

Course

Programme

2007/20--

2007-200- : 1st Year 28 weeks + 2 weeks of PT + 2 weeks of exams + 4-week work placement

| SEMESTER 1 (14 weeks) | | | | |
|---|-----------------|------------|------------|-----------|
| Title and content of UE | Number of hours | | | ECTS |
| | Lecture | Tutorial | PW | |
| UE 1 - CORE SCIENCE TRAINING | | | | |
| Mathematics : elementary tools | 21 | 21 | - | 3,5 |
| Mathematics : linear algebra | 21 | 21 | - | 3,5 |
| Thermodynamics | 21 | 21 | 12 | 4,5 |
| UE 2 - ENGINEERING SCIENCES | | | | |
| Statics of Solids | 21 | 21 | 12 | 4,5 |
| Electricity | 21 | 21 | 12 | 4,5 |
| UE 3 - TECHNOLOGICAL TRAINING | | | | |
| Industrial technology | 15 | 15 | 18 | 4 |
| Culture of transport technology 1 | 12 | - | - | - |
| Visiting a workplace 1 | - | 4 | - | - |
| UE 4 - COMMUNICATION | | | | |
| Expression and Communication 1 | 15 | 15 | - | 2,5 |
| English 1 | - | 28 | - | 2 |
| Sport 1 | - | 28 | - | 1 |
| TOTAL FOR THE SEMESTER | 147 | 195 | 54 | 30 |
| | | | 396 | |
| SEMESTER 2 (14 + 6 weeks) | | | | |
| Title and content of UE | Number of hours | | | ECTS |
| | Lecture | Tutorial | PW | |
| UE 1 - Core Sciences Training | | | | |
| Mathematics : Real Analysis | 21 | 21 | 9 | 3 |
| Mathematics : Geometry and complex analysis | 21 | 21 | - | 2,5 |
| Chemistry 1 | 12 | 12 | 12 | 2 |
| Waves | 12 | 12 | 12 | 2 |
| UE 2 - ENGINEERING SCIENCES | | | | |
| Applied Mechanics | 21 | 21 | 12 | 3 |
| ICT 1 | 21 | 21 | 12 | 3 |
| UE 3 - TECHNOLOGICAL TRAINING | | | | |
| Industrial Technology | 15 | 15 | 12 | 2,5 |
| Electronics | 12 | 12 | 12 | 2 |
| Structure of Computing Systems | 12 | 12 | 12 | 2 |
| Culture of transport technology 2 | 12 | - | - | - |
| Visiting a workplace 2 | - | 4 | - | - |
| UE 4 - COMMUNICATION | | | | |
| English 2 | - | 28 | - | 2 |
| Sport 2 | - | 28 | - | 1 |
| UE 5 - TRAINING FOR THE WORPLACE | | | | |
| Work Placement | 4 weeks | | | 5 |
| TOTAL FOR SEMESTER | 159 | 207 | 93 | 30 |
| | | | 459 | |
| TOTAL FOR THE YEAR | 306 | 402 | 147 | 60 |
| | | 35,79% | 47,02% | 17,19% |
| | | | 855 | |
| No. hours per week | | 28,5 | | |

2008-200- : 2nd Year 32 weeks + 2 weeks of exams

| SEMESTER 1 (16 weeks) | | | | |
|--|-----------------|------------|------------|-----------|
| Title and content of UE | Number of hours | | | ECTS |
| | Lecture | Tutorial | PW | |
| UE 1 - CORE SCIENCE TRAINING | | | | |
| Mathematics : Differentiel calculation | 21 | 21 | - | 2,5 |
| Mathematics : Series | 21 | 21 | - | 2,5 |
| Physics - electromagnetism | 12 | 12 | 15 | 2,5 |
| ICT 2 | 15 | 15 | 12 | 2,5 |
| UE 2 - ENGINEERING SCIENCES | | | | |
| Kinematics of solids | 15 | 15 | - | 2 |
| Structure of computing systems | 12 | 12 | 15 | 2,5 |
| Chemistry 2 | 12 | 12 | 15 | 2,5 |
| UE 3 - TECHNOLOGICAL TRAINING | | | | |
| Industrial technology | 21 | 21 | 21 | 4 |
| Fabrication | 21 | 21 | 15 | 3,5 |
| Metallic materials | 15 | 15 | 15 | 2,5 |
| Culture of transport technology | 6 | - | - | - |
| Visiting a workplace 3 | - | 4 | - | - |
| UE 4 - COMMUNICATION | | | | |
| English 3 | - | 32 | - | 2 |
| Sport 3 | - | 32 | - | 1 |
| TOTAL FOR SEMESTER | 171 | 233 | 108 | 30 |
| | 512 | | | |
| SEMESTER 2 (16 weeks) | | | | |
| Title and content of UE | Number of hours | | | ECTS |
| | Lecture | Tutorial | PW | |
| UE 1 - CORE SCIENCE TRAINING | | | | |
| Mathematics : vector analysis | 21 | 21 | 12 | 4 |
| Fluid Mechanics (perfect fluids) | 21 | 21 | 15 | 4 |
| UE 2 - ENGINEERING SCIENCES | | | | |
| Electrotechnique | 21 | 21 | 15 | 4 |
| Dynamics of solids | 15 | 15 | 15 | 3 |
| Material resistance | 21 | 21 | 15 | 4 |
| UE 3 - TECHNOLOGICAL TRAINING | | | | |
| Design project | 9 | 9 | 15 | 2 |
| Automated production systems | 21 | 21 | 15 | 4 |
| Culture of transport technology 4 | 6 | - | - | - |
| Visiting a workplace 4 | - | 4 | - | - |
| UE 4 - COMMUNICATION | | | | |
| Foreign Languages | - | 32 | - | 2 |
| Expression and Communication 2 | 18 | 18 | - | 2 |
| Sport 4 | - | 32 | - | 1 |
| TOTAL FOR SEMESTER | 153 | 215 | 102 | 30 |
| | 470 | | | |
| TOTAL FOR THE YEAR | 324 | 448 | 210 | 60 |
| | 32,99% | 45,62% | 21,38% | |
| | 982 | | | |
| No. hours per week | 30,7 | | | |

2009-20-- : 3rd Year 32 weeks + 2 weeks of exams

| SEMESTER 1 (16 weeks) | | | | |
|---|-----------------|--------------|------------|-----------|
| Title and content of UE | Number of hours | | | ECTS |
| | Lecture | Tutorial | PW | |
| UE 1 - CORE SCIENCE TRAINING | | | | |
| Real Fluid Mechanics | 15 | 15 | 15 | 3 |
| Heat | 15 | 15 | 15 | 3 |
| UE 2 - ENGINEERING SCIENCES | | | | |
| Systems | 18 | 18 | 15 | 3 |
| Material Resistance | 18 | 18 | 6 | 3 |
| Analogical control+A13 | 18 | 18 | 6 | 2 |
| UE 3 - TECHNOLOGICAL TRAINING | | | | |
| Production | 18 | 18 | 15 | 3 |
| Mechanical construction | 18 | 18 | 18 | 3 |
| Engines | 18 | 18 | 6 | 3 |
| Culture of transport technology | 6 | - | - | |
| Visiting a workplace | - | 4 | - | |
| UE 4 - COMMUNICATION | | | | |
| English 5 | 0 | 32 | 0 | 2 |
| Sport 5 | 0 | 32 | 0 | 1 |
| UE 5 - TRAINING FOR THE WORPLACE | | | | |
| Management Project | 18 | 18 | 0 | 4 |
| Project 1 | 0 | 0 | 120* | |
| TOTAL FOR SEMESTER | 162 | 224 | 96 | 30 |
| | | 482 | | |
| SEMESTER 2 (16 weeks) | | | | |
| Title and content of UE | Number of hours | | | ECTS |
| | Lecture | Tutorial | PW | |
| UE 1 - CORE SCIENCE TRAINING | | | | |
| UE 2 - ENGINEERING SCIENCES | | | | |
| Continuum mechanics (Elasticity) | 18 | 18 | 6 | 3 |
| Signal Processing | 18 | 18 | 6 | 3 |
| Asservissements numériques | 18 | 18 | 6 | 3 |
| UE 3 - TECHNOLOGICAL TRAINING | | | | |
| Production organisation | 15 | 15 | 18 | 3 |
| Engines | 15 | 15 | 9 | 3 |
| Fabrication | 15 | 15 | 18 | 3 |
| Culture of transport technology 6 | 6 | - | - | - |
| Visiting a workplace 6 | - | 4 | - | - |
| UE 4 - COMMUNICATION | | | | |
| English 6 | - | 32 | - | 2 |
| Human Resources | 18 | 9 | - | 2 |
| Law | 12 | 4,5 | - | 1 |
| Sport 6 | - | 32 | - | 1 |
| UE 5 - TRAINING FOR THE WORPLACE | | | | |
| Project 2 | - | - | 120* | 6 |
| TOTAL FOR SEMESTER | 135 | 180,5 | 63 | 30 |
| | | 378,5 | | |
| TOTAL FOR THE YEAR | 297 | 404,5 | 159 | 60 |
| | 34,51% | 47,01% | 18,48% | |
| | | 860,5 | | |
| No. hours per week | | 26,9 | | |

| 2010-20-- : 4th Year 20 weeks+1 week of exams+ 15-week work placement | | | | |
|---|-----------------|------------|------------|-----------|
| SEMESTER 1 (15 weeks) | | | | |
| Title and content of UE | Volume horaire | | | ECTS |
| UE 5 - TRAINING FOR THE WORPLACE | | | | |
| Work Placement | 14 weeks | | | 30 |
| SEMESTER 2 (20 weeks) | | | | |
| Title and content of UE | Number of hours | | | ECTS |
| | Lecture | Tutorial | PW | |
| UE 1 - CORE SCIENCE TRAINING | | | | |
| UE 2 - ENGINEERING SCIENCES | | | | |
| Numerical analysis | 15 | 15 | - | 2,5 |
| Acoustics | 15 | 15 | 15 | 2,5 |
| Vibrations | 15 | 15 | 15 | 2,5 |
| Finite Elements | 15 | 6 | 18 | 2,5 |
| Tribology | 15 | 15 | 6 | 2 |
| UE 3 - TECHNOLOGICAL TRAINING | | | | |
| Production management | 15 | 15 | 9 | 2,5 |
| Non-metalic materials | 15 | 15 | 15 | 2,5 |
| Quality | 15 | 15 | - | 1,5 |
| Energy | 15 | 15 | 15 | 2,5 |
| Culture of transport technology (Conferences) | 15 | - | - | - |
| UE 4 - COMMUNICATION | | | | |
| Foreign Languages | - | 60 | - | 2 |
| Management | 15 | 15 | - | 1,5 |
| Management (HR) | 15 | 4,5 | - | 1 |
| Professional Project | 4,5 | 1,5 | - | - |
| Sport 7 | - | 40 | - | 1 |
| UE 6- SPECIALIST TRAINING (Options) | | | | |
| See Options | 24 | 15 | 15 | 3,5 |
| TOTAL FOR SEMESTER | 208,5 | 262 | 108 | 30 |
| | 578,5 | | | |
| TOTAL FOR THE YEAR | 208,5 | 262 | 108 | 60 |
| | 36,04% | 45,29% | 18,67% | |
| | 578,5 | | | |
| No. hours per week | 28,9 | | | |

| 2011-20-- : 5th Year 15 weeks+1 week of exams+20-week work placement | | | | |
|--|-----------------|------------|-----------|-----------|
| SEMESTER 1 (15 weeks) | | | | |
| Title and content of UE | Number of hours | | | ECTS |
| | Lecture | Tutorial | PW | |
| UE 2 - ENGINEERING SCIENCES | | | | |
| Structure Dynamics | 18 | 18 | 12 | 2,5 |
| Aerodynamics | 18 | 9 | 9 | 2 |
| Rupture and fatigue | 18 | 18 | 9 | 3 |
| Seminars | 36 | - | - | - |
| UE 3 - TECHNOLOGICAL TRAINING | | | | |
| Ground contact | 18 | 18 | 15 | 3,5 |
| Maintenance | 18 | 9 | - | 2 |
| Choice of Materials | 18 | 9 | - | 2 |
| UE 4 - COMMUNICATION | | | | |
| Marketing & Commercial management | 15 | 3 | - | 1,5 |
| Communication | 3 | - | - | - |
| Commerical Law and Industrial property | 24 | - | - | 1,5 |
| Job interviews | 3 | - | - | - |
| Modern Languages | - | 30 | - | 2 |
| UE 6- SPECIALIST TRAINING (Options) | | | | |
| See Options | 39 | 39 | 30 | 10 |
| TOTAL FOR SEMESTER | 228 | 153 | 75 | 30 |
| | 456 | | | |
| SEMESTER 2 (16 weeks) | | | | |
| Title and content of UE | Number of hours | | | ECTS |
| | Lecture | Tutorial | PW | |
| UE 5 - TRAINING FOR THE WORPLACE | | | | |
| Work placement | 24 weeks | | | 30 |
| TOTAL FOR THE YEAR | 228 | 153 | 75 | 60 |
| | 50,00% | 33,55% | 16,45% | |
| | 456 | | | |
| No. hours per week | 30,4 | | | |

OPTIONS

| 2006-2007 : MATERIAL AND STRUCTURES | | | | | |
|---|-----------------|------------|-----------|-------------|--|
| FOURTH YEAR | | | | | |
| SEMESTER 2 | | (20 weeks) | | | |
| Title and content of UE | Number of hours | | | ECTS | |
| | Lecture | Tutorial | PW | | |
| Structural Assembly | 12 | 9 | 6 | 2 | |
| Mechanical Behaviour of Materials | 12 | 6 | 9 | 1,5 | |
| | 24 | 15 | 15 | 3,5 | |
| | 54 | | | | |
| FIFTH YEAR | | | | | |
| SEMESTER 1 | | (15 weeks) | | | |
| Title and content of UE | Number of hours | | | ECTS | |
| | Lecture | Tutorial | PW | | |
| Design of Composite Parts | 12 | 9 | 12 | 3 | |
| Industrial Procedures for Shaping Materials+A41 | 9 | 15 | 0 | 2 | |
| Non-Destructive testing | 6 | 6 | 12 | 2,5 | |
| Rapid dynamics and collision | 12 | 9 | 6 | 2,5 | |
| | 39 | 39 | 30 | 10 | |
| | 108 | | | | |
| | 63 | 54 | 45 | | |
| TOTAL FOR OPTIONS | 38,89% | 33,33% | 27,78% | 13,5 | |
| | 162 | | | | |

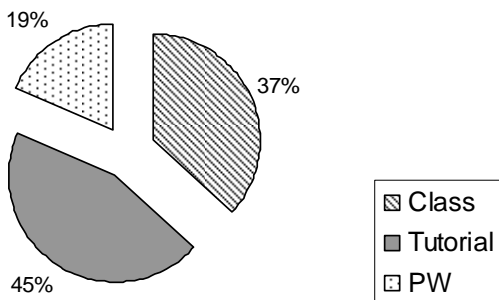
| 2006-2007 : VIBRO ACOUSTICS IN TRANSPORTS | | | | | |
|--|-----------------|-------------|-----------|-------------|--|
| FOURTH YEAR 2006-2007 | | | | | |
| SEMESTER 2 | | (20 weeks) | | | |
| Title and content of UE | Number of hours | | | ECTS | |
| | Lecture | Tutorial | PT | | |
| Vehicle and environment comfort | 16,5 | 16,5 | 6 | 2 | |
| Digital approaches for vibro-acoustic problems | 6 | 3 | 12 | 1,5 | |
| | 22,5 | 19,5 | 18 | 3,5 | |
| | 60 | | | | |
| FIFTH YEAR 2007-2008 | | | | | |
| SEMESTER 1 | | (15 weeks) | | | |
| Title and content of UE | Number of hours | | | ECTS | |
| | Lecture | Tutorial | PT | | |
| Aero-acoustics (applied to aeronautics) | 15 | 6 | 0 | 2 | |
| Acoustic & vibratory sources in road vehicles | 9 | 6 | 6 | 2 | |
| Noise reduction | 10,5 | 7,5 | 3 | 3 | |
| Experimental methodologies | 13,5 | 10,5 | 12 | 3 | |
| | 48 | 30 | 21 | 10 | |
| | 99 | | | | |
| | 70,5 | 49,5 | 39 | | |
| TOTAL FOR OPTIONS | 44,34% | 31,13% | 24,53% | 13,5 | |
| | 159 | | | | |

SYNTHESIS

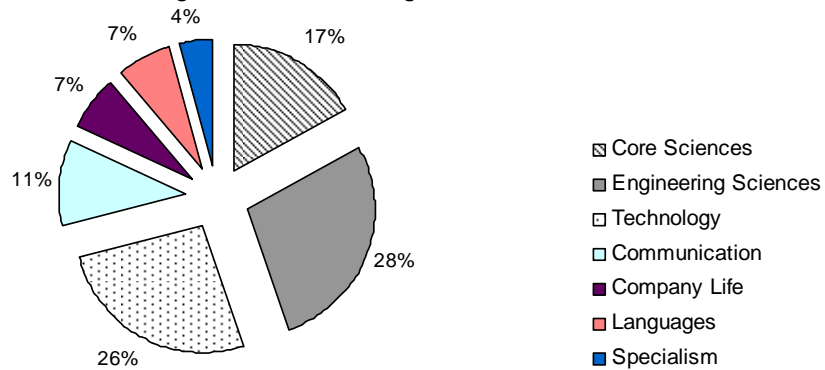
Training structure (hours/student)

| semester | Class | Tutorial | PW | Supervised Projects | Total | Placements (weeks) | Independent Work |
|-------------------|---------------|---------------|------------|---------------------|-------------|--------------------|------------------|
| S1 | 147 | 195 | 54 | 0 | 396 | | |
| S2 | 159 | 207 | 93 | 0 | 459 | | |
| S3 | 171 | 233 | 108 | 0 | 512 | | |
| S4 | 153 | 215 | 102 | 18 | 470 | | |
| S5 | 162 | 224 | 96 | 120* | 482 | | |
| S6 | 135 | 181 | 63 | 120* | 379 | | |
| S7 | 0 | 0 | 0 | 0 | 0 | | |
| S8 | 209 | 262 | 108 | 0 | 579 | | |
| S9 | 228 | 153 | 75 | 0 | 456 | | |
| S10 | 0 | 0 | 0 | 0 | 0 | | |
| sub-totals | 1363,5 | 1669,5 | 699 | 18 | 3732 | 0 | |
| % | 37% | 45% | 19% | | | | |
| Total | 3732 | | | | | | |

Academic Training : Distribution Class, Tute, PW



Academic Training: Distribution of teaching units




Distribution of courses by teaching units

| semester | Core Sciences | Engineering Sciences | Technology | Communication | Company Life | Languages | Specialism | Total |
|---------------|---------------|----------------------|-------------|---------------|--------------|------------|------------|-------------|
| S1 | 138 | 108 | 64 | 58 | 0 | 28 | 0 | 855 |
| S2 | 165 | 108 | 130 | 28 | 0 | 28 | 0 | |
| S3 | 165 | 108 | 175 | 32 | 0 | 32 | 0 | |
| S4 | 111 | 159 | 100 | 68 | 0 | 32 | 0 | 982 |
| S5 | 90 | 135 | 157 | 32 | 156 | 32 | 0 | 1101 |
| S6 | 0 | 126 | 145 | 76 | 120 | 32 | 0 | |
| S7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 579 |
| S8 | 0 | 195 | 174 | 96 | 0 | 60 | 54 | |
| S9 | 0 | 165 | 105 | 48 | 0 | 30 | 108 | 456 |
| S10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Totals | 669 | 1104 | 1050 | 437 | 276 | 274 | 162 | 3972 |
| % | 17% | 28% | 26% | 11% | 7% | 7% | 4% | |

First Year

Core Sciences Training (UE 1)

| | | | | |
|---|--|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 1 | |
| | Period : 2007-200- | | ECTS : 3,5 | |
| | Discipline : Core sciences training | | | |
| Platform : GENERAL STUDIES | | | | |
| Course title : ELEMENTARY MATHEMATICAL TOOLS | | | | |
| Lecturer : CORINNE TERREAU | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 21 | 21 | - | 21 |

Objective :

Command of basic tools of vector and affine transformations
 Analysis revision


Course content :

Vector analysis – circular trigonometry
 Complex numbers
 Euclidean affine space
 Functions of a real variable : limits, continuity, derivatives
 Common functions

Evaluation Methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on the whole subject

| |
|--|
| Final score = Mid-sem. exam x (1/3) + Final exam x (2/3) |
|--|

| | | | | |
|---|-------------------------------|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 1 | |
| | Period : 2007-200- | | ECTS : 3,5 | |
| | | | | |
| Discipline : | Core sciences training | | | |
| Platform : | GENERAL STUDIES | | | |
| Course title : | LINEAR ALGEBRA | | | |
| Lecturer: | CORINNE TERREAU | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 21 | 21 | - | 42 |

Objective:

Command of basic Matrix tools


Course content :

Vector Space
 Linear applications
 Matrices
 Determinants
 Linear equations
 Eigenvalues and Eigenvectors
 Diagonalisation of an endomorphism

Evaluation Methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.

| |
|--|
| Final score = Mid-sem. exam x (1/3) + Final exam x (2/3) |
|--|

| | | | | |
|---|-------------------------------|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 2 | |
| | Period : 2007-200- | | ECTS : 4,5 | |
| | | | | |
| Discipline : | Core sciences training | | | |
| Platform : | GENERAL STUDIES | | | |
| Course title : | THERMODYNAMICS | | | |
| Lecturer : | ALAIN RATLE | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 21 | 21 | 12 | 21 |

Objective :

Know, measure and utilise the main thermodynamic properties
 Understand the main thermodynamic cycles and their applications
 Analyse the functioning of thermal machines

Course content :

1. Measures, units and uncertainties.
2. Fundamental properties : density, pressure, temperature, ideal gas.
3. Thermodynamic states.
4. Energy and the first principle of thermodynamics
5. Control volume analysis
6. Second principle of thermodynamics
7. Entropy
8. Refrigeration cycles
9. Steam engine cycles, gas engine cycles


List of Practical Work :

PW 1 – Pressure measurement.
 PW 2 – Density measurement.
 PW 3 - Calorimetry
 PW 4 – Refrigeration cycles.

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.
- PW : Lab report submitted at the end of each session.

| |
|---|
| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
|---|

| | | | | |
|---|--|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 2 | |
| | Period : 2007-200- | | ECTS : 3 | |
| | Discipline : Core sciences training | | | |
| Platform : GENERAL STUDIES | | | | |
| Course title : FUNCTION ANALYSIS | | | | |
| Lecturer: ORLANDO ANDRIANARISON | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 21 | 21 | 9 | 21 |

Objective :

Command of basic mathematical tools

Course content :

1. Taylor's series- Limited development – Applications
2. Polynomials – Rational fractions
3. Piecewise integration of a continuous function on a segment [a, b]
4. Methods for calculating primitive values
5. Approximate calculation of an integral
6. Generalised integrals


List of Practical Work:

- PW 1 – Updating software – Formal and numeric calculations
 PW 2 – Analysis : Study of functions and graph/chart representations
 PW 3 – Linear algebra

Evaluation Methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.
- PW : Lab report submitted at the end of each session.

| |
|---|
| Final score = mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
|---|

| | | | | |
|---|--|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 2 | |
| | Period : 2007-200- | | ECTS : 2,5 | |
| | Discipline : Core sciences training | | | |
| Platform : GENERAL STUDIES | | | | |
| Course title: GEOMETRY AND COMPLEX ANALYSIS | | | | |
| Lecturer: CORINNE TERREAU | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 21 | 21 | - | 21 |

Objective :

Command of basic mathematical tools.

Course content :

Vector functions of a real variable – Definition of plane curves – Skewed curves


Plane curves using polar coordinates.

Kinematic applications : curvilinear abscissae, Frenet's formula, radius of curvature, circle of curvature and principal normal.

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.

| |
|--|
| Final score = Mid-sem. exam x (1/3) + Final exam x (2/3) |
|--|

| | | | | |
|---|--|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 2 | |
| | Period : 2007-200- | | ECTS : 2 | |
| | Discipline : Core sciences training | | | |
| Platform : GENERAL STUDIES | | | | |
| Course title : CHEMISTRY 1 | | | | |
| Lecturer: ESIREM STAFF MEMBER | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 12 | 12 | 12 | 12 |

Objective :

Review of the basic principles of solution chemistry.

Atomic approach to the understanding of organic chemistry reactions.

Course content :

Periodic classification of elements

Electronic structure of atoms

Valency, electro negativity, degrees of oxidation

Orbitals

Chemical bonding

Stereoisomerism

List of Practical Work :

PW 1. Concentration of a solution

PW 2. Solubility in a solvent


PW 3. Proton transfer reactions (acids et bases)

PW 4. Oxy-reduction

Evaluation methods :

- Mid-semester exam : 1h30
- Final exam : 2h00
- PW : Un rapport de laboratoire remis après chaque séance.

| |
|---|
| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
|---|

| | | | | |
|---|--|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 2 | |
| | Period : 2007-200- | | ECTS : 2 | |
| | Discipline : Core sciences training | | | |
| Platform : GENERAL DISCIPLINES | | | | |
| Course title : WAVES | | | | |
| Lecturer: ESIREM STAFF MEMBER | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 12 | 12 | 12 | 12 |

Objective :

Introduction to wave phenomenon in mechanics and electromagnetism : characteristics of propagation, applications

Course content :

1. Fundamental concepts (environment, dimension, polarisation, propagation speed...).
2. Mathematical description of propagation. Linear environment and principle of superposition. Progressive wave. Harmonic wave. Wave beat.
3. Mechanical waves. Case of the loudspeaker, stationary waves and resonance.
4. Concept of acoustics and applications.
5. Electromagnetic waves. Nature of the field. Frequency domains.
6. Light intensity. Concept of spectral composition.
6. Polarisation.
7. Concept of diffraction. Interference.

List of Practical Work :

PW 1. Ultrasound: measuring the speed of sound, principle of ultrasound.

PW 2. Vibrating chord and stroboscopy.

PW 3. Polarisation of light. Malus's Law. Role of phase angle


PW 4. Laser diffraction and interference.

Evaluation methods :

- Mid-semester exam : 1h30
- Final exam : 2h00
- PW : Lab report to be submitted at the end of each session.

| |
|---|
| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
|---|

Engineering Sciences Training (UE 2)

| | | | | |
|---|---|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 1 | |
| | Period : 2007-200- | | ECTS : 4,5 | |
| | Discipline : Engineering Sciences training | | | |
| Platform : MECHANICS | | | | |
| Course title : STATICS OF SOLIDS | | | | |
| Lecturer : OLIVIER SICOT | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 21 | 21 | 12 | 21 |

Objective :

Analysis of forces within a balanced mechanical system.

Course content :

Statics of rigid body
 Statics of Solids
 Mechanical forces and actions
 Frame structures and mechanisms
 Friction
 Contact and bonding actions


List of Practical Work :

PW 1. – Belt friction
 PW 2. - Strain gauges.
 PW 3. – Catenary
 PW 4. – In-plane pin-jointed structures

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.
- PW : Lab report submitted at end of each session.

| |
|---|
| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
|---|

| | | | | |
|---|--------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 1 | |
| | Period : 2007-200- | | ECTS : 4,5 | |
| | Engineering Sciences training | | | |
| Discipline : | Engineering Sciences training | | | |
| Platform : | I.E.E.A. | | | |
| Course title : | ELECTRICITY | | | |
| Lecturer : | PHILIPPE BRUNET | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 21 | 21 | 12 | 21 |

Objective :

Acquire the basic knowledge necessary to the study of electrical systems and electronics.

Course content :

Methods of circuit analysis : Kirchhoff's Law, general theorems.

Direct and alternating currents, transient currents

Bode plot

Fresnel's representation

Quadripoles (two-port networks).

List of Practical Work :

PW 1 – Resistance measurement and electrical safety.

PW 2 – Electronic generators and study of shunt winding.


PW 3 - Acquisition and analysis of periodic and transitory signals.

PW 4 – Study of first order filter and Bode plots.

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.
- PW : Lab report submitted after each session.

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| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
|---|

| | | | | |
|---|--------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 2 | |
| | Period : 2007-200- | | ECTS : 3 | |
| | Engineering Sciences training | | | |
| Discipline : | Engineering Sciences training | | | |
| Platform : | MECHANICS | | | |
| Course title : | APPLIED MECHANICS | | | |
| Lecturer : | ARTHUR DA SILVA | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 21 | 21 | 12 | 21 |

Objective :

Understand the principles of rigid body mechanics, basic elements required for the study of Solid mechanics

Course content :

1. Coordinate references :
 - System and positioning
 - relative and absolute movement
 - Cartesian, cylindrical and spherical coordinate systems, Frenet's formula
2. Kinematics:
 - speed, acceleration
 - analysis of movement
 - classic movement
3. Dynamics :
 - Inertia
 - Basic principles of dynamics
 - action-reaction, inertia forces in a non-Galilean reference system
4. Work and power
 - 1) work done by a force
 - 2) power
 - 3) kinetic energy, potential energy, stability
5. Impact between rigid bodies


List of Practical Work :

- PW.1 – Analysis of linear movements (cinématique, frottements et chocs)
PW.2 – Study of centrifugal forces
PW.3 – Study of crank mechanism
PW.4 – Study of a pendulum

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.
- PW : Report submitted after each session.

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|---|
| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
|---|

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|---|---|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 2 | |
| | Period : 2007-200- | | ECTS : 3 | |
| | Discipline : Engineering Sciences training | | | |
| Plateform : I.E.E.A. | | | | |
| Course title : INFORMATICS | | | | |
| Lecturer : ERIC CABRET | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 21 | 21 | 12 | 21 |

Objective :

Learn the concepts of structured programming and apply them to Language C.

Course content :

1. Establishing an algorithm and its coding : from functional analysis to programme

Analysis and specification (Abstraction, analysis, simplification → specification)
 Conception of algorithm (organising of data, functions, writing of pseudo-code)
 Codification (translate the pseudo code into the programming language)

2. Language C

Programme structure
 Types de data, inputs and outputs
 Affectations - Expressions - Operators
 Control structures and processing loops
 Functions, procedures, recursion
 Charts, character chains, structures
 Managing memory: pointers
 Linked lists
 Files
 Introduction to language C++

List of Practical Work :


PW 1 : Compilation, execution, debugging of a programme / E/S data types and Control structures and processing loops
 PW 2 : Tables, tri algorithms
 PW 3 : Managing linked lists
 PW 4 : Utilising files and joint work (developing a programme) : allocating tasks, separate compilations, assembling of final project.

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.
- PW : Lab report submitted after each session.

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|---|
| Final score = Mid-sem. exam x (2/9) + final exam x (4/9) + PW x (3/9) |
|---|

Technological Training (UE 3)

| | | | | |
|---|--------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 1 | |
| | Period : 2007-200- | | ECTS : 4 | |
| | Technological training | | | |
| Discipline : | CONSTRUCTION & PRODUCTION | | | |
| Platform : | INDUSTRIAL TECHNOLOGY I | | | |
| Course title : | JEROME ROUSSEAU | | | |
| Lecturer : | JEROME ROUSSEAU | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | 18 | 15 |

Objective :

Be able to analyse existing systems. Command of technical communication and associated descriptive tools. Understand how the stages of conception of a product fit together.

Course content :

1. System studies

- Structural analysis
- Analysis of internal and external functions
- Product components : Energy chain

2. Technical communication – system simplification

- Outline of system principles, kinematic schema, architectural schema, technological schema. Pneumatic, hydraulic and electric schemas


List of Practical Work:

- Using CAD (2 PW) software
- CAD assembly.
- System study 1 : CAD assembly and modelling.
- System study 2 : study of energy chain, transducers and actuators
Four stroke IC engine.

Evaluation methods :

- Mid-semester exam : 1h30 + presentation during semester.
- Final exam : 3h00 based on whole subject.
- PW : A lab. report at the end of each session

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|---|
| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
|---|

| | | | | |
|---|--------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 2 | |
| | Period : 2007-200- | | ECTS : 2,5 | |
| | Technological training | | | |
| Discipline : | CONSTRUCTION & PRODUCTION | | | |
| Platform : | INDUSTRIAL TECHNOLOGY II | | | |
| Course title : | JEROME ROUSSEAU | | | |
| Lecturer : | JEROME ROUSSEAU | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | 12 | 15 |

Objective :

Be able to analyse existing systems. Command of technical communication and associated descriptive tools. Understand how the stages of conception of a product fit together.

Course content :

1. Materials

- Classes of materials : metallic and non metallic, where they are used, criteria for material choice, designation.

2. PROCEDURES FOR SHAPING MATERIALS

- Shaping metallic and non-metallic materials (fabrication, casting, sintering, forging, welding, adhesive bonding...). Impact on parts manufacture.

List of Practical Work :

PW 1. Clutch and gearbox.

PW 2. Transmission and differential.


PW 3. Braking technology: disc, drum, ABS, ESP.

PW 4. Power-assisted steering.

Evaluation methods :

- Mid-semester exam : 1h30 + presentation during semester
- Final exam : 3h00 based on whole subject.
- PW : Lab report submitted after each session.

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|---|
| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
|---|

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|---|-------------------------------|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 2 | |
| | Period : 2007-200- | | ECTS : 2 | |
| | Technological training | | | |
| Discipline : | GENERAL STUDIES | | | |
| Platform : | ELECTRONICS | | | |
| Course title : | ESIREM STAFF MEMBER | | | |
| Lecturer : | ESIREM STAFF MEMBER | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 12 | 12 | 12 | 12 |

Objective :

Be able to make use of basic analogical electrical components

Course content :

1. Diode and applications
2. Operational amplifier and applications.


List of Practical Work :

- PW 1. Ultrasound : measure speed of sound, ultrasound principle (echography).
 PW 2. Vibrating chords and stroboscopy.
 PW 3. Light polarisation. Malus's Law..
 PW 4. Laser diffraction et interference.

Evaluation methods :

- Mid-semester exam : 1h30
- Final exam : 2h00
- PW : Lab report submitted after each session.

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|---|
| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
|---|

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|---|---------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 2 | |
| | Period : 2007-200- | | ECTS : 2 | |
| | Technological training | | | |
| Discipline : | Technological training | | | |
| Platform : | IEAA | | | |
| Course title : | STRUCTURE OF COMPUTING SYSTEMS | | | |
| Lecturer : | ESIREM STAFF MEMBER | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 12 | 12 | 12 | 12 |

Objective :

Acquire knowledge relating to digital electronics.

Course content :

1. Digital coding of information
2. Combinatory logic– Karnaugh’s Method
3. Logic gates and functions
4. Flip-Flop devices


List of Practical Work :

1. 7-segment display
2. Logic systems
3. Binary Counters
4. PW Project

Evaluation methods :

- Mid-semester exam : 1h30
- Final exam : 2h00
- PW : lab report submitted after each session.

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| $\text{Final score} = \text{Mid-sem. exam} \times (2/9) + \text{Final exam} \times (4/9) + \text{PW} \times (3/9)$ |
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|---|--|------------------|---------------------------|-------------------------|
|  | Year : 1 | | Semester : 1&2 | |
| | Period : 2007-200- | | ECTS : - | |
| | Technological training | | | |
| Discipline : | Technological training | | | |
| Platform : | GENERAL STUDIES | | | |
| Course title : | TRANSPORT TECHNOLOGY PHILOSOPHY | | | |
| Lecturer : | Invited speaker | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 6 | - | - | - |

Objective :

Cycle of conferences and lectures aimed at deepening awareness of modern transport issues .

Guidance from professionals, conferences etc. :

- SIA conference cycle.
- Input from professionals.


| | | | | |
|---|-------------------------------|------------------|----------------------------|-------------------------|
|  | Year : 1 | | Semester : 1& 2 | |
| | Period : 2007-200- | | ECTS : - | |
| | Technological training | | | |
| Discipline : | Technological training | | | |
| Platform : | GENERAL STUDIES | | | |
| Course title : | VISITING A WORKPLACE | | | |
| Lecturer : | STAFF MEMBER | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | - | 4 | - | - |

Objective :

Knowledge of the industrial environment and its organisation.

Communication

(UE 4)

| | | | | |
|---|-----------------------------------|------------------|---------------------|-------------------------|
|  | Year : 1 | | Semester : 1 | |
| | Period : 2007-200- | | ECTS : 2,5 | |
| | Discipline : Communication | | | |
| Platform : GENERAL DISCIPLINES | | | | |
| Course title : EXPRESSION AND COMMUNICATION I | | | | |
| Lecturer : FRANÇOISE HERVET | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | 0 | 15 |

Objective :

- 1) Correctly express ideas, written and spoken.
- 2) Be able to utilise communication techniques.
- 3) Be able to compose and produce a work placement report.

Course content :

- 1) Express ideas correctly in writing, or verbally
 - Perfecting spelling, grammar, style
 - Errors to avoid when writing or speaking


- 2) Using communication techniques
 - writing and online communication :
Covering letter. Curriculum Vitae. Administrative letter.

- 3) Composing a work experience report:
 - How to document a work placement.
 - Which organisation rules to follow?
 - Structuring the levels of a report
 - Being comprehensible : organisation of sections, paragraphs, etc.
 - Using visuals. Presenting the report to a board of examiners.
 -

Evaluation methods :

- 2 exams during semester : 1h30 x 2
- 1 Final exam : 2h00

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| Final score = Exams x (1/3) + Final exam x (2/3) |
|--|

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|---|-----------------------------------|------------------|---------------------------|-------------------------|
|  | Year : 1 | | Semester : 1&2 | |
| | Period : 2007-200- | | ECTS : 1 | |
| | Discipline : Communication | | | |
| Course title : SPORT | | | | |
| Lecturer : PHILIPPE DUCHESNE | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | - | 28 | - | - |

Objective :

- Student investment in group management tasks and activities covering ISATs sporting association.
- Improving motor and cardio-vascular capacity

Organisation of course :


- Practice, covering 14 areas.
- Obligatory participation
- Optional participation, must choose 3 activities during the year (on average, one per term).
- Associated practice (FNSU - UFOLEP - Fédérale, etc..) through ISATs sporting association (ISATHLON)
- Free practice, recreational

List of sporting activities :

- Tennis.
- Table Tennis.
- Group sports.
- Fencing.
- French Boxing.
- Swimming.
- Skating.
- Canoë-Kayak.
- Mountain biking.
- Body building.
- Badminton.
- African Dance.
- Scuba diving.
- English Boxing.
- Squash.
- Golf.
- Jogging.
- Yoga.

Evaluation methods :

- Attendance, personal effort.
- Personal investment
- Level of practice
- Mid-semester exam : 1h30.

| | | | | |
|---|---|------------------|---------------------------|-------------------------|
|  | Year : 1 | | Semester : 1&2 | |
| | Period : 2007-200- | | ECTS : 2 | |
| | Discipline : Formation à l'encadrement-communication | | | |
| Platform : GENERAL DISCIPLINES | | | | |
| Course title : ENGLISH | | | | |
| Lecturer : LANGUAGE CENTRE STAFF | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | - | 28 | - | 40 |

Objective :

Develop sufficient command of the language by consolidating language structure and expanding vocabulary.

Be able to express oneself spontaneously and fluently in general and professional situations.

Improve communication techniques

Obtain a university diploma or a recognised diploma of linguistic competence

Course content :

- 1) Deeper understanding of grammatical structures
- 2) Reading comprehension
- 3) Letter writing and short essays
- 4) Spoken language comprehension
- 5) Discussions and exchanges on various themes
- 6) Improving pronunciation and intonation

List of Practical Work :

Give a presentation


Practice job interviews

Evaluation methods :

- Mid-semester exam : 1h30. (speaking aptitude)
- Final exam : 2h00 based on whole subject.

| |
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| Final score = Mid-sem. exam x (1/3) + Final exam x (2/3) |
|--|

Industry and the workplace (UE 5)

| | | | | |
|---|-----------------------------------|------------------|---------------------|-------------------------|
|  | Year: 1 | | Semester : 2 | |
| | Period : 2007-200- | | ECTS : 5 | |
| | Industry and the workplace | | | |
| Discipline : | Industry and the workplace | | | |
| Course title : | INDUSTRIAL WORK EXPERIENCE | | | |
| Lecturer : | THIERRY SCARFOGLIERE | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | - | - | - | 240 |

Objective :

Operate in a real work situation in some post associated with production engineering :

1°) Workstation responsibility, interpersonal and technical aspects

2) Familiarise oneself with the workplace and the company environment with particular attention to overall functioning and organisation of production.

ASSESSMENT OF WORK PLACEMENT :

1st Year : 15 mn oral presentation with 10 mn of questions to student, (25 mn total)

For each student: panel discussion in student's absence (5mn), panel then presents their conclusions to the student (5mn).

Evaluation methods :

1°) Industry supervisor's evaluation (50 % of marks)

Explains how well the candidate integrated the workplace, interest in technical aspects, level of motivation at work and the student's interpersonal skills. (an evaluation grid is submitted to the supervisor)

2°) Placement report (25% of marks)


3°) Oral presentaion of report (25% of marks)

Takes place before a mixed panel of work placement supervisors and ISAT tutors
Students must attain a score of 12/20 to successfully complete the placement.

| |
|--|
| Final score = Industry supervisor's evaluation x (1/2) + Report x (1/4) + Presentation x (1/4) |
|--|

Second Year

Core Sciences Training (UE 1)

| | | | | |
|---|---|------------------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 1 | |
| | Period : 2007-2008 | | ECTS : 3 | |
| | Discipline : Core science training | | | |
| Platform : GENERAL STUDIES | | | | |
| Course Title : MATHEMATICS IV (ANALYSIS) | | | | |
| Lecturer : ORLANDO ANDRIANARISON | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 24 | 24 | - | 24 |

Objective :

Command of elementary mathematical tools.

Course content :

Differential equations – linear differential equations with constant coefficients.

Number series and sequences – Function series

Functions with several independent variables

Curvilinear coordinates/integral


Multiple integrals – Applications

Vector analysis

Evaluation methods:

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.

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|--|
| Final score = Mid-sem. exam x (1/3) + Final exam x (2/3) |
|--|

| | | | | |
|---|---|-----------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 1 | |
| | Period: 2007-2008 | | ECTS : 3 | |
| | Discipline : ENGINEERING SCIENCES TRAINING | | | |
| Course Title : SERIES | | | | |
| Lecturer : SYLVIE GOROG | | | | |
| Number of hours | LECTURES | TD | PW | Independent work |
| | 24 | 24 | - | 48 |

Objective :

Command of elementary mathematical tools.


Course content :

- Fourier series
- Fourier transform
- Laplace transform
- Distributions

Evaluation methods:

- Mid-semester exam : 1h30.
- Final exam : 1h30 based on whole subject.

$$\text{Final score} = \text{Mid-sem. exam} \times (1/3) + \text{Final exam} \times (2/3)$$

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|---|---|-----------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 2 | |
| | Period: 2007-2008 | | ECTS : 4 | |
| | Discipline : Core science training | | | |
| Platform: GENERAL STUDIES. | | | | |
| Course Title : MATHEMATICS VI (SÉRIES) | | | | |
| Lecturer: SYLVIE GOROG | | | | |
| Number of hours | CM | TD | PW | Independent work |
| | 24 | 24 | 12 | 24 |

Objective :

Command of elementary mathematical tools.


Course content :

- Numerical series
- Series and sequence functions
- Complete series and series development
- Elementary functions of complex variable

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.

| |
|--|
| Final score = Mid-sem. exam x (1/3) + Final exam x (2/3) |
|--|

| | | | | |
|---|---|-----------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 2 | |
| | Period: 2007-2008 | | ECTS : 2 | |
| | Discipline : Core science training | | | |
| Platform : GENERAL STUDIES | | | | |
| Course Title : CHEMISTRY 2 | | | | |
| Lecturer : MICHEL LABOUREYRAS | | | | |
| Number of hours | CM | TD | PW | Independent work |
| | 12 | 12 | - | 12 |

Objective :

Understand the basic aspects of Chemistry in the context of the automotive industry.

Course content :

Thermo-chemistry

Chemical kinetics

Study of chemical bonding

2. Organic Chemistry

Hydrocarbons

Isomerics

Thermo-chemistry

Energy sources


3. Oxy-reduction, batteries and accumulators, galvanisation

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.

| |
|--|
| Final score = Mid-sem. exam x (1/3) + Final exam x (2/3) |
|--|

Engineering sciences training (UE 2)

| | | | | |
|---|---|-----------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 1 | |
| | Period: 2007-2008 | | ECTS : 3 | |
| | Discipline : Engineering sciences training | | | |
| Platform : MECHANICS | | | | |
| Course Title : MECHANICS IV | | | | |
| Lecturer : PASCAL DELANGUE | | | | |
| Number of hours | CM | TD | PW | Independent work |
| | 24 | 24 | - | 24 |

Objective :

Take into account system inertia, understand kinetic torque and resolve a complete dynamical system


Course content :

- 1 – Mass and geometry
- 2 – Speed magnitude
- 3 – Acceleration magnitude
- 4 – Dynamics (Torque action, PFD, kinetic energy theorem, Power and Work done by a force, Virtual Power principle)

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.

| |
|--|
| Final score = Mid-sem. exam x (1/3) + Final exam x (2/3) |
|--|

| | | | | |
|---|---|-----------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 1 | |
| | Period: 2007-2008 | | ECTS : 3 | |
| | Discipline : Core science training | | | |
| Platform : ENERGY | | | | |
| Course Title : FLUID MECHANICS I (PERFECT FLUIDS) | | | | |
| Lecturer : BÉATRICE LAY | | | | |
| Number of hours | CM | TD | PW | Independent work |
| | 24 | 24 | 15 | 24 |

Objective :

Acquire a fundamental knowledge of Fluid Mechanics

Course content :

1. Fluid statics
 - a – General Laws
 - b – Fluid statics, constant volume = hydrostatics
 - c – Compressible fluids
2. Dynamics of non-viscous and incompressible fluids
 - a – General equations of non-viscous fluid dynamics
 - b – Steady-state fluid flow at constant volume
 - c - Flow of fluids with variable volume and mass
3. Dimensional analysis and similitude
 - a – Dimensional analysis
 - b - Similitude


List of Practical Work :

- PW 1 – Loss of pressure
- PW 2 – Flow measurement
- PW 3 - Weir
- PW 4 – Viscosity
- PW 5 – Static pressure measurement

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.
- PW : Lab report submitted after each session.

| |
|--|
| $\text{Final score} = \text{Mid-sem. exam} \times (2/9) + \text{Final exam} \times (4/9) + \text{PW} \times (3/9)$ |
|--|

| | | | | |
|---|--------------------------------------|-----------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 1 | |
| | Period: 2007-2008 | | ECTS : 3 | |
| | Engineering sciences training | | | |
| Discipline : | Engineering sciences training | | | |
| Platform : | MECHANICS | | | |
| Course Title : | STRENGTH OF MATERIALS 1 | | | |
| Lecturer : | SHAHRAM AIVAZZADEH | | | |
| Number of hours | CM | TD | PW | Independent work |
| | 24 | 24 | 0 | 24 |

Objective :

Understand the behaviour of ductile bodies

Calculate stresses and strains of bodies under different types of pressure.

Study the influence of loading on the material and dimensional variation of simple structures.

Course content :

Basic principles and notions

Tension - Compression

Beams in bending

Torsion


Combined loading

Mohr's circle

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.

| |
|--|
| Final score = Mid-sem. exam x (1/3) + Final exam x (2/3) |
|--|

| | | | | |
|---|--------------------------------------|-----------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 2 | |
| | Period: 2007-2008 | | ECTS : 4 | |
| | Engineering sciences training | | | |
| Discipline : | Engineering sciences training | | | |
| Platform : | MECHANICS | | | |
| Course Title : | STRENGTH OF MATERIALS II | | | |
| Teacher : | XIAO-JING GONG | | | |
| Number of hours | CM | TD | PW | Independent work |
| | 24 | 24 | 15 | 24 |

Objective :

Understand the behaviour of ductile bodies

Calculate stresses and strains of bodies under different types of pressure.

Study the influence of loading on the material and dimensional variation of simple structures.

Course content :

1. Strain Energy Method
2. Axisymmetrical loading.
3. Strength of materials failure criteria.
4. Instability and buckling.
5. Mechanical assembly.


List of Practical Work:

- 1 – Stress concentrations.
- 2 – Combined flexion and torque on cylindrical shafts.
- 3 – Buckling of straight columns.
- 4 - Deformation of curved beams.

Evaluation methods :

- Mid-semester exam : 1h30
- Final exam : 2h on whole subject
- Marks for PW : reports after each session

| |
|---|
| $\text{Final score} = (\text{Mid-sem. exam} \times (1/3) + \text{Final exam} \times (2/3)) \times (2/3) + \text{PW marks} \times (1/3)$ |
|---|

| | | | | |
|---|---|-------------------------------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 2 | |
| | Period: 2007-2008 | | ECTS : 4 | |
| | Discipline : Core science training | | | |
| Platform: | | IEEA | | |
| Course Title : | | ELECTRICAL ENGINEERING | | |
| Lecturer : | | ALAIN BURY | | |
| Number of hours | CM | TD | PW | Independent work |
| | 24 | 24 | 18 | 24 |

Objective :

1. Understand the principle of static and rotating motors for applying them in automated systems and traction systems.
2. Basic understanding of electronic power components as applied to motor speed controllers.

Course content :

Electromagnetism: general laws.

Three-phase power circuits: balanced three-phase systems, star and triangle connections, Single-phase transformers (loaded and unloaded) – three-phase transformer (construction and use).

Direct current machines : construction, reversibility, starter motors used on vehicles.

Synchronous motors: creation of a rotating magnetic field, construction and principles of the alternator, alternators used on vehicles.

Asynchronous motor: principle, operation equations, characteristics, starting.

Electrical energy : presentation of different static converters.

Electronic components of power (diode, transistor, thyristor, GTO, IGBT) study and implementation.

AC/DC converters : AC rectifiers

List of Practical Work:

PW1 – Transistor switches

PW2 – Operational amplifier

PW3 - Monostable et oscillating devices : applications


PW4 – Single-phase transformers

PW5 and 6 - Thyristor et Triac : applications

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 1h30 based on whole subject.
- PW : Lab report submitted after each session.

| |
|---|
| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
|---|

| | | | | |
|---|--------------------------------------|-----------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 2 | |
| | Period: 2007-2008 | | ECTS : 4 | |
| | Engineering sciences training | | | |
| Discipline : | Engineering sciences training | | | |
| Platform : | MECHANICS | | | |
| Course Title : | METALLIC MATERIALS | | | |
| Lecturer : | THIERRY SCARFOGLIERE | | | |
| Number of hours | CM | TD | PW | Independent work |
| | 24 | 24 | 15 | 24 |

Objective :

- 1) Provide knowledge on the structure of metallic materials.
- 2) Look at methods for hardening metallic alloys.
- 3) Describe methods of obtaining bar stock, plates and blanks.

Course content :

- 1 – Metals and their alloys.
- 2 – Thermal processes and surface treatments.
- 3 – Moulding materials.
- 4 – Shaping materials by deformation.
- 5 – Powder metallurgy
- 6 – Welding.

List of Practical Work :


- PW1 – Resilience: studying different types of rupture.
 PW2 – Hardness: knowledge of different measuring techniques.
 PW3 – Radioactivity: Measuring radioactivity and material absorption.
 PW4 – Jominy end test.
 PW5 – Metallography.

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam: 2h00 based on whole subject.
- PW: Lab report submitted after each session.

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| $\text{Final score} = \text{Mid-sem. exam} \times (2/9) + \text{Final exam} \times (4/9) + \text{PW} \times (3/9)$ |
|--|

Technological training (UE 3)

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|---|-------------------------------|-----------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 1 | |
| | Period: 2007-2008 | | ECTS : 3 | |
| | | | | |
| Discipline : | Technological training | | | |
| Platform : | IEEA | | | |
| Course Title : | INDUSTRIAL IT I | | | |
| Lecturer : | PHILIPPE BRUNET | | | |
| Number of hours | CM | TD | PW | Independent work |
| | 24 | 24 | 15 | 24 |

Objective :

1. Be able to integrate component materials and software into industrial applications and particularly embedded systems.
2. Reinforce training in languages, operating systems and data transmissions

Course content :

Introduction to industrial IT – Industrial processes, Characteristics of industrial IT systems – Real-time computing

Combinational logic:

 Digital arithmetic

 Logic operators

 Study of digital circuits: technology of integrated circuits

 Study of basic electro mechanical components

 Problem-solving: using Karnaugh's Method

Study of technical systems applied to automotives and automatism of driving force

 Functional analysis

 System structure : processor – interfaces – memory - bus

 Data transmission (serial, parallel, USB...) - Network introduction

 Analogue-digital and digital-analogue conversion

 Input/output interfacing of programmable systems

 Microcontrollers: implementation and programming

List of Practical Work:

Integrated digital circuits TTL/CMOS

Process control: microcontroller, data transmission, analogue-digital and digital-analogue conversion.

Individual project and group project (4 students)


Evaluation methods :

Mid-semester exam : 1h30.

Final exam : 2h00 based on whole subject.

PW : Lab report submitted after each session.

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| Final score = Mid-sem. exam x (2/9) + Finals exam x (4/9) + PW x (3/9) |
|--|

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|---|--|-----------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 2 | |
| | Period: 2007-2008 | | ECTS : 4 | |
| | Discipline : Technological training | | | |
| Platform : IEEA | | | | |
| Course Title : INDUSTRIAL IT II | | | | |
| Lecturer : FLAVIEN ROUX | | | | |
| Number of hours | CM | TD | PW | Independent work |
| | 24 | 24 | 12 | 24 |

Objective :

Awareness of the potential problems encountered as a production manager in a company.

Course content :

- Structure of an automated system, Operation and Control.
- Pneumatic actuators and pre-actuators, definition and calculations.
- Hydraulic actuators and pre-actuators, definition and calculations.
- Barcodes
- Automated system controls.
- GRAFCET (sequential functional chart).
- Method to establish GRAFCET (sequential functional chart) of task coordination.
- GEMMA.
- Industrial automation systems.


List of Practical Work:

Creating and programming an automated system.

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.
- PW : Lab report submitted after each session.

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| $\text{Final score} = \text{Mid-sem. exam} \times (2/9) + \text{Final exam} \times (4/9) + \text{PW} \times (3/9)$ |
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|---|---------------------------------------|-----------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 1 | |
| | Period: 2007-2008 | | ECTS : 4 | |
| | Technological training | | | |
| Discipline : | Technological training | | | |
| Platform : | CONSTRUCTION & FABRICATION | | | |
| Course Title : | MANUFACTURING | | | |
| Lecturer : | DENIS RIMBAULT | | | |
| Number of hours | CM | TD | PW | Independent work |
| | 24 | 24 | 18 | 24 |

Objective :

By the end of their second year, ISAT students must be able to completely define the manufacturing procedure of a mechanical device and optimise it.

Course content :

- 1) Numerically controlled machine tools :
 - Role of NC machines in mechanical manufacturing.
 - Implementing NC and programming.
 - : Manufacturing specification
 - Calculating quotes using ΔI method.
 - Modular manufacturing assembly
 - Metrology using 3-D Measuring Machine
- 2) Machining :
 - Merchant's theory.
 - Cutting power.
 - Life expectancy of cutting materials.
- 3) Manufacturing study (case study)

List of Practical Work :

PW 1 – Setting up a 3-D MM.

PW 2 – Case-study of a tool-holder.

PW 3 – Study of cutting conditions.


PW 4 –Machining of a plane surface and associated metrology

PW 5 – PW Exam

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.
- PW : Lab report submitted after each session.

| |
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| $\text{Final score} = \text{Mid-semester exam} \times (2/9) + \text{Final exam} \times (4/9) + \text{PW} \times (3/9)$ |
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|---|---------------------------------------|-----------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 1 | |
| | Period: 2007-2008 | | ECTS : 4 | |
| | Technological training | | | |
| Discipline : | CONSTRUCTION & FABRICATION | | | |
| Platform : | MECHANICAL CONSTRUCTION III | | | |
| Course Title : | LILIAN FAURE | | | |
| Lecturer : | LILIAN FAURE | | | |
| Number of hours | CM | TD | PW | Independent work |
| | 24 | 24 | 24 | 24 |

Objective :

- Use methods of mechanical and technological analysis on mechanical systems
- Select mechanical models and resolution techniques which are best adapted for each stage of project conception.
- Define most suitable technological solutions in relation to specifications.

Course content :

1. Sealing - Lubrication
 - Sealing function
 - Lubrication function
2. Dimensioning of assembly systems
 - Basic function requirements
 - Classification of technological solutions
 - Complete permanent and dismountable assemblies - typology and dimensioning
3. Analysis and conception of a pin-joint and sliding pin-joint.
 - Basic function requirements
 - Classification of technological solutions
 - Conception of bushings - typology and dimensioning
 - Design of pin-joints with rotating elements - typology, assembly and dimensioning
4. Analysis and conception of a sliding joint
 - Basic function requirements, classification of technological solutions
 - Design of smooth sliding joints - typology and dimensioning
 - Design of joints with rotating elements - typology, assembly and dimensioning.
 - Translation of movement and forces by a lead-screw


List of Practical Work :

Practical work is based in part on the conception projects (across the whole semester) and on CAD training using software referenced by the main automobile constructors.

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 1h30 based on whole subject.
- PW : Lab report submitted after each session.

| |
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| $\text{Final score} = \text{Mid-sem. exam} \times (2/9) + \text{Final exam} \times (4/9) + \text{PW} \times (3/9)$ |
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|---|---------------------------------------|-----------|---------------------|-------------------------|
|  | Year : 2 | | Semester : 2 | |
| | Period: 2007-2008 | | ECTS : 2 | |
| | Technological training | | | |
| Discipline : | Technological training | | | |
| Platform : | CONSTRUCTION & FABRICATION | | | |
| Course Title : | CROSS-SUBJECT PROJECT | | | |
| Lecturer : | LILIAN FAURE | | | |
| Number of hours | CM | TD | PW | Independent work |
| | - | - | 18 | 70 |

Objective :

Implementing conception methods bringing together knowledge and tools acquired in different disciplines. Summary of knowledge acquired in the area of engineering sciences.

For the most part, knowledge is acquired through subject lessons already in place.

The aim is to bring the knowledge of all these subjects together and find relationships by a process of self-teaching within the framework of an industrial project.

Form of the project

4 themes divided between each Practical Work group: students are in competition with each other.

A study topic is handled by 3 or 4 students with a project leader for each sub-group.


Stages:

- Set out the necessary specifications.
Find solutions by analysing state-of-art; standards, patents and bibliography, etc.
Evaluation of solutions using several criteria and selection of the « best ».
- Development: calculation notes (mechanics, Strength of materials...), CAD- modelling, detailed drawing of complete work, cost evaluation, specifications of other elements considered...
- Fabrication analysis of a part of the system.
- Presentation of CAD work in front of a jury.
- Final commercial and technical presentation **in English** lasting 30minutes, in front of the whole class. Students must convince potential clients of the significance of their choice, using Power Point CAD and virtual product modelling.

Evaluation methods :

Evaluation will consider the quality of all submitted documents, presentations, autonomy and meeting of deadlines.

| |
|--|
| Final score = (3xDossiers + (CAD work and presentation) + (Final presentation in English))/5 |
|--|


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|---|--|-----------|---------------------------|-------------------------|
|  | Year : 2 | | Semester : 1&2 | |
| | Period: 2007-2008 | | ECTS : - | |
| | Discipline : Technological training | | | |
| Platform : | DISCIPLINES GÉNÉRALES. | | | |
| Course Title : | CULTURE OF TRANSPORT TECHNOLOGY. | | | |
| Lecturer : | Invited speakers | | | |
| Number of hours | CM | TD | PW | Independent work |
| | 6 | - | - | 6 |

Objective :

Cycle of conferences and lectures which aim to deepen knowledge of transport issues.

Advice from professionals, conferences etc. :


- SIA conference cycle.
- Input from professionals.

| | | | | |
|---|--|-----------|---------------------------|-------------------------|
|  | Year : 2 | | Semester : 1&2 | |
| | Period: 2007-2008 | | ECTS : - | |
| | Discipline : Technological training | | | |
| Platform : DISCIPLINES GÉNÉRALES | | | | |
| Course Title : VISITING A WORKPLACE | | | | |
| Lecturer : STAFF MEMBER | | | | |
| Number of hours | CM | TD | PW | Independent work |
| | - | 4 | - | 2 |

Objective :

Know the industrial environment and its organisation

Communication (UE 4)

| | | | | |
|---|--|-----------|---------------------------|-------------------------|
|  | Year : 2 | | Semester : 1&2 | |
| | Period: 2007-2008 | | ECTS : 5 | |
| | Discipline : Communication Skills | | | |
| Platform : GENERAL STUDIES | | | | |
| Course Title : ENGLISH | | | | |
| Lecturer : Language Centre of Nevers | | | | |
| Number of hours | CM | TD | PW | Independent work |
| | - | 32 | - | 40 |

Objective :

Develop sufficient command of the language by consolidating language structure and expanding vocabulary.

Be able to express oneself spontaneously and fluently in everyday and professional situations.

Improve communication techniques

Obtain a university diploma or a recognised diploma of linguistic competence


Course content :

- 1) Deeper understanding of grammatical structures
- 2) Reading comprehension
- 3) Letter writing and short essays
- 4) Spoken language comprehension
- 5) Discussions and exchanges on various themes
- 6) Improving pronunciation and intonation

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.

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| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
|---|

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|---|--|-----------|---------------------------|-------------------------|
|  | Year : 2 | | Semester : 1&2 | |
| | Period: 2007-2008 | | ECTS : 2 | |
| | Discipline : Communication Skills | | | |
| Course Title : SPORTS | | | | |
| Lecturer : PHILIPPE DUCHESNE | | | | |
| Number of hours | CM | TD | PW | Independent work |
| | - | 32 | - | - |

Objective :

- Involve students in group management tasks and activities covering ISAT's sporting association.
- Improving motor and cardio-vascular capacity

Course layout :


- Practice, covering 14 sporting disciplines.
- Obligatory participation
- Optional participation, must choose 3 activities during the year (on average, one per term).
- Associated practice (FNSU - UFOLEP - National, etc..) through ISAT's sporting association (ISATHLON)
- Free practice sessions, recreational activities

Listes des activités sportives :

- Tennis.
- Table tennis.
- Group sports.
- Judo.
- Fencing.
- French boxing.
- Swimming.
- Horse riding.
- Canoë-Kayak..
- VTT
- Bodybuilding.
- Badminton.
- African dancing.
- English boxing.
- Squash.
- Golf.
- Jogging.
- Yoga.

Evaluation methods :

- Attendance, Effort.
- Personal investment
- Level of practice Exam: 1h30 mid-semester.

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|---|--|-----------|---------------------|--------------------------|
|  | Year : 2 | | Semestre : 2 | |
| | Period: 2007-2008 | | ECTS : 2 | |
| | Discipline : Communication Skills | | | |
| Platform : GENERAL STUDIES | | | | |
| Course Title : EXPRESSION & COMMUNICATION II | | | | |
| Lecturer : FRANÇOISE HERVET | | | | |
| Number of hours | CM | TD | PW | Travail personnel |
| | 18 | 18 | - | 12 |

Objective :

- 1) Effective time management when writing.
- 2) Development of communication techniques.
- 3) Role of gestures

Course content:

- 1) Effective time management:
 - Précis methodology.
 - Word building.
 - Summarisation methodology :
 - Draw up a synoptic table from a reference document.
 - Introduction and conclusions.
 - Report methodology..
- 2) Development of communication techniques:
 - Presentation.
 - Dynamic tools :
 - Body language:
 - Personal body space, contact with the ground,
 - Posture and its significance - interpretation: (Chest, pelvis, legs, feet, arms)
 - Gestures to support language.
 - Gestures as barriers.
- 3) Role of gestures
 - From misunderstanding to real communication: facial expressions.


Evaluation methods :

- 2 Exams : 1h30 x 2
- Final exam : 1h30

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| Final score = Exams x (1/3) + Final exam x (2/3) |
|--|

Third Year

Core Sciences Training (UE 1)

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|---|---|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 1 | |
| | Period : 2009-20-- | | ECTS : 3 | |
| | Discipline : Core science training | | | |
| Platform : MECHANICS | | | | |
| Course title : FLUID MECHANICS 2 | | | | |
| Lecturer : BÉATRICE LAY | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | 15 | 20 |

Objective :

Extend knowledge basis of fluid mechanics 1

Course content :

1. Kinematics

- Descriptive elements of fluid motion (CM)
- Particulate derivative
- Continuity equation
- Flow lines and surfaces
- Constant volume irrotational flow
- 2-D irrotational motion of perfect incompressible fluids

2. Dynamics of a real fluid

- Fundamental results of fluid motion
- Models of fluid motion, Navier-Stokes general model
- Navier-Stokes equation for incompressible flow
- Flow with very low Reynolds numbers
- Laminar boundary conditions

List of Practical Work:

PW 1, 2, 3 – Use of software for fluid mechanics calculations


PW 4 – Flow in a pipe

PW 5 – Flow around an immersed body

Evaluation methods:

- Mid-semester exam: 1h30.
- Final exam: 2h based on whole subject.
- Project (in groups of two students): report.

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| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + Project x (3/9) |
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|---|---|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 1 | |
| | Period : 2009-20-- | | ECTS : 3 | |
| | Discipline : Core science training | | | |
| Platform : | ENERGY | | | |
| Course title : | HEAT | | | |
| Lecturer : | BRUNO MARTIN | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | 15 | 20 |

Objective:

Introduction to basic heat phenomena.

Course content:

- 1) Conduction
- 2) Convection
- 3) Radiation
- 4) Industrial heat exchangers

List of Practical Work:

PW 1&2. Heat conduction: Measure thermal conductivity of steel and aluminium bars.

PW 3&4. Heat convection: Measure diffusion coefficients (in air and in water)


PW 5. Heat radiation: Measure directional and polar emission.

Evaluation methods:

- Mid-semester exam: 1h30.
- Final exam: 2h00 based on whole subject.
- PW: Lab report submitted after each session.

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| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
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Engineering sciences training (UE 2)

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|---|---|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 1 | |
| | Period : 2009-20-- | | ECTS : 3 | |
| | Discipline : Engineering sciences training | | | |
| Platform : IEEA | | | | |
| Course title : SYSTEMS | | | | |
| Lecturer : PHILIPPE BRUNET | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 18 | 15 | 18 |

Objective :

1. Be able to choose and install an appropriate electric motor.
 2. Manage the subsets of power and controls of industrial equipment, electric traction chain, actuators used in vehicles.
 3. Understand the functioning of basic microprocessor systems in embedded electronics technology applications.
 3. Extend technological knowledge about electrical equipment and vehicle electrics.

Course content :

1 – Speed variation of electric motors

Energy: distribution, tariffication, earthing strategy, managing cosinus Φ values
 Revision of types of electric motors, speed variation of d.c motors, speed variation of a.c motors, current vector control.

2 – Electric vehicles

Motorisation problems: electric and hybrid motorisation.
 Use and behaviour of electric motors in vehicles

3 - Electricity, electronics, industrial IT in vehicles

Batteries (Types - functioning - charge), Cable harness lay-outs - Multiplexing: CAN VAN,
 Electromagnetic compatibility: interference and statutory regulations


List of practical work:

- PW1 – speed variation of an asynchronous three-phase motor (frequency converter, constant voltage/frequency ratio)
 PW2 – Heating by induction
 PW3 – Parcels handling robot (power and control sections, speed variation of d.c motor)
 PW4 - Multiplexing, CAN bus
 PW5 – Electromagnetic compatibility: application of cabling rules, reducing system interference.

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.
- PW : Lab report submitted after each session.

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| Final score = Mid-semester exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
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|---|---|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 1 | |
| | Period : 2009-20-- | | ECTS : 3 | |
| | Discipline : Engineering sciences training | | | |
| Platform : MECHANICS | | | | |
| Course title : STRENGTH OF MATERIALS | | | | |
| Lecturer : SHAHRAM AIVAZZADEH | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 18 | 6 | 24 |

Objective :

Understand the mechanical behaviour of ductile bodies.

Calculate stresses and strains of bodies under different types of loading.

Study the influence of loading on dimensional and material response of simple structures.

Course content :

1. Strain energy method.
2. Axisymmetric loading of structure.
3. Stress loading criteria.
4. Instability and buckling.
5. Mechanical assembly.


List of Practical Work :

- 1 - Stress concentrations.
- 2 – Combined bending and torsion of circular shafts.

Evaluation methods :

- Mid-semester exam : 1h30
- Final exam : 2h00
- PW mark based on a report.

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| $\text{Final score} = (\text{Mid-semester exam} \times (1/3) + \text{Final exam} \times (2/3)) \times (2/3) + \text{PW mark} \times (1/3)$ |
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|---|--------------------------------------|------------------|---------------------|-------------------------|
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| | Year : 3 | | Semester : 1 | |
| | Period : 2009-20-- | | ECTS : 2 | |
| Discipline : | Engineering sciences training | | | |
| Platform : | IEEA | | | |
| Course title : | ANALOGICAL SERVO-SYSTEMS | | | |
| Lecturer : | BRUNO MARTIN | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 18 | 6 | 24 |

Objective :

Be able to determine and study the transfer function of a system.
Choose a corrector in order to improve system performance.

Course content :

- 1 - Laplace Transform - Fourier - Z
- 2 – System transfer function
- 3 - Representation of transfer functions: Bode, Nyquist, Black.
- 4 – Sampled systems
- 5 – Non-linear systems
- 6 – System stability
- 7 – System correction and precision.


Practical work:

PW 1- Dynamics of a system according to position of its poles.
PW 2- Transitory speed of RC circuit and identifying unknown system using BODE diagram and indexed response.

Evaluation methods :

- Mid-semester exam : 1h30r.
- Final exam : 2h00 based on whole subject.
- PW : Lab report submitted after each session.

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| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
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|---|---|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 2 | |
| | Period : 2009-20-- | | ECTS : 3 | |
| | Engineering sciences training | | | |
| Discipline : | Engineering sciences training | | | |
| Platform : | MECHANICS | | | |
| Course title : | CONTINUUM MECHANICS (ELASTICITY) | | | |
| Lecturer : | NADIA MASSE | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 18 | 6 | 24 |

Objective:

Provide the basic ideas in Continuum Mechanics, looking primarily at the mechanics of ductile solids.

Course content:

1. Description of continuous solids

Notion of continuous matter
Mathematical aspect
Lagrangian description

2. Transformation of continuous matter

Strain measurement
Infinitely small transformations
Strain-rate tensor
Compatibility equations

3. Stress

Stress tensors
Normal and tangential stress
Principal stress

4. Laws of behaviour: relationship between stress and deformations

Practical work


PW 1: Pressurised tank

PW 2: Elastic response of a plate under stress

Evaluation methods:

- Mid-semester exam: 1h30.
- Final exam: 2h based on whole subject.
- PW: report submitted after each session.

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|---|
| $\text{Final score} = \text{Exam} \times (2/9) + \text{Final exam} \times (4/9) + \text{PW} \times (3/9)$ |
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|---|---|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 1 | |
| | Period : 2009-20-- | | ECTS : 3 | |
| | Discipline : Engineering sciences training | | | |
| Platform : IEEA | | | | |
| Course title : SIGNAL PROCESSING | | | | |
| Lecturer : SYLVIE GOROG | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 18 | 6 | 15 |

Objective:

Understand how signal processing representation works.
 Introduction to random processing.
 Measurement of signal parameters and spectral analysis.

Course content :

Formulation (Presentation, mathematical representation, linear systems, introduction to spectral analysis)
 Energy characterisation (Energy levels, correlation, spectral density, linear systems)
 Random signals (statistical description, spectral characterisation, signals with noise)
 Processing for experimental spectral analysis (sampling, windows)


List of Practical Work:

PW 1. Signal and system analysis tools: Matlab applied to signal processing
 PW 2. Signal processing with Siglab

Evaluation methods:

- Mid-semester exam : 1h3r.
- Final exam : 2h00 based on whole subject.
- PW: Lab report submitted after each session.

| |
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| $\text{Final score} = \text{Mid-sem. exam} \times (2/9) + \text{Final exam} \times (4/9) + \text{PW} \times (3/9)$ |
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|---|--------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 2 | |
| | Period : 2009-20-- | | ECTS : 3 | |
| | Engineering sciences training | | | |
| Discipline : | Engineering sciences training | | | |
| Platform : | IEEA | | | |
| Course title : | DIGITAL SERVO-SYSTEMS | | | |
| Lecturer : | BRUNO MARTIN | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 18 | 6 | 24 |

Objective:

Be able to determine and study the transfer function of a system.
Choose a corrector in order to improve system performance.

Course content :

- 1 - Laplace Transforms - Fourier - Z
- 2 – System transfer function
- 3 - Representation of transfer functions: Bode, Nyquist, Black.
- 4 – Sampled systems
- 5 – Non-linear systems
- 6 – System stability
- 7 – System correction and precision.

List of Practical Work:


PW1: Using Simulink, simulate a robotic arm controlled by operational speed.
PW2: Introduction to Labview, graphic programming and acquisition, applied to the speed regulation of a d.c motor.

Evaluation methods :

- Mid-semester exam: 1h30.
- Final exam : 2h00 based on whole subject.
- PW: Lab report submitted after each session.

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| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
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Technological training (UE 3)

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|---|-------------------------------|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 1 | |
| | Period : 2009-20-- | | ECTS : 4 | |
| | Technological training | | | |
| Discipline : | Technological training | | | |
| Platform : | IEAA | | | |
| Course title : | PRODUCTION ENGINEERING | | | |
| Lecturer : | FLAVIEN ROUX | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 24 | 24 | 18 | 24 |

Objective:

Awareness of problems encountered as a production engineer in the industrial environment.

Course content :

- 1 – Industrial organisation.
 - Production circles.
 - Industrial competitiveness.
 - Group technology.
 - Setting-up.
 - Quality.
 - Company improvement procedures.
- 2 – Production management.
 - ABC analysis
 - PERT.
 - Commercial provisions
 - MRP.
 - Stock management.
 - Kanban.
 - Layout.
 - Gantt.


List of Practical Work :

- PW 1. CAP (Computer aided production) in turning and milling.
 PW 2. Flow study (using witness software)
 PW 3. Flexible warehouse management : Supervision, planning, CAMM
 PW 4 CADP, machining centre and NC tower
 PW 5 & 6. Setting up and programming an automated system.

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.
- PW : Lab report submitted after each session.

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| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
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|---|---------------------------------------|------------------|-----------------|-------------------------|
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| | | | | Semester : 1 |
| | Period : 2009-20-- | | ECTS : 3 | |
| Discipline : | Technological training | | | |
| Platform : | CONSTRUCTION & FABRICATION | | | |
| Course title : | MECHANICAL CONSTRUCTION | | | |
| Lecturer : | LILIAN FAURE | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 18 | 18 | 20 |

Objective :

Modelling and simulation of mechanical systems.

1. Analysis of functional principles of power transmission mechanisms; belts, chains, universal joints, constant-velocity joints, coupling of shafts (rigid and elastic), gearing, brakes, main elements of hydraulic transmissions.

Course content :

• 1 Functional analysis of mechanisms – theory and practice

Structure and function of mechanical systems, mechanical models : solids and rigid body connections

Theory of mechanisms: geometric analysis, kinematics and statics.

• 2 Power transmission

Connecting of solid and elastic transmission shafts,

Flexible or rigid links, by friction (brake, clutch), belt and production line technology,

Geometry and dimensioning of gears: straight cut and helical gears, gears with non-parallel axis, gear cutting, epicyclic gear trains

List of Practical Work:

Modelling and study of mechanical systems using CAD software such as Adams, Motion for Catia or Solid dynamic. : air-conditioning compressor, axial piston pumps, rear suspension of vehicles, vane pump.

Independent work:


Group design project (about 20 hours) :

Conception and modelling of the design of an innovative mechanical system in the transport industry using CAD to validate the design and present it to a potential investor.

Evaluation methods:

- Exam : 1h30
- Final exam : 3h
- Project : presentation of 20 mn

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| $\text{Final score} = (2 \times (\text{Exam} \times (1/3) + \text{Final exam} \times (2/3)) + \text{Project}) / 3$ |
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|---|-------------------------------|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 1 | |
| | Period : 2009-20-- | | ECTS : 3 | |
| | Technological training | | | |
| Discipline : | ENERGY | | | |
| Platform : | I-C ENGINES | | | |
| Course title : | ALEXANDRE LOREDO | | | |
| Lecturer : | ALEXANDRE LOREDO | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 18 | 6 | 24 |

Objective :

Theoretical study of various heat engines; role of operating parameters.
 Technological aspects of modern engine design.
 Engine bench testing; specifics of powertrains

Course content :

Introduction, basic principles - Torque, power, average pressure, charge – Fuel and combustion - output, consumption – maximum power, charge adjustment, chamber filling – combustion process, ignition-controlled engines, Diesel engines, mixed engines – thermodynamic analysis of cycles partial loss and output of real cycles.


Motor units, cylinder heads, sump, collectors – Mobile elements : pistons, piston rings, crankshaft – Engine control (petrol and Diesel: historical aspects, evolution, current situation) – Valve-gear : general architecture, elements, cam profiles and lift parameters. Boosting : generalities, turbocompressors, direct-drive compressors, the “Complex”.

Engine testing; comprehensive look at different types of dynamometers - specific instrumentation – output shaft behaviour.

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h based on whole subject.

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| Final score = Mid-sem. exam x (1/3) + Final exam x (2/3) |
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|---|--|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 2 | |
| | Period : 2009-20-- | | ECTS : 3 | |
| | Discipline : Technological training | | | |
| Platform : CONSTRUCTION AND PRODUCTION | | | | |
| Course title : PRODUCTION MANAGEMENT | | | | |
| Lecturer : FLAVIEN ROUX | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | 18 | 24 |

Objective :

Awareness of problems encountered as a production engineer in the industrial environme

Course content :

- 1 – Industrial organisation.
 - Production circles, Industrial competitiveness.
 - Group technology.
 - Setting up, Quality assurance.
 - Company improvement procedures.
- 2 – Production management.
 - ABC analysis, PERT.
 - Commercial previsions.
 - MRP.
 - Stock management, Kanban.
 - Layout.
 - Gantt.
- 3- Continued improvement of production
 - Poka yoké


List of Practical Work:

Study of flow (using Witness software)
 Flexible warehouse management: Supervision, planning , GPAO
 Company simulation ‘Jeu Kanban 1 et 2’
 Productivity gain at assembly post (poka yoké)

Evaluation methods:

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.
- PW : Lab report submitted after each session.
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| Final score = Mid-sem. exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
|---|

| | | | | |
|---|-------------------------------|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 2 | |
| | Period : 2009-20-- | | ECTS : 3 | |
| | Technological training | | | |
| Discipline : | ENERGY | | | |
| Platform : | I-C ENGINES | | | |
| Lecturer : | ALEXANDRE LOREDO | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | 9 | 12 |

Objective :

Theoretical study of various heat engines; role of operating parameters.
 Technological aspects of modern engine design.
 Engine bench testing; specifics of powertrains

Course content :

Introduction, basic principles - Torque, power, average pressure, charge – Fuel and combustion - output, consumption – maximum power, charge adjustment, chamber filling – combustion process, ignition-controlled engines, Diesel engines, mixed engines – thermodynamic analysis of cycles partial loss and output of real cycles.

Motor units, cylinder heads, sump, collectors – Mobile elements : pistons, piston rings, crankshaft – Engine control (petrol and Diesel: historical aspects, evolution, current situation) – Valve-gear : general architecture, elements, cam profiles and lift parameters. Boosting : generalities, turbocompressors, direct-drive compressors, the “Complex”.

Engine testing; comprehensive look at different types of dynamometers - specific instrumentation – output shaft behaviour

List of Practical Work :

PW 1 – ignition and injection bench : study of Bosch Motronic system on animated model acquired on PC (ELWE)


PW 2 - didactic motor bench including motor, brakes, steering system and acquisition, ignition and injection cartography programmable in real time and cycle acquisition (P-V) in real time.

PW 3 – industrial type engine bench: pilot for an industrial engine test bench (Morphée software).

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h00 based on whole subject.
- PW : Lab report submitted after each session.
-

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| Final score = Mid-semester exam x (2/9) + Final exam x (4/9) + PW x (3/9) |
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|---|------------------------------|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 2 | |
| | Period: 2009-20-- | | ECTS : 3 | |
| Discipline : | PRODUCTION | | | |
| Course title : | MECHANICAL PRODUCTION | | | |
| Lecturer : | DENIS RIMBAULT | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 21 | 21 | 18 | 24 |

Objective :

By the end of this module, students should be able to completely define the production process of a mechanical part.

Course content

1. Numerically-controlled machine tools :

- Learning about DCMT in mechanical production.
- Setting up DCMT and programming.

2. Phase contract:

- Calculating quotes produced using $\Delta 1$ method.
- Modular manufacturing assembly.
- measuring range on 3-D MM

3. Study of a tool holder

4. Study of cutting conditions :

- Merchant theory.
- Cutting power.
- Life expectancy of cutting tools.

5. Production study (case study)

Individually, students will carry out a production study on a mechanism studied in mechanical production

List of Practical Work :

PW 1 – Set up a 3-D MM.

PW 2 – Study of a interchangeable tool holder

PW 3 - Programming and modifying DCMT NC tower

PW 4 – Programming and modifying DCMT machine centre

PW 5 – Study of process variations.


PW 6 - Preparing for production using computer methods

Evaluation methods :

Mid-semester exam : 1h30r.

Final exam: 2h00 based on whole subject

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| Final score: Mid-sem. Exam X (1/3) + Final exam X (2/3) |
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|---|-------------------------------|------------------|---------------------------|-------------------------|
|  | Year : 3 | | Semester : 1&2 | |
| | Period : 2009-20-- | | ECTS : - | |
| | Technological training | | | |
| Discipline : | Technological training | | | |
| Course title : | TRANSPORT TECHNOLOGY | | | |
| Lecturer : | - | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 6 | - | - | 6 |

Objective:

Cycle of conferences and lectures which enhance student awareness of transport issues.

Guidance from professionals, conferences etc. :


- SIA conference cycle.
- Input from professionals.

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|---|-------------------------------|------------------|---------------------------|-------------------------|
|  | Year : 3 | | Semester : 1&2 | |
| | Period : 2009-20-- | | ECTS : - | |
| | | | | |
| Discipline : | Technological training | | | |
| Platform : | GENERAL STUDIES | | | |
| Course title : | VISITING THE WORKPLACE | | | |
| Lecturer : | THIERRY SCARFOGLIÈRE | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | - | 4 | - | - |

Objective :

Understand the industrial workplace and its organisation.

Communication (UE 4)

| | | | | |
|---|-----------------------------------|------------------|---------------------------|-------------------------|
|  | Year : 3 | | Semester : 1&2 | |
| | Period : 2009-20-- | | ECTS : 2 | |
| | Discipline : Communication | | | |
| Platform : GENERAL STUDIES | | | | |
| Course title : ENGLISH | | | | |
| Lecturer : LANGUAGE CENTRE | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | - | 32 | - | 40 |

Objective:

Develop sufficient command of the language by consolidating language structure and expanding vocabulary.

Be able to express oneself spontaneously and fluently in everyday and professional situations.

Improve communication techniques

Obtain a university diploma or a recognised diploma of linguistic competence

Course content:

Deeper understanding of grammatical structures

Reading comprehension

Letter writing and short essays

Spoken language comprehension


Discussions and exchanges on various themes

Improving pronunciation and intonation

Evaluation methods:

- Mid-semester exam: 1h30.
- Final exam: 2h00 based on whole subject.

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| Final score = Mid-sem. exam x (1/3) + Final exam x (2/3) |
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|---|-----------------------------------|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 2 | |
| | Period : 2009-20-- | | ECTS : 1 | |
| | Discipline : Communication | | | |
| Platform : GENERAL STUDIES | | | | |
| Course title : LAW | | | | |
| Lecturer : OLIVIER SICOT | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 12 | 4,5 | - | 12 |

Objective :

Give the engineering student an understanding of Law and jurisdictional organisation and examine specific legal disciplines: social law, business law.

Course content :

1 – Definition of Law

2 – Objective Law

Rule of Law

- Coercive character of the rule of law
- Creation of the rule of law : Laws, customs
- Interpreting rule of law: interpreting techniques, jurisprudence, practice, doctrine

3 – Subjective Law


- Holder of rights
- Main subjective laws
- Sources of subjective laws
- Proof of subjective laws

4 – Jurisdictional organisation

Evaluation methods :

- Mid-semester exam : 1h30.
- Final exam : 2h based on whole subject.

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|--|
| Final score = Mid-sem. exam x (1/3) + Final exam x (2/3) |
|--|

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|---|-----------------------------------|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 2 | |
| | Period : 2009-20-- | | ECTS : 2 | |
| | Discipline : Communication | | | |
| Platform : GENERAL STUDIES | | | | |
| Course title : HUMAN RESOURCES | | | | |
| Lecturer : ERNEST GALINDO | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 9 | - | 18 |

Objective :

Familiarise future engineers with the organisation of companies and Human Resources management.


Course content:

- COMPANY MANAGEMENT
- RUNNING A MEETING AND LEADING WORK GROUPS
- COMMUNICATION
- EVALUATING THE POTENTIAL OF WORKERS
- DEVELOP THE SKILLS OF CO-WORKERS
- RECRUITMENT
- SALARY STRATEGY
- OTHER TOOLS AND INDICATORS FOR THE MANAGEMENT OF HUMAN RESOURCES.

Evaluation methods:

- Mid-semester exam: 1h30.
- Final exam: 2h based on whole subject.

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|--|
| Final score = Mid-sem. exam x (1/3) + Final exam x (2/3) |
|--|

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|---|-----------------------------------|------------------|---------------------------|-------------------------|
|  | Year : 3 | | Semester : 1&2 | |
| | Period : 2009-20-- | | ECTS : 1 | |
| | Discipline : Communication | | | |
| Course title : SPORT | | | | |
| Lecturer : PHILIPPE DUCHESNE | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | - | 32 | - | - |

Objective :

- Student participation in group management tasks and activities covered by ISAT's sporting association.
- Improving motor and cardio-vascular capacity

Course layout :

- Practice, covering 14 areas.
- Obligatory participation
- Optional participation, must choose 3 activities during the year (on average, one per term).
- Additional practice (FNSU - UFOLEP - Fédérale, etc..) through ISAT's sporting association (ISATHLON)
- Free practice, recreational


List of sporting activities:

- Tennis.
- Table tennis.
- Group sports.
- Judo.
- Fencing.
- French boxing.
- Swimming.
- Horse riding.
- Canoë-Kayak..
- Mountain bike
- Bodybuilding.
- Badminton.
- African dance.
- English boxing.
- Squash.
- Golf.
- Jogging.
- Yoga.

Evaluation methods :

- Attendance, Effort.
 - Personal investment
 - Level of training carried out
- Mid-semester exam: 1h30.

Training for the workplace (UE 5)


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|---|---|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 1 | |
| | Period : 2009-20-- | | ECTS : 4* | |
| | Discipline : Project and work placements | | | |
| Platform : GENERAL STUDIES | | | | |
| Course title : PROJECT MANAGEMENT | | | | |
| Lecturer : JEAN DAUVERGNE | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 18 | - | - |

- **Objective:**

The main objective is to initiate engineering students into project work including:

- Making necessary contacts,
- Definition of subject matter and objectives to be attained,
- Financing,
- Planning a schedule,
- Taking into account any delays or hold-ups, etc.

* This course is an integral part of the 3rd Year project. It serves as an introduction to project management.

| | | | | |
|---|---|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 1 | |
| | Period : 2009-20-- | | ECTS : 5 | |
| | Discipline : Projects and work placement | | | |
| Platform : PRODUCTION | | | | |
| Course title : PROJECT 1 | | | | |
| Lecturer : ARTHUR DA SILVA | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | - | - | 120 | 100 |

- **Objective :**

The main objective is to initiate students into project work, including :

- Establishing necessary contacts,
- Defining subject matter and targets to be reached,
- financing,
- putting in place a time schedule,
- Accounting for delays and hold-ups, etc.
- Secondary objectives: facilitate the integration of engineering students from similar background and contribute to the partnership between ISAT and companies.

- **Subject type**

- Technological surveillance: new techniques, developing numerical and experimental methods.
- Study and creation of equipment.
- Spadework done on a subject where a company does not yet have the skills or does not have the time to find a technician.
- Subject with experimental character in relation with laboratory research.
- Designing a prototype, actual creation is expected in the company.
- Study and creation of software.

- **ORGANISATION**

This educational activity requires group work. Each group of 3 engineering students allows us to put together students from similar recruitment and the normal syllabus into working relations. Following preparation and definition of subject matter including participation of a company, ISAT, and external partners (ANVAR), an agreement is signed between the company and the school.

Work on the project (about 250 hours) takes place one day a week throughout the academic year. Training is equally shared by an ISAT Lecturer (« school tutor ») and a member of a company (« company tutor »). By the end of this time spent working in a company, a report written by the student is submitted. This report is evaluated based on form and content by the « school tutor ». In turn, the « company tutor » evaluates and gives marks according to precise criteria the skills and efforts of the engineering students when working for the company. An oral presentation given by each group before a panel of « company tutors » and « school tutors » is also evaluated.


- **Independent work:**

About 200 hours of group work across the year.

- **Evaluation methods:**

- Evaluation of work.
- Report.

| |
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| Final score: 1/3 Work assessment + 1/3 Report + 1/3 Presentation |
|--|

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|---|---|------------------|---------------------|-------------------------|
|  | Year : 3 | | Semester : 2 | |
| | Period : 2009-20-- | | ECTS : 6 | |
| | Discipline : Projects and work placement | | | |
| Platform : PRODUCTION | | | | |
| Course title : PROJECT 2 | | | | |
| Lecturer : ARTHUR DA SILVA | | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | - | - | 120 | 100 |

• **Objective :**

The main objective is to initiate students into project work, including :

- Establishing necessary contacts,
- Defining subject matter and targets to be reached,
- financing,
- put in place a time schedule,
- Accounting for delays and hold-ups, etc.
- Secondary objectives: facilitate the integration of engineering students from similar recruitment and contribute to the partnership between ISAT and companies.

• **Subject type**

- Technological surveillance: new techniques, developing digital and experimental methods.
- Study and creation of equipment.
- Spadework done on a subject where a company does not yet have the skills or does not have the time to find a technician.
- Subject with experimental character in relation with laboratory research.
- Designing a prototype, actual creation is expected in the company.
- Study and creation of a software..

• **ORGANISATION**

This educational activity requires group work. Each group of 3 engineering students allows us to put together students from similar recruitment and the normal syllabus into working relations. Following preparation and definition of subject matter including participation of a company, ISAT, and external partners (ANVAR), an agreement is signed between the company and the school.

Work on the project (about 250 hours) takes place one day a week throughout the academic year. Training is equally shared by an ISAT Lecturer (« school tutor ») and a member of a company (« company tutor »). By the end of this time spent working in a company, a report written by the student is submitted. This report is evaluated based on form and content by the « school tutor ». In turn, the « company tutor » evaluates and gives marks according to precise criteria the skills and efforts of the engineering students when working for the company. An oral presentation given by each group before a panel of « company tutors » and « school tutors » is also evaluated.

• **Independent work:**

About 200 hours of group work across the year.


• **Evaluation methods:**

- Evaluation of work.
- Report.
-

| |
|--|
| Final score: 1/3 Work assessment + 1/3 Report + 1/3 Presentation |
|--|

Fourth Year

Engineering sciences training (UE 2)

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|---|--------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 2,5 | |
| | Engineering sciences training | | | |
| Group of disciplines : | Engineering sciences training | | | |
| Platform : | IEEA | | | |
| Course title : | NUMERICAL ANALYSIS | | | |
| Lecturer : | ALAIN RATLE | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | 0 | |

Objective:

Provide the theoretical and numerical tools to allow the student to define and solve the scientific problems faced by an engineer.


Course content:

1. Matrix calculation
2. Variational methods:
3. Discretization of functions (approximation, interpolation, derivation).
4. Numerical integration.
5. Solving equations numerically.
6. Ordinary and partial differential equations.
7. Methods of similitude.

Evaluation methods:

- Exam: 1h30 mid-semester.
- Class exam: 2h based on whole subject.

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| Calculation of final score = Exam x (1/3) + Class exam x (1/3) |
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|---|--------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 2,5 | |
| | Engineering sciences training | | | |
| Group of disciplines : | Engineering sciences training | | | |
| Platform : | MECHANICS | | | |
| Course title : | ACOUSTICS | | | |
| Lecturer : | PHILIPPE LECLAIRE | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | 15 | 15 |

Objective:

- Understand the physical phenomena associated with sound
- Noise-reduction methods
- Learn how to measure noise effectively

Course content:

- Basic elements of physical and physiological acoustics: physical units, weighted units, spectral analysis, main acoustic phenomena, types of sound fields.
- Physiological acoustics: anatomy of auditory system, auditory functions, characteristics of listening.
- Psycho acoustics: masking phenomena, height, intensity, roughness, duration, timbre.
- Linear acoustic theory: fundamental equations, characteristics of sound waves.
- Acoustical radiation of structures, origin, radiation factor, fluid-structure problem model, geometric interpretation.
- Transmission and absorption: acoustic indicators linked to transmission, reverberation chamber theory; sound transmission between closed spaces.


List of Practical Work:

- Describing sound source:
 - * PW 1 - Sonometer
 - * PW 2 – Comparative acoustic power
- Vibro-acoustics: plate-cavity interaction
 - * PW 3 – Natural frequency of decoupled systems
 - * PW 4 & 5 – vibro-acoustic interaction with mechanical and acoustic stimulation.

Evaluation methods:

- Mid-semester exam: 1h30.
- Class exam: 2h based on whole subject.
- PW: Lab report submitted after each session.

| |
|--|
| Calculation of final score = Mid-sem. exam x (2/9) + Class exam x (4/9) + PW x (3/9) |
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|---|--------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 2,5 | |
| | Engineering sciences training | | | |
| Group of disciplines : | Engineering sciences training | | | |
| Platform : | MECHANICS | | | |
| Course title : | FINITE ELEMENT ANALYSIS | | | |
| Lecturer : | SHAHRAM AIVAZZADEH | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 6 | 18 | 15 |

Objective:

- 1 - Provide the basics of the Finite Element Method.
- 2 – Be able to use available softwares

Course content:

- 1 – Basis of Finite Element Method
 - Variational and approximation methods.
 - Concept of finite elements.
 - Properties of displacement elements.
- 2 – Calculation techniques
 - Interpolation matrices :
 - Intrinsic coordinates
 - isoparametric elements
 - numerical integration
- 3 – Application to plain elasticity, beams and plates
- 4 – Static analysis and dynamic modelling
- 5 - Presentation of finite element software applied to simple cases
 - Demonstration of a complex case

List of Practical Work:


PW 1 – Modal schema of a simple structure (beam), influence of boundary conditions, discretisation...

PW 2 – Testing the possibilities of finite element software: possibilities and limits

Evaluation methods:

- Mid-semester exam: 1h30.
- Class exam: 2h based on whole subject.
- PW: Lab report submitted after each session.

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| Calculation of final score = Mid-sem. exam x (2/9) + Class exam x (4/9) + PW x (3/9) |
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|---|--------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 2 | |
| | Engineering sciences training | | | |
| Group of disciplines : | Engineering sciences training | | | |
| Platform : | MECHANICS | | | |
| Course title : | TRIBOLOGY | | | |
| Lecturer : | OLIVIER SICOT | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | 6 | 20 |

Objective:

Basics of friction, wear, seizing and lubrication.

Course content:

1. Friction – Wear and seizing - Strain – Friction materials
2. Surface states ; case study
3. Mechanical treatments ; case study
4. Lubrication

List of Practical Work:

PW 1 – Surface states, Measure of friction coefficient


PW 2 – contact stress - Position of maximum cutting point

Evaluation methods:

- Mid-semester exam: 1h30.
- Class exam: 2h based on whole subject.
- PW: Lab report submitted after each session.

| |
|--|
| Calculation of final score = Mid-sem. exam x (2/9) + Class exam x (4/9) + PW x (3/9) |
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Technological training (UE 3)

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|---|---------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 2,5 | |
| | Technological training | | | |
| Group of disciplines : | Technological training | | | |
| Platform : | CONSTRUCTION & FABRICATION | | | |
| Course title : | PRODUCTION MANAGEMENT | | | |
| Lecturer : | FRANÇOIS LANDOIS | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | 9 | 15 |

Objective:

Develop a global understanding of production constraints and situate production in relation to other company sectors (Finances, research, purchasing)

Consolidate understanding of industrial management tools and models, according to the company's industrial constraints (product, market, size, quantity)


Course content:

- 1) Production management
- 2) Production management models
- 3) Stages of Production Management
- 4) M.R.P.
- 5) Technical data of production management (articles, nomenclatures, product range)
- 6) Group technology
- 7) Management tools for production flow (kanban, OPT)
- 8) Project management
- 9) Management tools for short term production (stock, planning)
- 10) Purchasing and supplying
- 11) SMED method used to rapidly change from one production to another
- 12) M.T.M. Method-Time Measurement (information)
- 13) Industrial logistics
- 14) Transport

Evaluation methods:

- Exam: 1h30
- Class exam: 1h30

| |
|--|
| Calculation of final score = Exam x (1/3) + Class exam x (2/3) |
|--|

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|---|-------------------------------|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 2,5 | |
| | Technological training | | | |
| Group of disciplines : | Technological training | | | |
| Platform : | MECHANICS | | | |
| Course title : | NON-METALLIC MATERIALS | | | |
| Lecturer : | DONALD HEARN | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | 9 | 20 |

Objective:

Basic understanding of composites, thermoplastics, elastomers and ceramics.

Course content:

- 1) Definition of materials and their constituent parts.
- 2) Fabrication techniques and main applications.
- 3) Physical and mechanical properties.
- 4) Designing simple parts (flat composite plate).

List of Practical Work:

Fabrication of composite plate specimens


Mechanical tests

Thermoplastics moulding

Evaluation methods:

- Mid-semester exam: 1h30.
- Class exam: 2h based on whole subject.
- PW: Lab report submitted after each session.

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| Calculation of final score = Mid-sem. exam x (2/9) + Class exam x (4/9) + PW x (3/9) |
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|---|-------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 1,5 | |
| | Technological training | | | |
| Group of disciplines : | Technological training | | | |
| Platform : | CONSTRUCTION AND FABRICATION | | | |
| Course title : | QUALITY CONTROL | | | |
| Lecturer : | OLIVIER SICOT | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | - | 15 |

Objective:

Is not to

Make a quality specialist. Develop deep understanding of 1-2 quality tools. Glance at or skim through concepts, methods, and tools in an academic way.

Is to

Give a sense of perspective. Advise, warn, and prepare students, whatever their future career or function. Be able to read and understand a company's quality standard in order to integrate and act accordingly.

Course content:

1 - First contact.

- Quality control: why? To do what?
- Clarify expectations. Goal and objectives.

2 – Understand the different areas of quality control from the workstation.

- Evolution of Quality
- Inspection to prevention
- System quality, Total quality control

3 – Making coherent the concepts of quality through contributions from leaders in the field

- C.OQ./C.O.N.Q.
- Client and supplier

4 – Construct quality plan. Resolve quality problems

- P.D.C.A.

5 – Construct quality plan. Resolve quality problems

- 5S methodology

6 – Resolve quality problems

- Auto testing

7 – Construct quality plan. Resolve quality problems

- Seven Tools of quality.

8 – Construct quality plan. Resolve quality problems

9 – Reference system. Norms. Audit and certification.


10 – Reference system. Audit and certification

11 - Beyond certification

Evaluation methods:

- Class exam: 1h30 based on whole subject.
- Mid-semester exam: 2h.

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|---|
| Calculation of final score = Mid-sem. exam x (1/3) + Class exam x (2/3) |
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|---|---------------------------------|-----------|-------------------------|-----------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 2,5 | |
| | Technological training | | | |
| Group of disciplines : | ENERGY | | | |
| Platform : | ENERGY LOSSES IN SYSTEMS | | | |
| Course title : | ARTHUR DA SILVA | | | |
| Lecturer : | LECTURES | | | |
| Number of hours | TUTORIALS | PW | Independent work | |
| | 15 | 15 | 15 | 15 |

Objective:

Study the aerodynamic effects on ground and air vehicles and analyse associated flow, (take off control, drag reduction, optimisation of form).

Course content:

Boundary layer in Aerodynamics

-- Boundary Limit equations, surface friction, take-off, displacement thickness, movement quantity, form factor, Blasius solutions

Aeronautics

--aerodynamic forms, generating lift, drag, dyanlpic vector, induced drag on an aerofoil of finite length, effects of Mach number

Aerodynamics applied to vehicles

--dynamics and energy: strain outside a vehicle, energy balance between friction and movement and aerodynamic drag, performance of an automobile vehicle,

--analytic calculation of the aerodynamic drag of an automobile, identifying parameters of influence, analysis and drag control.

--Analysis of slipstream, characterising energy dissipated in slipstreams.

List of Practical Work:

PW 1. Study of flow around a cylinder

PW 2et 3. Study of flow around a Rankine cylinder with flat or oblique trailing edge


PW 4. Study of flow around a NACA wing

PW 5. Study of flow around a DELTA wing

Evaluation methods:

- Mid-semester exam: 1h30.
- Class exam: 2h00 based on whole subject.
- PW: Lab report submitted after each session.

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|---|
| $\text{Calculation of final score} = \text{Mid-sem. exam} \times (2/9) + \text{Class exam} \times (4/9) + \text{PW} \times (3/9)$ |
|---|

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|---|-------------------------------|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : - | |
| | Technological training | | | |
| Group of disciplines : | Technological training | | | |
| Platform : | GENERAL DISCIPLINES | | | |
| Course title : | TRANSPORT TECHNOLOGY | | | |
| Lecturer : | INVITED SPEAKERS | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | - | - | - |


Objective:

Cycle of conferences and lectures which aim to increase awareness of transport issues.

Guidance from professionals, conferences etc.:

- SIA conference cycle.
- Input from professionals.

Communication (UE 4)

| | | | | |
|---|----------------------------|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 1,5 | |
| | Communication | | | |
| Group of disciplines : | Communication | | | |
| Platform : | GENERAL DISCIPLINES | | | |
| Course title : | MANAGEMENT | | | |
| Lecturer : | ESC DIJON | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 15 | 0 | 15 |

Objective:

1. Acquire accountancy terminology; be able to read results, accounts and balance sheets.
2. Understand the ideas of cost and margin.
3. Elaborate a control panel.

Course content:

1 – General Accountancy

- General presentation and vocabulary.
- Balance sheet.
- Results account
- Account books
- Main current operations (billing, VAT)
- Main inventory operations (reserve, provision)

2 – Analytical accounting

- Methods for developing stocks
- Analytical costs and their incorporation
- Calculating costs
- Calculating margins

3 – Management control


- Management strategy and control
- Management control in the service of company

4 - Developing a navigation system –control panel

Evaluation methods:

- Class exam : 2h00 based on whole subject.

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| Calculation of final score = Exam mark |
|--|

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|---|-----------------------------------|------------------|---------------------|-------------------------|
|  | | | | |
| | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 1 | |
| Group of disciplines : | Communication | | | |
| Platform : | GENERAL DISCIPLINES | | | |
| Course title : | HUMAN RESOURCES MANAGEMENT | | | |
| Lecturer : | ERNEST GALINDO | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 4,5 | - | 20 |

Objective:

Introduce the future engineer to working rights as a practical application in his role as a professional.


Course content:

- 1 – Daily Work rights - Brief history
- 2 – Work contracts
- 3 – Internal settlements and disciplinary rights
- 4 – Working period
- 5 - Salary
- 6 – Health and Safety
- 7 – Institutions representing the workforce unions
- 8 – Work inspection
- 9 – Work conflicts

Evaluation methods:

- Exam: 1h30 mid-semester.
- Class exam: 2h based on whole subject.

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| Calculation of final score = Exam x (1/3) + Class exam x (2/3) |
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|---|-----------------------------|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : - | |
| | Communication | | | |
| Group of disciplines : | Communication | | | |
| Platform : | GENERAL DISCIPLINES | | | |
| Course title : | PROFESSIONAL PROJECT | | | |
| Lecturer : | ERNEST GALINDO | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 4,5 | 1,5 | - | 10 |

Objective:

1. Work out a personal assessment and from there draw up a professional project.
2. Prepare to take one's place in the working market.


Course content:

1. Self assessment
 - Psycho technological tests and tools of reflection to elaborate a professional project.
2. Personalised support for professional project (interviews).
3. Presentation of a personal project (video, poster and CV); evaluation and advice from course organisers.
4. Job-searching techniques

Evaluation methods:

- Exam: 1h30 mid-semester.
- Class exam: 2h based on whole subject.

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| Calculation of final score = Exam x (1/3) + Class exam x (2/3) |
|--|

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|---|---------------------------|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 1 | |
| | Communication | | | |
| Group of disciplines : | Communication | | | |
| Course title : | SPORT | | | |
| Lecturer : | PHILIPPE DUCHESNE | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | - | 40 | - | - |

Objective:

- Students' investment in group management tasks and activities covering ISAT's sporting association.
- Improving motor and cardio-vascular capacity

Course layout:


- Practice, covering 14 areas.
- Obligatory participation
- Optional participation must choose 3 activities during the year (on average, one per term).
- Associated practice (FNSU - UFOLEP - Fédérale, etc..) across ISAT's sporting association (ISATHLON)
- Free practice, recreational

List of Sporting Activities:

- Tennis.
- Table tennis.
- Group sports.
- Judo.
- Fencing.
- French boxing.
- Swimming.
- Horse riding.
- Canoe-Kayak.
- VTT
- Bodybuilding.
- Badminton.
- African dance.
- English boxing.
- Squash.
- Golf.
- Jogging.
- Yoga.

Evaluation methods:

- Attendance, Effort.
- Personal investment
- Level of practice Exam: 1h30 mid-semester.

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|---|----------------------------|------------------|---------------------|-------------------------|
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| | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 2 | |
| Group of disciplines : | Communication | | | |
| Platform : | GENERAL DISCIPLINES | | | |
| Course title : | ENGLISH | | | |
| Lecturer : | LANGUAGE CENTRE | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | - | 60 | - | 60 |


Objective:

- Develop sufficient command of the language by consolidating language structure and expanding vocabulary.
- Be able to express oneself spontaneously and fluently in general and professional situations.
- Improve communication techniques
- Obtain a university diploma or a recognised diploma of linguistic competence

Course content:

- Using the telephone
- Job interviews
- Presenting a company and its products
- logistics, - negotiation, - environment,- marketing
- explaining and describing systems, procedures and equipment etc ...

Training for the Workplace (UE 5)

| | | | | |
|---|-----------------------------------|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 1 | |
| | Period : 2010-20-- | | ECTS : 30 | |
| | Training for the workplace | | | |
| Group of disciplines : | Training for the workplace | | | |
| Course title : | WORK PLACEMENT | | | |
| Lecturer : | THOMAS DUPONT | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | - | - | - | 650 |

Objective:

Give the student a position of technical responsibility (complete or shared) by entrusting him with a study or project amounting to 600 hours of work.

Welcoming/Host company:

Constructors and manufacturers in the automotive, rail or aviation industries.

Major themes: Design, production, organisation, fabrication, testing.

As an example, students can work on the following subjects:

Research department

- initial project of mechanical construction, automation of an existing project
- equipping or modifying of a new manufacturing process

Organisation of production

- Participation in a team project GPAO
- Study of flow, Study of supplies/stock

Methods

- Research into improving productivity
- Defining new operating ranges, Industrialisation of a new product
- Study of equipment

Quality

- Involvement in quality control, continuous improvement
- Analysing causes of functional problems, procedure proposals

Evaluation methods:

1°) Feedback and appraisal from placement tutor (50 % of final score)

This relates to the student's ability to integrate well in the company, the interest they show in technical aspects, level of motivation towards work and interpersonal skills (an evaluation grid is given to the tutor).

2°) Placement report (25% of final score)

3°) Oral presentation of report (25% of final score)


To take place before a mixed panel of available placement tutors and ISAT Lecturers.

Students must obtain a score of 12/20 to pass this stage.

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| $\text{Calculation of final score} = \text{Company evaluation} \times (1/2) + \text{Rapport} \times (1/4) + \text{Viva} \times (1/4)$ |
|---|

Specialist Training (UE 6)

MATERIALS AND STRUCTURES

| | | | | |
|---|--------------------------|-----------|--------------|------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 2 | |
| Optional Group | MATERIALS AND STRUCTURES | | | |
| Course title : | STRUCTURAL ASSEMBLY | | | |
| Lecturer : | DONALD HEARN | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 12 | 9 | 6 | 20 |

Objective:

Master the different types of assembly most commonly found in the automotive and transport industry.

Course content:

- 1) Gluing
- 2) Soldering
- 3) Riveting & bolting


Practical Work

- 1) Dimensioning and producing glued joints (composite assembly)
- 2) Study of the mechanical behaviour of glued joints

Evaluation methods:

- Exam: 1h30 mid-semester.
- Class exam: 2h based on whole subject.
- PW: Lab report submitted after each session.

| |
|--|
| $\text{Calculation of final score} = \text{Exam} \times (2/9) + \text{Class exam} \times (4/9) + \text{PW} \times (3/9)$ |
|--|

| | | | | |
|---|--|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 1,5 | |
| Optional Group | MATERIALS AND STRUCTURES | | | |
| Course title : | MECHANICAL BEHAVIOUR OG MATERIALS | | | |
| Lecturer : | XIAO-JING GONG | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 12 | 6 | 9 | 20 |

Objective:

Provide the future engineer with conceptual and practical tools for predicting and analysing the mechanical behaviour of materials used in automotive and transport industry. In particular, we consider viscous type behaviour (elasticity, plasticity) whether it be linear or non-linear, as well speed-temperature equivalences.

Course content:

- 1) Non-linear elasticity, Visco-elasticity
- 2) Plasticity and significant deformations
- 3) Flow and relaxation
- 4) Spoiling and ageing

Practical Work


- 1) Influence of prompting speeds (polymers, ...)
- 2) Influence of temperature (polymer, ...)
- 3) Flow and relaxation

Evaluation methods:

- Exam: 1h30 mid-semester.
- Class exam: 2h based on whole subject.
- PW: Lab report submitted after each session.

| |
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| $\text{Calculation of final score} = \text{Exam} \times (2/9) + \text{Class exam} \times (4/9) + \text{PW} \times (3/9)$ |
|--|

VIBRO-ACOUSTICS

| | | | | |
|---|--|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 2 | |
| | Group of disciplines : VIBRO-ACOUSTICS IN TRANSPORT | | | |
| Course title : | VEHICLE AND ENVIRONMENT COMFORT | | | |
| Lecturer : | THOMAS DUPONT | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 16,5 | 16,5 | 6 | 40 |

Objective:

The objective of this course is to provide engineering methodologies which allow the student to study, understand and characterise acoustic, vibratory and thermal comfort and transport system designs. The course also presents engineering methodologies and elements allowing for the study of transport noise in the environment.

Course content:

1. Acoustic and vibratory comfort:

Introduction to Acoustic comfort: industrial context, definition, receptors, automotive noises
Hearing.

Basics of la psycho-acoustics (notions and parameters of force, height, variation, shock)

Subjective tests methodologies.

Vibratory comfort

2) Thermal comfort

3) Ergonomics, design

4) Transport noise

Introduction: noise as source of discomfort?

Transport noise (cars, heavy goods vehicles, rail, aeronautics).

Environmental acoustic elements.

Norms and methodologies for measuring noise outside the vehicle and traffic noise

Acoustic screens

Practical Work Content:


PW.1 measuring noise outside the vehicle and measuring traffic noise, Acoustic comfort: introduction to sound quality and perception.

PW.2 Thermal comfort: study of air-conditioning inside passenger compartment.

Evaluation methods:

- Exam: 1h30 mid-semester.
- Class exam: 2h based on whole subject.
- PW: Lab report submitted after each session.

| |
|--|
| $\text{Calculation of final score} = \text{Exam} \times (2/9) + \text{Class exam} \times (4/9) + \text{PW} \times (3/9)$ |
|--|

| | | | | |
|---|--|------------------|---------------------|-------------------------|
|  | Year : 4 | | Semester : 2 | |
| | Period : 2010-20-- | | ECTS : 1,5 | |
| | Group of disciplines : VIBRO-ACOUSTICS IN TRANSPORT | | | |
| Course title : | DIGITAL APPROACHES TO VIBRO-ACCOUSTIC PROBLEMS | | | |
| Lecturer : | ORLANDO ANDRIANARISON | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 6 | 3 | 12 | 20 |

Objective:

The course objective is to present numerical/digital methods which allow students to tackle automotive and transport vibro-acoustic problems across a wide frequency range. For each frequency band (LF, LF/MF, MF and HF) methods will be presented and any limits on their use discussed. For each method software used in the industry will be presented and students will be introduced to practical cases through their Practical Work.

This kind of problem is common in many sectors of the transport industry and, in particular, concerns the improvement of acoustic comfort for passengers in transport vehicles or the reduction of noise radiation from structures.

Course content:

Review of structure vibrations and linear acoustic equations

1. LF problem (0-20 Hz)
2. LF problem (0-200 Hz) : method based on EF (software: Nastran, Ideas)
3. MF problem (200-800 Hz) : method FEM-BEM (software: Sysnoise, Ideas vibro-acoustic)

Practical Work Content:

- 1.LF Domains: Acoustic radiation
- 2.LF Domains: Structure radiation
- 3.MF Domains: IDEAS vibro-acoustic
- 4.MF Domains: IDEAS vibro-acoustic


Evaluation methods:

- Exam: 1h30 mid-semester.
- Class exam: 2h based on whole subject.
- PW: Lab report submitted after each session.

| |
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| $\text{Calculation of final score} = \text{Exam} \times (2/9) + \text{Class exam} \times (4/9) + \text{PW} \times (3/9)$ |
|--|

Final Year

Engineering sciences training (UE 2)

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|---|--------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : 2,5 | |
| | Engineering sciences training | | | |
| Group of disciplines : | Engineering sciences training | | | |
| Platform : | MECHANICS | | | |
| Course title : | STRUCTURE DYNAMICS | | | |
| Lecturer : | ALI EL HAFIDI | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 18 | 12 | 21 |

Objective:

Study of elements linking the chassis to the ground to achieve driving comfort and security.

Course content:

- 1 - Review of mechanical behaviour of tyres.
- 2 – Suspension design and technology:
 - Fundamental characteristics.
 - Axle technology (MacPherson strut, trailing arms, multiple arms...)
- 3 – Study of suspension
 - Passive suspension.
 - Active suspension.
- 4 – Study of steering systems
 - Mechanical steering.
 - Power assisted steering
- 5 – Modelling the dynamic behaviour of a vehicle.


List of Practical Work:

PW 1 & 2 – Vibratory behaviour of a model vehicle chassis and its suspension, taking into account four degrees of freedom.
 PW 3 & 4 – Modelling of a vehicle in movement, instability and critical speed.

Evaluation methods:

- Mid-semester exam: 1h30.
- Class exam: 2h00 based on whole subject.

Calculation of final score = Mid-sem. exam x (1/3) + Class exam x (2/3)

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|---|--------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : 2 | |
| | Engineering sciences training | | | |
| Group of disciplines : | Engineering sciences training | | | |
| Platform : | MECHANICS | | | |
| Course title : | AERODYNAMICS | | | |
| Lecturer : | XAVIER GERGAUD | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 9 | 9 | 15 |

Objective:

Provide the basics of aerodynamics with a view to understanding physical forces exerted on a vehicle in motion.

Course content:

1. Fluid dynamics: Review, Consequences of testing in a wind tunnel
2. Aerodynamic flow at low speed: boundary layer, aerodynamics of simple obstacles, contours, aerofoils
3. Automotive aerodynamics: Description of flow, over-all strain, objectives of automotive aerodynamics, study methods by calculation, wind tunnel testing, road testing.


List of Practical Work:

PW 1, 2, 3. Wind tunnel study of a racing vehicle

Evaluation methods:

- Mid-semester exam: 1h30.
- Class exam: 1h30 based on whole subject.
- PW: Lab report submitted after each session.

Calculation of final score = Mid-sem. exam x (2/9) + Class exam x (4/9) + PW x (3/9)

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|---|--------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : 3 | |
| | Engineering sciences training | | | |
| Group of disciplines : | Engineering sciences training | | | |
| Platform : | MECHANICS | | | |
| Course title : | RUPTURE AND FATIGUE | | | |
| Lecturer : | XIAO-JING GONG | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 18 | 9 | 10 |

Objective:

Understand the failure mechanisms of mechanical structures

Study the mechanical behaviour of damaged structural elements and identify the risk of sudden or progressive crack propagation.

Be able to calculate rupture and fatigue of parts.

Course content:

1. Sudden fracture by cracking
 - Review of continuum mechanics
 - Stress Fields, strain and displacement fields near a crack
 - Energy approaches
 - Determination of K_I or G_I
 - Measuring tenacity of material
 - Plastic analysis near a crack
 - Propagation of cracks: R Curve
 - Crack-branching criteria
2. Failure by fatigue
 - Fatigue failure mechanisms
 - Resistance to fatigue
 - Failure by cracking under fatigue

List of Practical Work:

PW 1. Case of stratified composite tubes


PW 2. Measuring the tenacity of composites in pure mode I, pure mode II, and mixed mode I+II

Evaluation methods:

- Mid-semester exam: 1h30
- Class exam: 2h
- Marks for PWs: Report + oral presentation

Calculation of final score = (Mid-semester exam x (1/3) + Class exam x (2/3)) x (2/3) + Marks for PW x (1/3)

Technological training (UE 3)

| | | | | |
|---|-------------------------------|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : 3,5 | |
| | Technological training | | | |
| Group of disciplines : | MECHANICS | | | |
| Platform : | GROUND CONTACT | | | |
| Course title : | THOMAS DUPONT | | | |
| Lecturer : | THOMAS DUPONT | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 18 | 15 | 18 |

Objective:

Study a vehicle's ground contact behaviour, study the dynamics of a braking vehicle.

Course content:

- Braking and Grip:
 - Presentation, history, norms.
 - Tyres and grip.
 - Dynamics of a braking vehicle.
 - Hydraulic braking system.
 - Brake technology: Disc brakes and drum brakes.
 - Anti-lock Braking Systems (ABS).

- 2. Vehicle dynamics:
 - Transversal dynamics of a vehicle; behaviour of a vehicle in a curved trajectory.
 - Rolling and pitching
 - Transversal dynamics.
 - Ground contact elements.


List of practical work:

PW 1 – ABS system.
 PW 2 – Braking, skidding and suspension test benches.
 PW 3, 4, 5 – Familiarising with vehicle dynamics software

Evaluation methods:

- Mid-semester exam: 1h30.
- Class exam: 2h00 based on whole subject.
- PW: Lab report submitted after each session.

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|--|
| Calculation of final score = Mid-sem. exam x (2/9) + Class exam x (4/9) + PW x (3/9) |
|--|

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|---|-------------------------------|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : 2 | |
| | Technological training | | | |
| Group of disciplines : | Technological training | | | |
| Platform : | GENERAL DISCIPLINES | | | |
| Course title : | MAINTENANCE | | | |
| Lecturer : | OLIVIER SICOT | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 18 | 9 | - | 20 |

Objective:

Acquire the necessary knowledge for setting up industrial and preventative maintenance in a company.


Course content:

1. General introduction.
2. Industrial maintenance:
 - Company maintenance service.
 - Terminology.
 - The « 5S » system.
 - PWM.
 - Computer-aided Maintenance management.
 - AMDEC .
 - Reliability-Based Maintenance.
3. Diagnostics and preventative maintenance:
 - Breakdown diagnostic theory
 - Case study
 - Introduction to vibration analysis as a maintenance tool
 - Infrared thermography
 - Notions of monitoring wear through analysis of lubricants

Evaluation methods:

- Class exam: 2h00 based on whole subject.

| |
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| Calculation of final score = Class exam result |
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|---|-------------------------------|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : 2 | |
| | Technological training | | | |
| Group of disciplines : | MECHANICS | | | |
| Platform : | SELECTION OF MATERIALS | | | |
| Course title : | OLIVIER SICOT | | | |
| Lecturer : | LECTURES | | | |
| Number of hours | 18 | TUTORIALS | PW | Independent work |
| | 9 | - | 30 | |

Objective:

- 1- Understand the many aspects which play a part in choice of materials in mechanical design.
- 2- Master the proposed methodology as a general tool for resolving the problem of material choice. Be able to identify and correctly formulate the main items that play a part in real case studies.

Course content:


1. Design Principles
 - Formulating needs
 - Functional breakdown
 - Specifications and selection strategy
2. Choice diagram and performance indices
 - Choice diagram
 - Performance index and level curves
3. Multi Constraint and Multi Criteria design
 - Balancing factors method
 - Compound objectives, exchange constants
4. Materials / geometry / procedures
 - Form
5. Economic factors / ecology and esthetics
 - Estimating costs and viability
 - Esthetics and design
6. Materials for automotive and transport engineering
 - Inventory of assembly
 - Sources of innovation

Evaluation methods:

- Project (Report +oral presentation)

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| Calculation of final score = 0.6*report + 0.4*oral presentation |
|---|

Communication (UE 4)

| | | | | |
|---|--|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : 1,5 | |
| | Communication | | | |
| Group of disciplines : | Communication | | | |
| Platform : | GENERAL DISCIPLINES | | | |
| Course title : | MARKETING & COMMERCIAL MANAGEMENT | | | |
| Lecturer : | ERNEST GALINDO | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 15 | 3 | - | 10 |

Objective:

Understand the concept of marketing.

Enable students to take a strategic approach.

Enable the future engineer to consider how a company operates from a strategic marketing angle.


Course content:

1. What is marketing?
2. Marketing in the company (strategic approach)
3. Marketing: tools for action
- 4 - Purchasing
- 5 – Market studies
- 6 – Marketing plan
- 7- Commercial setup in industry

Evaluation methods:

- Mid-semester exam: 1h30.
- Class exam: 2h00 based on whole subject.

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| Calculation of final score = Mid-sem exam x (1/3) + Class exam x (2/3) |
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|---|---|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : - | |
| | Group of disciplines : Managerial and interpersonal training | | | |
| Platform : | GENERAL DISCIPLINES | | | |
| Course title : | COMMUNICATION | | | |
| Lecturer : | FRANÇOISE HERVET | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 3 | - | - | 10 |

Objective:

- 1) Introduce students to new recruitment methods: the Blog.
- 2) How to use communication techniques and how to build personal networks to further career prospects in industry.
- 3) How to respond to difficult questions during a job interview.

Course content:

- 1) The blog: a communication tool but also a way to steer recruiters towards a candidates C. V. and covering letter.
- 2) Using techniques for communication: building personal networks
This course considers all the methods a student might use for:
 - * Finding a job
 - * Progressing within a company or in the world of work in general
 - * Techniques of the game 'GO'.
- 3) Replying to difficult questions during a job interview:
 - Traps to avoid

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|---|---|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2006-2007 | | ECTS : 1 | |
| | Communication | | | |
| Group of disciplines: | Communication | | | |
| Platform: | GENERAL DISCIPLINES | | | |
| Course Title: | COMMERCIAL LAW & INTELLECTUAL PROPERTY | | | |
| Teacher: | ROLAND FRICQUEGNON | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent Work |
| | 24 | - | - | 10 |

Objectives:

- 1 – Introduce the future engineer to the laws that govern commercial relations between companies.
- 2 – Inform students about protection of inventions and brands.


Course Content:

1. Legal framework of economic relations and related juridical mechanisms.
2. Legal structure of companies – Grouping of firms.
3. Company tax systems.
4. Links between a company, its personnel and intermediaries.
5. Commercial campaigns.
6. Financing development campaigns - Relations with banks.
7. Company litigation.
8. Intellectual Property.

Evaluation Methods:

- Class exam: 2h00 based on the whole subject.

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| Calculation of final score = Class exam |
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|---|----------------------------|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | TOEIC | |
| | Communication | | | |
| Group of disciplines : | | | | |
| Platform : | GENERAL DISCIPLINES | | | |
| Course title : | ENGLISH | | | |
| Lecturer : | LANGUAGE CENTRE | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | | 30 | | 40 |

Objective:

Develop sufficient command of the language by consolidating language structure and expanding vocabulary.

Be able to express oneself spontaneously and fluently in general and professional situations.

Improve communication techniques

Obtain a university diploma or a recognised diploma of linguistic competence


Course content:

- Using the telephone
- Job interviews
- Company and product presentations
- logistics, - negotiating, - environment,- marketing
- explaining and describing systems, procedures, equipment ...

List of Practical Work:

- Giving a presentation
- Job interview practice

Training for the Workplace (UE 5)

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|---|--|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 2 | |
| | Period : 2011-20-- | | ECTS : 30 | |
| | Group of disciplines : Training for the workplace | | | |
| Course title : | WORK PLACEMENT | | | |
| Lecturer : | THOMAS DUPONT | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | - | - | - | 850 |

Objective:

Place the student in a real-life setting as an engineer in a company.

Host Company:

Any company where the presence of a mechanical engineer specialising in transport mechanics is essential.

Major themes :

5th Year interns have received four and a half years training, including academic study, the 6-week work placement in 1st year and the 15-week placement in 4th year. They are therefore capable of functioning in most areas of production or design.

As an example, interns are able to work in the following areas:

Research Departments

- Initial project of mechanical construction, study and development of a production procedure.
- automation of an existing procedure
- integrating a product and/or new procedure in the company
- equipping or modifying machine tools
- equipment design, optimisation of a product (output – costing....)

Organisation of production

- GPAO, selection, implementation, warehouse setup, of a new production
- Study of flow, research in optimisation
- Study of supplies, organisation of maintenance

Methods

- research into improving productivity
- defining new operational ranges, optimising the use of equipment
- study of an investment programme, industrialisation of a new product

Quality

- analysis of the causes of dysfunctions, suggested procedures
- setting up a preliminary works quality plan with ISO 9000 certification

Marketing

- technical-commercial product definition, specifications
- participation in drawing up a marketing plan for products or technical services
- suggested organisation of a S.A.V


Evaluation methods:

- Evaluation by placement tutor.
- Dissertation about placement.
- Oral presentation of dissertation.

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| Calculation of final score = Evaluation x (1/2) + Dissertation x (1/4) + presentation x (1/4) |
|---|

Specialist Training (UE6)

MATERIALS AND STRUCTURES

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|---|----------------------------------|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : 3 | |
| | Specialist Training | | | |
| Group of disciplines : | Specialist Training | | | |
| Platform : | MECHANICS | | | |
| Course title : | DESIGN OF COMPOSITE PARTS | | | |
| Lecturer : | DONALD HEARN | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 12 | 9 | 12 | 15 |

Objective:

Extend knowledge of composite materials acquired in 3A with the aim of using composites, calculating ply properties and the assembly of plies. Designing parts with regular geometry.

Course content:

1. Definition of unidirectional fibre ply.
2. Particularities of ply assembly, effects of coupling, role of anisotropy.
3. Description of the elastic properties of materials by MMC; 2-D case.
4. How fabrication methods influence mechanical properties.
5. Assembly methods.
6. Specific mechanical testing.
7. Effects of the environment on the durability of composite materials.
8. Case study, dimensioning methods.
9. Failure criteria.


List of Practical Work:

PW 1 – Fabrication of a composite sandwich board with skin determined by work carried out in tutorials. Fabrication of a composite tube by way of demonstration.

PW2: Instrumented 3-point bend test to confront experimental and theoretical property predictions ; Measurement of inter-laminar resistance; Measurement of a tube's transversal rigidity.

Evaluation methods:

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| Calculation of final score = PW x (1/4) + Class exam x (3/4) |
|--|

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|---|--------------------------------|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : 2,5 | |
| | Specialist Training | | | |
| Group of disciplines : | Specialist Training | | | |
| Platform : | MECHANICS | | | |
| Course title : | NON-DESTRUCTIVE TESTING | | | |
| Lecturer : | JÉRÔME ROUSSEAU | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 6 | 6 | 12 | 10 |

Objective:

A grounding in the methods employed in non-destructive testing. Present the link between fabrication and the presence of faults, on the one hand, and between faults and the mechanical behaviour of parts, on the other.

Course content:

Ultrasonic testing (US)
 Ionizing radiation testing
 Acoustic emission testing
 Thermographic testing


List of Practical Work:

- 1) Acoustic emission testing
- 2) Ultrasound method (C-Scan)
- 3) Infrared thermography
- 4) Penetrant testing, visual and sound testing

Evaluation methods:

- Class exam: 2h00 based on whole subject.
- PW: Lab report submitted after each session.

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| Calculation of final score = Class exam x (2/3) + PW x (1/3) |
|--|

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|---|--|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2007-2012 | | ECTS : 2 | |
| | Specialist Training | | | |
| Group of disciplines : | Specialist Training | | | |
| Platform : | MECHANICS | | | |
| Course title : | INDUSTRIAL PROCEDURES FOR FORMING MATERIALS | | | |
| Lecturer : | OLIVIER SICOT | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 9 | 15 | - | 15 |

Objective:

The objective of this module is to present the main industrial procedures of material transformation. Specifications for different types of materials will be explored and compared with the knowledge acquired in modules concerned with design.


Course content:

- 1- Procedures specific to polymers
- 2- Procedures specific to metals
- 3- Procedures specific to composites
- 4- Mixed procedures

Evaluation methods:

Project

| |
|--------------------------------------|
| Calculation of final score = Project |
|--------------------------------------|

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|---|-------------------------------------|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2007-20-- | | ECTS : 2,5 | |
| | SPECIALIST TRAINING | | | |
| Group of disciplines : | SPECIALIST TRAINING | | | |
| Course title : | RAPID DYNAMICS AND COLLISION | | | |
| Lecturer : | ORLANDO ANDRIANARISON | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 12 | 9 | 6 | 20 |

Objective:

The needs of the transport industry, and in particular the automotive industry, in relation to crash security, requires a thorough understanding of the behaviour of structures which undergo significant deformation under dynamic loading conditions

This course aims to give an appraisal of techniques (numerical and experimental modelling methods) for solving problems of crash and impact.

Course content:


- Review of non-linearity in structure mechanics
- Description of Lagrange, Lagrange in practice
- Thin-walled fixed and articulated structures
- Crash resistance (human tolerance to impact....)

Evaluation methods:

Practical work
Project

| |
|---|
| Calculation of final score = PW x (1/3) + Project x (2/3) |
|---|

VIBRO/ACOUSTIQUE

| | | | | |
|---|---------------------|-----------|--------------|------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : 2 | |
| | SPECIALIST TRAINING | | | |
| Group of disciplines : | SPECIALIST TRAINING | | | |
| Course title : | AERO ACOUSTICS | | | |
| Lecturer : | EMMANUEL REDON | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 10,5 | 6 | - | 15 |

Objective:


This course is an extension of acoustic and fluid mechanics modules of previous years. It is especially concerned with the study of the effect of flow on sound propagation. After establishing equations which govern the propagation of acoustic waves in flow, a solution is presented in the case of guided propagation.

Course content:

1. Review of general equations
2. Propagation of acoustic waves in flow
3. Change of reference axes for acoustic propagation – Doppler Effect
4. Guided propagation in presence of uniform flow

Evaluation methods:

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| Calculation of final score = Class exam |
|---|

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|---|--|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : 3 | |
| | SPECIALIST TRAINING | | | |
| Group of disciplines : | SPECIALIST TRAINING | | | |
| Course title : | EXPERIMENTAL METHODOLOGIES IN ACOUSTICS | | | |
| Lecturer : | ALI EL HAFIDI | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 13,5 | 10,5 | 12 | 15 |

Objective:

The objective of this course is to present different experimental methodologies used to:

- identify acoustic and vibratory parameters of structures
- characterise and analyse acoustic and vibratory fields.

The course is based on characterisation techniques and experimental measurements frequently used in practice and these will be detailed.

Course content:


1. Experimental method: data recording, sensors, actuators, analysis
2. Experimental modal analysis
 - a- Theoretical aspects: input/output, modal truncation, absorption
 - b- Measuring techniques, identification and reduction methods, Modal summary
3. Localisation of sources (imaging, intensimetry, inverse methods ...)
4. Vibratory maintenance

List of Practical Work:

- PW 1. Modal analysis of a structure (laminated windscreen)
 PW 2. Localisation of sources and measurement of intensity: imaging and intensimetry
 PW 3. Study of diffuse field and measurement of acoustic transparency
 PW 4. Vibratory diagnostic

Evaluation methods:

| |
|--|
| Calculation of final score = Class exam x (2/3) + PW x (1/3) |
|--|

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|---|----------------------------|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : 1,5 | |
| | SPECIALIST TRAINING | | | |
| Group of disciplines : | SPECIALIST TRAINING | | | |
| Platform : | MECHANICS | | | |
| Course title : | NOISE REDUCTION | | | |
| Lecturer : | THOMAS DUPONT | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 10,5 | 7,5 | 3 | 10 |

Objective:

Provide engineering methodologies which allow the student to study, understand and characterise acoustic and vibratory comfort of transport system.
Methodologies enabling the study of transport noise in the environment.

Course content:

1. Acoustic and vibratory comfort:

- Introduction to acoustic comfort: industrial context, definition, receptors, automotive noise sources
- Hearing
- Basics of psycho-acoustics (notions and parameters of force, height, variation,)
- Subjective test methodologies.
- Vibratory comfort

2. Transport noise (environment):

- Introduction: noise as source of discomfort?
- Transport noise (cars, heavy goods vehicles, rail, aeroplanes).
- Environmental acoustics.
- Norms and methodologies for measuring noise outside the vehicle and traffic noise
- Sound proofing.


List of practical work:

PW. 1 Application of acoustic norms to passing vehicle noise

Evaluation methods:

- Class exam: 2h based on whole subject relating to the course « Experimental method in vibration ».
- Practical work

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|---|
| Calculation of final score = Class exam*(2/3) + Practical work* (1/3) |
|---|

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|---|--|------------------|---------------------|-------------------------|
|  | Year : 5 | | Semester : 1 | |
| | Period : 2011-20-- | | ECTS : 1,5 | |
| | Specialist Training | | | |
| Group of disciplines : | Specialist Training | | | |
| Platform : | MECHANICS | | | |
| Course title : | ACOUSTIC & VIBRATORY SOURCES IN ROAD VEHICLES | | | |
| Lecturer : | THOMAS DUPONT | | | |
| Number of hours | LECTURES | TUTORIALS | PW | Independent work |
| | 9 | 6 | 6 | 10 |

Objective:

- Introduction to the problem of coupled systems
- Find equation for a coupled fluid-structure problem
- Methodology for solving problems

Course content:

- Conservative systems with several degrees of freedom
- Vibration of thin-walled structures
- Linear equations of small movements in perfect fluids
- Acoustic behaviour of tubular networks
- Fluid-structure coupling ; Variation formulations and resolution methodology

List of Practical Work:

PW 1.

PW 2.

Evaluation methods:

| |
|--|
| Calculation of final score = Class exam x (2/3) + PW x (1/3) |
|--|