de terrain mines)Department: G.E.O.S.** |  |
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| **Coordinator: M.NASRAOUI** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
| **0h** | **0h** |  **0h** |  **0h** | **0h** | **0h** | **0h** |  **32h** |  **20h** |

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| **ECTS credits:2,5** |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Mining field trip: mapping, mineralogy, geochemistry, project management and implementation |
| **By the end of the module, students will be able to (objectives):** |
| Mining field trip: have a grounding in mining exploration, organize and conduct a mining field trip.Produce a summary of geological data collected in person and by other members of the field trip team. |
| **Content:** |
| Mining field trip: The trip includes 3 phases:1 - Prior to the field trip: the students determine the equipment needed to conduct the project (documents, logistics, etc.).2 - During the field trip: the engineering students conduct their own surveys and measurements. They check and organize the work on a day-to-day basis (checking the validity of data acquisition and producing daily summaries) and ensure efficient development of the exploration project/characterization of mineral zones.3 - After the field trip: the engineering students produce a summary report of their own work (geological data with a map and sections needed to ensure proper understanding of the area analyzed, etc.). |
| **Teaching staff:** | M.NASRAOUI, L.CORBINEAU |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Report |  0h | 100% | Mining field trip report |

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# **Mineral processing & Mining Congress**

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| **Geology** |

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| **4th Year GeologySemester 8** |

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| **Program information** |

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| **GG4205** |

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| **Mineral Processing and mining congress** |

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| **2017-2018** |

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| **(Mineral Processing and mining congress)Department: G.E.O.S.** |  |
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| **Coordinator: L.CORBINEAU** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
|  **10h** | **2h** |  **6h** |  **0h** | **2h** | **0h** | **0h** | **6h** |  **25h** |

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| **ECTS credits:**2 |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Mineral processing, Business sectors and geology professions, Solid mechanics, Metallogeny, Industrial minerals, Geostatistics, Mineral geochemistry |
| **By the end of the module, students will be able to (objectives):** |
| Congress:• Decide to attend a scientific event depending on its importance for career aspirations• Attend a conference as a delegate/stakeholder (ask questions)• Take notes and summarize the event for presentation in a written report on his/her return.Mineral processing: know the different stages of ore and industrial mineral extraction and processing: comminution, ore dressing, metallurgy, know how to read a process diagram and calculate mass balance, costs and energy consumption in a mineral process. |
| **Content:** |
| Congress: Mineral resources themed trip or other mining congress\*Attend a scientific meeting or conference as a delegate or stakeholder\*Write a report of the eventMineral processing\*Introduction and concepts\*Extraction\*Comminution\*Ore dressing\*Metallurgy (hydro and pyro metallurgy)\*Mass balance in mineral processing\*Particle size reduction calculation\*Energy consumption calculation\*Mineral processing costs\*Visit to two ore processing sites: an industrial mineral quarry (clay, chalk, gypsum, kaolin, feldspar, etc.) and a pilot or recycling processing center |
| **Teaching staff:** | L.CORBINEAU, S.BROCHOT |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Exam | 2h | 90% | Ore processing and article following visit |
| Assessment 2 | Report | 0h | 10 | Conference report |

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# **Applied GIS and Remote sensing**

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| **Geology** |

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| **4th Year GeologySemester 8** |

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| **Program information** |

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| **Applied GIS and Remote sensing** |

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| **2017-2018** |

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| **(SIG et télédétection appliqués)Department: G.E.O.S.** |  |
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| **Coordinator: O.BAIN** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
| **0h** | **0h** |  **0h** |  **16h** | **4h** | **0h** | **0h** | **0h** |  **20h** |

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| **ECTS credits:2** |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Applied GIS and Remote sensing: 3rd Year GIS – Databases – Remote sensing |
| **By the end of the module, students will be able to (objectives):** |
| Applied GIS and Remote sensing:Tackle a real-world problem (hydrogeology – mining – environmental – petroleum) using geomatics toolsCombine several tools (databases, GIS and remote sensing) to develop an argumentPerform multi-source and multi-criteria spatial analysesCommunicate via map semantics |
| **Content:** |
| Applied GIS and Remote sensing:• Projects in groups of 4 or 5 organized according to specialization• Introduction to spatial analysis techniques• Principles for interpreting medium- and high-resolution images• Developing applications using ArcInfo• Project management• Principles of cartosemioticsall associated with project management |
| **Teaching staff:** | O.BAIN, A.COMBAUD |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Report | 0h | 100% | Applied GIS and remote sensing associated with project management |

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# **Foundations**

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| **Geology** |

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| **4th Year GeologySemester 8** |

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| **Program information** |

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| **Foundations** |

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| **2017-2018** |

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| **(Géotechnique 2 - Fondations)Department: G.E.O.S.** |  |
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| **Coordinator: J.VERNHES** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
|  **20h** | **2h** |  **0h** |  **0h** | **0h** | **0h** | **0h** | **0h** |  **15h** |

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| **ECTS credits:1,5** |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Third-year Geotechnics course |
| **By the end of the module, students will be able to (objectives):** |
| Design shallow and deep foundations in typical cases, in compliance with applicable standards. |
| **Content:** |
| The course will be based on Eurocode 7, as well as French standards for shallow and deep foundations.- Introduction to geotechnical calculations: categories, soil surveys and testing- Geotechnical design using calculations: characteristic values, calculation values, ULS, SLS- Geotechnical design of shallow foundations- Geotechnical design of deep foundations- Examples of applications  |
| **Teaching staff:** | B.BARAKAT |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Exam | 2h | 100% | Foundations |

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# **Modeling**

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| **Geology** |

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| **4th Year GeologySemester 8** |

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| **Program information** |

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| **GG4207** |

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| **Modeling** |

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| **2017-2018** |

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| **(Geotechnique-2 - Modélisation)Department: G.E.O.S.** |  |
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| **Coordinator: J.VERNHES** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
|  **10h** | **2h** |  **0h** |  **8h** | **0h** | **0h** | **0h** | **0h** | **5h** |

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| **ECTS credits:1,5** |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Soil Mechanics course |
| **By the end of the module, students will be able to (objectives):** |
| Carry out simple projects requiring the use of a common geotechnical modeling "finite element" package (PLAXIS 2D)  |
| **Content:** |
| - Introduction to the basic software features- "1 session = 1 new project" approach, with increasing difficulty level- Final project covering all aspects, carried out independently |
| **Teaching staff:** | B.BARAKAT, J.VERNHES, TERRASOL consultants |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Exam | 2h | 100% | Geotechnical modeling |

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# **Ground support and earth berms**

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| **4th Year GeologySemester 8** |

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| **Ground support and earth berms** |

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| **2017-2018** |

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| **(Soutènements et talus)Department: G.E.O.S.** |  |
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| **Coordinator: B.BARAKAT** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
|  **18h** | **2h** |  **0h** |  **0h** | **0h** | **0h** | **0h** | **0h** |  **10h** |

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| **ECTS credits:1,5** |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Geotechnics 1, geostatistics |
| **By the end of the module, students will be able to (objectives):** |
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| **Content:** |
| 3. Ground support and earth berms- Limit equilibrium states: granular and cohesive environments- Practical calculations of active and passive pressure using software- Principles of designing structures according to Eurocode 7: free-standing retaining walls, sheet piling, different wall types |
| **Teaching staff:** |  |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Exam | 2h | 100% | Ground support and earth berms |

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# **Case study geotechnics and engineering geology**

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| **Geology** |

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| **4th Year GeologySemester 8** |

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| **Program information** |

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| **Case study, geotechnics and engineering geology** |

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| **2017-2018** |

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| **(Etude de cas, géotechnique et géologie de l'ingénieur)Department: G.E.O.S.** |  |
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| **Coordinator: J.VERNHES** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
| **6h** | **0h** |  **0h** |  **6h** | **4h** | **0h** | **0h** | **0h** | **0h** |

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| **ECTS credits:1,5** |

 |
|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | General geology, first-year Master's levelGeneral geotechnics |
| **By the end of the module, students will be able to (objectives):** |
| Design a solution to build a structure in a specific, restrictive geological context |
| **Content:** |
| Preparation on campus and in the field (combined with May field trip) |
| **Teaching staff:** | L. FROBERT (ENGIE) |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Report | 0h | 100 |  |

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# **Geohazards and offshore geotechnics**

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| **Geology** |

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| **4th Year GeologySemester 8** |

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| **Program information** |

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| **Offshore Geohazards and Geotechnics** |

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| **2017-2018** |

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| **(Geohazards et Géotechnique offshore)Department: G.E.O.S.** |  |
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| **Coordinator: J.VERNHES** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
|  **12h** | **2h** |  **10h** |  **0h** | **0h** | **0h** | **0h** | **0h** | **0h** |

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| **ECTS credits:1** |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Engineer tools and techniques |
| **By the end of the module, students will be able to (objectives):** |
| Gain insight in offshore geohazards and offshore geotechnics, capability to asses a range of practical situations through calculations |
| **Content:** |
| Offshore Industry Overview and contextTypes of subsea foundations, Offshore anchorsSubsea foundation calculationsPlatform foundations + Driven piles ExercicesShore approach (trenching/dredging)+ soil and pipes interactionsOffshore GeohazardsReconnaissance of offshore soils, Lab testing, soil parameters interpretation + exercices |
| **Teaching staff:** | D. OREJUELA, E. SERRA (SUBSEA7) |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Exam | 1h | 50% | Exam n° 1 |
| Assessment 2 | Exam | 1h | 50% | Exam n° 2 |

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# **French as Foreign Language**

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| **Geosciences** **French as a Foreign Language 1** | **2018-2019** |
| **Faculty: Dr. Martine REY et al.** | **Module:****Beginning French**  | **Time :****24 contact hrs. & interactive assignments****HW: 12 hrs.****Exam: 2 hrs.**  | **2 ECTS credits****1 US credit** |
| **Numerus clausus : 20** |
| **Prerequisite:** none |
| **Objective:** Students will acquire the basic skills to use French in everyday situations  |
| **Description:**. This language course aims at providing students with the necessary language tools to interact successfully in a variety of situations and settings, for example at a farmers’ market or while traveling. Students will continue to learn French outside the classroom by practicing their acquired skills and adding new ones, for example by reading product labels in French, or asking questions during campus events, at a restaurant or in local businesses.. Interactive assignments will therefore complement classroom instruction. Students will be expected to participate actively, using the language skills they are learning inside and outside the classroom.**Course content** :* Basics of French language; “*when in France*” – culturally appropriate does and don’ts
* Describe, narrate, and ask/answer questions in the foreign language in the present time about a variety of topics related to family, daily activities, eating, and traveling.
* Comprehend the foreign language with sufficient ability to grasp the main idea in short conversations pertaining to the topics mentioned above.
* Read and understand the main idea and some details of materials related to daily life and travel (maps, classified ads,)
* Write sentences and short paragraphs on familiar topics relating to personal interests and practical needs. (e.g. postcards)

**Course material** includes: * Music (e.g. Nino Ferrer, Charles Aznavour)
* Food art
* Excerpts from French literature (e.g Emile Zola, *Le Ventre de Paris*)
* Films & video (e.g. *After Winter, Spring; Demain (Tomorrow); Nos enfants nous accuserons (Food Beware)*),
* Menus and descriptions of regional French products.
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| **Instructor:**Martine Rey, Associate Professor of Languages and Cultural Studies et al. |
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| **Assessment:**

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| **Assignments:** | **Method:** | **Time limit (for supervised tests):** | **Weighting:** |
| Class participation | Preparation for class and class discussion | N/A | 30% |
| Communication tasks | Interactive, real life assignments using French | N/A | 30% |
| Final Exam |  |  | 40% |

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| **Geosciences** **French as a Foreign Language 2** | **2018-2019** |
| **Faculty: Dr. Martine REY et al.** | **Module:****Intermediate French**  | **Time :****24 contact hrs. & interactive assignments****HW: 12 hrs.****Exam: 2 hrs.**  | **2 ECTS credits****1 US credit** |
| **Numerus clausus : 20** |
| **Prerequisite:** French 102 or equivalent |
| **Objective:** this course is designed for students at an intermediate level. The goal is to consolidate and improve skills previously acquired in French (101/102, or equivalent). |
| **Description:**. This language course allows students to explore French language and culture in a variety of situations and settings. Students will continue to learn French outside the classroom by practicing their acquired skills and adding new ones, for example by actively participating in campus events, or interacting in everyday life. Interactive assignments will therefore complement classroom instruction. Students will review grammar and phonetics to improve their communication skills. Classes are conducted entirely in French.**Course content** :* Speak the foreign language well enough to communicate on a variety of topics important in the foreign language culture that go beyond needed to “survive” in the foreign culture.
* Read and understand the main idea and most details in material about a variety of topics.
* Write longer paragraphs that show more cohesion than at the elementary level.
* Review of the most basic grammar structures

**Course material** includes: * Music (e.g. George Brassens, Nino Ferrer)
* Magazines and newspapers
* Films & video (e.g. *After Winter, Spring; Demain (Tomorrow); Nos enfants nous accuserons (Food Beware)*),
 |
| **Instructor:**Martine Rey, Associate Professor of Languages and Cultural Studies  |
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| **Assessment:**

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| **Assignments:** | **Method:** | **Time limit (for supervised tests):** | **Weighting:** |
| Class participation | Preparation for class and class discussion | N/A | 30% |
| Communication tasks | Interactive, real life assignments using French | N/A | 30% |
| Final Exam | Oral and written exam |  | 40% |

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# **Mineral exploration concepts**

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| **Geology** |

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| **5th Year Geology Semester 9** |

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| **Program information** |

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| **GG5125** |

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| **Mineral exploration concepts - research and development strategy** |

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| **2017-2018** |

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| **(Mineral exploration concepts - research and development strategy)Department: G.E.O.S.** |  |
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| **Coordinator: L.CORBINEAU** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
|  **24h** | **1h** |  **0h** |  **0h** | **0h** | **0h** | **0h** | **0h** |  **36h** |

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| **ECTS credits:**2 |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Introduction to mineral resources (Year 3), Metallogeny (Year 4), Industrial minerals (Year 4), Mining prospection (Year 4), Mining economy (Year 4), Rock and mineral geochemistry (Year 4) |
| **By the end of the module, students will be able to (objectives):** |
| • Have good knowledge and an in-depth grasp of mineral exploration and research and development issues applied to mineral resources• Plan and execute subsurface, drilling and geochemical sampling campaigns• Determine the quality and limitations of results obtained during campaigns• Integrate geochemical results with remote sensing, geology mapping and with geophysical and other data to set new exploration targets or develop an exploration and metallogenic model• Apply the principles of the different types of mining laws |
| **Content:** |
| • Introduction to exploration R&D and review of Year 4• New methods of investigation• Data management in exploration and application to prospectivity mapping• Exploration phasing: - Generative exploration - Stream sampling campaign and recon (greenfield) - Subsurface sampling and mapping (property phase) - Trenching and the 2D-3D shift (property phase) - Drill testing and development via 3D modeling (development phase)• Introduction to mining law - Jack Testard |
| **Teaching staff:** |  |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Exam | 1h | 70% | Exam on exploration R&D |
| Assessment 2 | Report | 16h | 30% | Final report based on a 2-day serious game approach |

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# **Field School Mineral Exploration**

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| **Geology** |

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| **5th Year GeologySemester 9** |

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| **Program information** |

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| **GG5126** |

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| **Field camp: Mineral Exploration & Mineral Processing)** |

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| **2017-2018** |

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| **(Field camp: Mineral Exploration & Mineral Processing)Department: G.E.O.S.** |  |
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| **Coordinator: M.NASRAOUI** |

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| **Teaching method : Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
| **0h** | **0h** |  **0h** |  **0h** | **0h** | **0h** | **0h** |  **36h** |  **18h** |

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| **ECTS credits:**3 |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Crystallography and Mineralogy I & II (Year 1, Year 2), Mines and Quarries (Year 3), Ore Deposit Classification/Metallogeny (Year 4), Exploration and Mineral Processing (Year 4), Applied Geophysics (Year 4) |
| **By the end of the module, students will be able to (objectives):** |
| • Apply specific geological survey field techniques to ore deposits• Produce metallogenic maps using geological and mineralogical information• Implement tactical/strategic exploration approaches• Demonstrate the interpersonal skills needed to work in a multi-cultural setting• Establish correlations between geological and geophysical data, and mineral processing |
| **Content:** |
| This field camp is based in the central part of Morocco and covers exploration/exploitation and mineral processing of a copper (gold) ore deposit. Key aspects of the field camp include:• Different scale mapping techniques in mineralized areas: both underground and surface mapping• In-depth understanding of the links between mineralization processes, lithology, tectonic and 3D mineral distribution.• Mapping and sampling of altered zones (hydrothermal & supergene alteration processes)• Field geophysical data acquisition & interpretation• Drilling location and implementation• Ore deposit targeting• Mineral processing optimization |
| **Teaching staff:** | M. NASRAOUI |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Report | 0h | 100% |  |

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# **Mining Modeling SURPAC**

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| **Geology** |

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| **5th Year GeologySemester 9** |

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| **Program information** |

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| **GG5152** |

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| **3D Mining Modeling – Surpac** |

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| **2017-2018** |

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| **(Modélisation minière 2 Surpac)Department: G.E.O.S.** |  |
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| **Coordinator: L.CORBINEAU** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
| **4h** | **0h** |  **20h** |  **0h** | **0h** | **0h** | **0h** | **0h** |  **20h** |

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| **ECTS credits:2** |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Mining modeling 1, Industry sectors and careers in geology, Geodesy, SQL and GIS databases, Geostatistics, Gitology-Metallogeny, Industrial Minerals |
| **By the end of the module, students will be able to (objectives):** |
| Understand the purpose of developing a 3D model of the sub-surface using a Surpac GeoModeler. Understand the problems related to geostatistics applied to a 3D model. Create their own model using Surpac software. |
| **Content:** |
| \* 3D visualization\* Topographic modeling\* Modeling a complex metal deposit\* Creating and editing sections\* Calculating volumes and content according to the variability of an element\* Drawing an open pit mine shaft\* Operation phasing |
| **Teaching staff:** | E. INTERVENANT |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Report | 0h | 100% | Surpac modeling project |

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# **Ore deposits, In-depth Metallogeny versus Geometallurgy**

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| **Geology** |

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| **5th Year GeologySemester 9** |

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| **Program information** |

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| **GG5124** |

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| **Ore deposits, In-depth Metallogeny versus Geometallurgy**  |

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| **2017-2018** |

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| **(Métallogénie approfondie)Department: G.E.O.S.** |  |
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| **Coordinator: M.NASRAOUI** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
| **2h** | **1h** | **8h** | **8h** | **0h** | **0h** | **0h** | **0h** |  **12h** |

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| **ECTS credits:**2 |

 |
|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Crystallography, Mineralogy and Geochemistry I & II (Year 1, Year 2), Mines and Quarries (Year 3), Gitology-Metallogeny (Year 4), Ore Prospecting and Processing (Year 4) |
| **By the end of the module, students will be able to (objectives):** |
| • Process information from centripetal exploration and centrifugal exploitation and exploration phases,• Make a diagnosis based on macro-microscopic observations of samples and their geochemical composition and on the physical and chemical properties of their constituent minerals,• Correlate it with ore processing optimization methods |
| **Content:** |
| The module addresses metallogeny with an overall structured approach from a geometallurgical perspective, by establishing links between exploration, ore characterization and valuation procedures. It includes:• Ore characterization studies: metallographic observation and reflection polarizing optical microscope identification of the principal metallic minerals• Scanning electron microscope examination of bearer minerals and their textural relations to establish a paragenetic evolution model• Assessment of the impact of textural relations on ore processing procedures**Case studies:**Resolution of problems involved in refractory ore valuation:- Alluvial gold deposit- Vein-type copper and gold-bearing deposit- Laterite deposit containing niobium, tantalum and rare earths- Underground and open pit mine surveying studies and geometric/reading implications, interpretation and correlation of borehole surveying/geochemical and mineralogical data |
| **Teaching staff:** | M. NASRAOUI |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Practical report | 0h | 50% |  |
| Assessment 2 | Exam | 1h | 50% |  |

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# **Mineral Processing**

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| **Geology** |

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| **5th Year Geology Semester 9** |

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| **Teaching information** |

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| **GG5153** |

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| **Mineral Processing: Grinding/Comminution**  |

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| **2017-2018** |

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| **(Mineral Processing: Grinding/Comminution)Department: G.E.O.S.** |  |
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| **Coordinator: M.NASRAOUI** |

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| **Teaching method : Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
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| **ECTS credits:1,5** |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | - Mineral Processing- Quarry/Mine Life Cycles |
| **By the end of the module, students will be able to (objectives):** |
| - Conceptualize optimal grinding/comminution processes via case studies- Use/implement BRUNO software to evaluate the performance of crushers and grinding mills in view of rock and machine parameters- Assist decision makers with optimizing grinding/crushing processes |
| **Content:** |
| The operational content is divided into three parts:Part 1: Case study of a grinding/crushing project with a reminder of basic principles and background knowledgePart 2: In-depth study of parameter calculation involved in grinding/crushing processesPart 3: Simulation conceptualization exercise relating to the grinding/crushing process using BRUNO software |
| **Teaching staff:** |  |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Report | 0h | 100% |  |

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# **Geophysics for geotechnical applications**

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| **Geology** |

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| **5th Year GeologySemester 9** |

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| **Program information** |

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| **GG5108** |

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| **Geophysics for geotechnical applications**  |

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| **2017-2018** |

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| **(Géophysique Appliquée à la Géotechnique)Department: G.E.O.S.** |  |
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| **Coordinator: P.LUTZ** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
| **6h** | **1h** |  **0h** |  **6h** | **0h** | **0h** | **0h** | **0h** | **6h** |

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| **ECTS credits:1** |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Geophysics Years 3 and 4 – Geotechnics Year 4  |
| **By the end of the module, students will be able to (objectives):** |
| • Understand the principles of near-surface geophysics applied to geotechnics and natural risks• Understand the limits and advantages of each method• Decide which method to use depending on the specific geotechnical problem and the geological context  |
| **Content:** |
| Lectures: • Methods for detecting and locating cavities (microgravimetry, electrical methods, radar, etc.)• Methods for dam testing (electromagnetic and electrical methods, etc.)• Electromagnetic methods applied to estimating water content• Presenting the results of geophysical research applied to geotechnical problems• Correlation between geophysical and geotechnical resultsGeophysics practical work:• Reflections on suitable methods for specific case studies, proposing a program and drawing up an estimate• Processing and analyzing geophysical data with the use of specific software (microgravimetry, tomography, geological radar, etc.)• Exercises to understand the limits and advantages of each method• Interpretation of geophysical results by incorporating geological and geotechnical knowledge• Proposing recommendations |
| **Teaching staff:** | F.RENALIER |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Exam | 1h | 50% |  |
| Assessment 2 | Report | 0h | 50% |  |

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# **Practical geotechnics**

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| **Geology** |

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| **5th Year GeologySemester 9** |

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| **Program information** |

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| **GG5116** |

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| **Practical geotechnics** |

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| **2017-2018** |

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| **(Pratiques géotechniques)Department: G.E.O.S.** |  |
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| **Coordinator: B.BARAKAT** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
|  **60h** | **3h** |  **0h** |  **0h** | **0h** | **0h** | **0h** | **0h** |  **30h** |

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| **ECTS credits:4** |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | 3rd and 4th year courses in geotechnics |
| **By the end of the module, students will be able to (objectives):** |
| At the end of the course, the student will be efficient in dealing with different practical geotechnical problems. |
| **Content:** |
| Legal framework of geotechnics • Geotechnical assignments • Consistency of geotechnical investigations• Reinforcement and improvement of soils• Environmental geotechnology• Geology and geotechnics of dams |
| **Teaching staff:** | B.BARAKAT |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Exam | 3h | 100% |  |

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# **Geotechnical Works**

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| **Geology** |

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| **5th Year GeologySemester 9** |

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| **Program information** |

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| **GG5149** |

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| **Geotechnical Works** |

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| **2017-2018** |

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| **(Chantiers géotechniques)Department: G.E.O.S.** |  |
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| **Coordinator: J.VERNHES** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
|  **24h** | **2h** |  **0h** |  **0h** | **0h** | **0h** | **0h** | **0h** |  **12h** |

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| **ECTS credits:2** |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Specialization program 1 Geotechnics course |
| **By the end of the module, students will be able to (objectives):** |
| - Draw on extensive knowledge to apply a solution for a geotechnical project from the range of approaches currently available in France.- Make effective use of a suite of geotechnical design software such as MIS or MEL concepts, aimed at resolving common geotechnics problems- Understand the principles governing recent and current developments in geotechnical standardsMain applications of this course: foundations, retaining walls, ground hydraulics. |
| **Content:** |
| - General information on geotechnical works- Correlations (following on from Specialization program 1)- Retaining structures- Deep foundation solutions- Water table lowering solutions- Introduction to Eurocode 7- K-REA software (retaining walls)- TALREN software (slope stability) |
| **Teaching staff:** | J.VERNHES |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Exam | 1h | 50 | Multiple-choice test on knowledge acquired in lectures |
| Assessment 2 | Exam | 1h | 50 | Geotechnical design using software |

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# **Team Project Geotechnics**

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| **5th Year GeologySemester 9** |

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| **Program information** |

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| **GG5128** |

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| **Geotechnics team project** |

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| **2017-2018** |

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| **(Projet collectif Géotechnique)Department: G.E.O.S.** |  |
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| **Coordinator: B.BARAKAT** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
|  **40h** | **2h** |  **0h** |  **0h** |  **100h** | **0h** | **0h** | **0h** |  **60h** |

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| **ECTS credits:12** |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | Attend all courses in the geotechnics specialty |
| **By the end of the module, students will be able to (objectives):** |
| • Solve industrial problems• Propose operational solutions• Manage an entire project• Organise team work• Meet requirements regarding results, budget and time |
| **Content:** |
| • Lectures on the design of geotechnical works according to Eurocode 7• The team project is based on the resolution of often complex industrial issues leading to strategic decisions.• The subject is defined and supervised by the Head of the specialty; it can be realized in collaboration with a company.• The team in charge of the project or part of it consists of 4 to 8 students who are responsible for organizing the group, distributing tasks, quickly drawing up a schedule and completing the activity for a specified deadline.• Note: The project may sometimes be carried out individually, especially by students having completed a preparatory engineering internship over the previous July and August (this preparatory period is designed to help interns become operational more quickly after their arrival in January). Examples include a literature review, a report on using a software application, monitoring a drilling campaign, etc. The subject of this preparatory internship may be used as a basis for the project. This approach enables the student to remain in contact with the company during semester 9 and serves as a bridge between the preparatory internship and the engineering internship. |
| **Teaching staff:** | B.BARAKAT, J.VERNHES |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Report | 0h | 50% |  |
| Assessment 2 | Oral | 0h | 50% |  |

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# **Team Project Mineral Resources**

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| **Geology** |

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| **5th Year GeologySemester 9** |

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| **Program information** |

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| **Team Project – In-Depth Mines & Quarries Program** |

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| **2017-2018** |

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| **(MINERAL RESOURCES Team Project)Department: G.E.O.S.** |  |
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| **Coordinator: M.NASRAOUI** |

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| **Teaching method: Common core** |

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| **Distribution of teaching methods:** |
| **CM** | **EXA** | **TD** | **TP** | **AFP** | **AFNP** | **CC** | **EXT** | **TTE** |
| **0h** | **4h** |  **0h** |  **0h** |  **116h** | **0h** | **0h** | **0h** | **0h** |

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| **ECTS credits:12** |

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|  | **Key:** CM = Lecture, EXA = Exam, TD = Tutorial, TP = Practical work, AFP = Scheduled self-study, AFNP = Unscheduled self-study, CC = Ongoing assessment, EXT = Curriculum related excursion, TTE = Homework |
| **Pre-requisites (module title(s)):** | In-depth Mines & Quarries program |
| **By the end of the module, students will be able to (objectives):** |
| • Solve time-sensitive industrial problems• Find/propose realistic solutions• Manage an entire industrial project• Demonstrate team-building skills• Achieve project targets and results within deadline and budget constraints |
| **Content:** |
| • The team project is based on the resolution of complex industrial issues, leading to strategic decisions• The project topic is determined and supervised by the head of the 'Mines & Quarries' program, often in cooperation with industrial partners• The project is conducted by a student team tasked with ensuring full organization of all the work involved, generating the sequence of tasks, and achieving project targets within a set schedule and budgetNote: If necessary, the project can be conducted by a single student, particularly if a pre-engineering internship was done in the July and August preceding the team project. In this case, the project can be based on a bibliography review, use of a software program, or monitoring of a drilling survey for example. The work achieved during the pre-internship can provide the basis for the team project. This enables the student to remain in touch with industrial partners during semester 9 and ensure continuity between the pre-internship and the final engineering internship  |
| **Teaching staff:** | M. NASRAOUI |
| **Assessment (procedures and weightings):** |
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| Number of assessments | Procedures | Length of assessment | Weighting of each assessment | Assessment title |
| Assessment 1 | Report | 0h | 50% |  |
| Assessment 2 | Oral | 4h | 50% |  |

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# **French as Foreign Language**

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| **Geosciences** **French as a Foreign Language 1** | **2018-2019** |
| **Faculty: Dr. Martine REY et al.** | **Module:****Beginning French**  | **Time :****24 contact hrs. & interactive assignments****HW: 12 hrs.****Exam: 2 hrs.**  | **2 ECTS credits****1 US credit** |
| **Numerus clausus : 20** |
| **Prerequisite:** none |
| **Objective:** Students will acquire the basic skills to use French in everyday situations  |
| **Description:**. This language course aims at providing students with the necessary language tools to interact successfully in a variety of situations and settings, for example at a farmers’ market or while traveling. Students will continue to learn French outside the classroom by practicing their acquired skills and adding new ones, for example by reading product labels in French, or asking questions during campus events, at a restaurant or in local businesses.. Interactive assignments will therefore complement classroom instruction. Students will be expected to participate actively, using the language skills they are learning inside and outside the classroom.**Course content** :* Basics of French language; “*when in France*” – culturally appropriate does and don’ts
* Describe, narrate, and ask/answer questions in the foreign language in the present time about a variety of topics related to family, daily activities, eating, and traveling.
* Comprehend the foreign language with sufficient ability to grasp the main idea in short conversations pertaining to the topics mentioned above.
* Read and understand the main idea and some details of materials related to daily life and travel (maps, classified ads,)
* Write sentences and short paragraphs on familiar topics relating to personal interests and practical needs. (e.g. postcards)

**Course material** includes: * Music (e.g. Nino Ferrer, Charles Aznavour)
* Food art
* Excerpts from French literature (e.g Emile Zola, *Le Ventre de Paris*)
* Films & video (e.g. *After Winter, Spring; Demain (Tomorrow); Nos enfants nous accuserons (Food Beware)*),
* Menus and descriptions of regional French products.
 |
| **Instructor:**Martine Rey, Associate Professor of Languages and Cultural Studies et al. |
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| **Assessment:**

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| **Assignments:** | **Method:** | **Time limit (for supervised tests):** | **Weighting:** |
| Class participation | Preparation for class and class discussion | N/A | 30% |
| Communication tasks | Interactive, real life assignments using French | N/A | 30% |
| Final Exam |  |  | 40% |

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| **Geosciences** **French as a Foreign Language 2** | **2018-2019** |
| **Faculty: Dr. Martine REY et al.** | **Module:****Intermediate French**  | **Time :****24 contact hrs. & interactive assignments****HW: 12 hrs.****Exam: 2 hrs.**  | **2 ECTS credits****1 US credit** |
| **Numerus clausus : 20** |
| **Prerequisite:** French 102 or equivalent |
| **Objective:** this course is designed for students at an intermediate level. The goal is to consolidate and improve skills previously acquired in French (101/102, or equivalent). |
| **Description:**. This language course allows students to explore French language and culture in a variety of situations and settings. Students will continue to learn French outside the classroom by practicing their acquired skills and adding new ones, for example by actively participating in campus events, or interacting in everyday life. Interactive assignments will therefore complement classroom instruction. Students will review grammar and phonetics to improve their communication skills. Classes are conducted entirely in French.**Course content** :* Speak the foreign language well enough to communicate on a variety of topics important in the foreign language culture that go beyond needed to “survive” in the foreign culture.
* Read and understand the main idea and most details in material about a variety of topics.
* Write longer paragraphs that show more cohesion than at the elementary level.
* Review of the most basic grammar structures

**Course material** includes: * Music (e.g. George Brassens, Nino Ferrer)
* Magazines and newspapers
* Films & video (e.g. *After Winter, Spring; Demain (Tomorrow); Nos enfants nous accuserons (Food Beware)*),
 |
| **Instructor:**Martine Rey, Associate Professor of Languages and Cultural Studies  |
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| **Assessment:**

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| **Assignments:** | **Method:** | **Time limit (for supervised tests):** | **Weighting:** |
| Class participation | Preparation for class and class discussion | N/A | 30% |
| Communication tasks | Interactive, real life assignments using French | N/A | 30% |
| Final Exam | Oral and written exam |  | 40% |

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