Basic Teaching Unit:1.1	*Coefficient :3*	*Credits:3*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Electricity 1**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student must know how to calculate and measure the current and voltage quantities in continuous mode and in sinusoidal mode.					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** 1. Electrokinetics:fundamental notions, potentialdifference, current, dipole, Ohm'slaw. 2. Periodicsignals:instantaneous values, average values, effective values 3. Voltage and currentgenerators 4. Thévenin'stheorems, Norton'stheorem 5. Superposition theorem 6. Wheatstone Bridge 7. RLC Dipole 8. Harmonicregimes. Complexeimpedances. 9. Study of the RLC circuit: saturation and overcurrent coefficient. 10. Electricalsafetyawareness. **Practicalwork :** • Discovery of electricalmeasuringdevices:Generators, voltmeters, ammeters, multimeters, oscilloscopes, low-frequencygenerator, decibelmeter. • Discovery of common components. • Study of the RLC circuit in transient and harmonic regimes.					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Basic Teaching Unit:1.1	*Coefficient :3*	*Credits:3*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Mechanics 1**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student must know how to calculate and measure the characteristics of movement.					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** General principles of mechanics: 1. Cinematics 2. Staticelementsincluding contact forces 3. Balance of forces and fundamentalrelationship of dynamics (the problems of change of frame of referencewillsimplybementioned) 4. Notions of energy, conservation of energy for a conservative system 5. Angularmomentumtheorem 6. Solid mechanics (wewillessentially deal with the problem of the solidrotatingaround an axis) **Practicalwork :** • Study of mechanicalquantities. Speed, acceleration, forces… • Free fall. • Inclined plane. • Study of springs • Study of Movements: use of an air cushion table or self-supporting mobile. • Study of the movement of an electron: Use of an electron gun.					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Basic Teaching Unit:1.1	*Coefficient :3*	*Credits:3*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Atomic and molecular structure**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student must have acquired a first level of understanding of atomic and molecular structures.					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** 1. Atomic structure 2. Periodic classification of elements 3. Radioactivity. Radiation protection concepts 4. Chemical bonds 5. Energy diagrams of simple molecules. Applications to molecularorbitals 6. Organic and inorganicmolecular structures. **Practicalwork :** • Use of molecular modeling software.					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Basic Teaching Unit:1.1	*Coefficient :2*	*Credits:2*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Chemical analysis methods**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student must have acquired good laboratory practice and basic chemical analysis methods					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** 1) Chemical equilibria, equilibriumfactors, and equilibriumlaws. 2) Focus. 3) Progress table, Stoichiometry. 4) Chemical thermodynamics. 5) Equilibrium and chemicalkinetics. 6) Chemical reactions in solution. **Practicalwork** • Direct, indirect, and return titrations • pH meter • Zerocurrentpotentiometer • Chemical kinetics					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Basic Teaching Unit:1.1	*Coefficient :3*	*Credits:3*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Optical systems 1**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	Know basic notions for shaping and characterizing a beam through an optical system					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** 1) Basics of light 2) Principle of geometricoptics 3) Snell-Descartes laws, mirrors, thinlenses. 4) Dispersion, prism 5) Concept of object, concept of image, Gaussian approximation 6) Centeredsystems 7) Optical Instruments (eye, objective, ocular, telescope, microscope) **Practicalwork :** • Reflection, refraction, plane diopter. • Conjugationrelationship. • Bessel method					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Basic Teaching Unit:1.1	*Coefficient :3*	*Credits:3*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Energy conversion**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student must have understood the possibilities and limitations of heat-energy conversions.					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** 1) First principle of thermodynamics:Thermodynamic system, state variables, the transformation of idealgases, Energy exchanges: Work, heat, internal energy, calorimetricquantities, enthalpy, open systems, 2) Second law of thermodynamics:entropy, reversibility, irreversibility. Potentialfunctions. 3) Change of state. **Practicalwork :** • Temperature and pressure measurements, • Calorimetry, • Work-heatequivalence, •Change of state,					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

<table>
<tr><td colspan="2">Basic Teaching Unit:1.1</td><td>Coefficient : 3</td><td>Credits:3</td><td colspan="4">VH:52h30</td></tr>
<tr><td colspan="4"></td><td>L</td><td>T</td><td>TW</td><td>Other</td></tr>
<tr><td>Titled</td><td colspan="3">Mathematics 1</td><td>15h 00</td><td>15h 00</td><td>22h 30</td><td>55h</td></tr>
<tr><td>Objectifs</td><td colspan="7">At the end of this module, the student must know how to carry out the mathematical treatment of the physics problems addressed in the rest of the program.</td></tr>
<tr><td>Focusedabilities</td><td colspan="7"></td></tr>
<tr><td></td><td colspan="6"></td><td>Level requirement</td></tr>
<tr><td>Content (blocks of skill)</td><td colspan="6">The subject's content :
1. Vectors and barycenter
2. The scalarproduct, the vectorproduct, the mixed product
3. The differentcoordinatesystems (Cartesian, polar, cylindrical, spherical)
4. Complexnumbers and complexexponential use
5. Circulartrigonometryreminders
6. Polynomialswith real and complex coefficients
7. Usualfunctions of a real variable, differential notation
8. Partial derivatives, differentials, differentialforms
9. Differentialequations. First-orderequations, second-orderequationswith constant coefficients
10. The Riemann integral. The primitives. The change of variable. Integration by parts
11. Descriptive statistics with one variable. Concept of a random variable, law of probability (discrete and continuous), mean and standard deviation.</td><td></td></tr>
<tr><td>Type of control and monitoring</td><td colspan="6">Continuous monitoring: 60%; Exam: 40%</td><td></td></tr>
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Basic Teaching Unit:1.1		*Coefficient :2*	*Credits:2*	**VH:52h30**			
				L	*T*	*TW*	*Other*
Titled	**Metrology 1**			**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student must be aware of the importance of uncertainty as an integral part of a result. He must know how to determine measurement uncertainty based on available information or knowledge.						
Focusedabilities							
							Level requirement
Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** 1. Physical quantity. 2. Dimensions and units. 3. Measurementsystems. 4. Measurement operating procedure. 5. International vocabulary of metrology (fidelity, accuracy, accuracy, etc.). 6. Approach for determiningmeasurementuncertainties:determination of the announced value (average, corrections, measurement model), determination of uncertainties (type A and type B methods), propagation of uncertainties, and expression of results. 7. Study of calibration documents. **Practicalwork** The manipulations in this module willbe able to illustratemetrology and demonstrateitstransversalitythroughthemesfrom simple practicalwork in physics and chemistry, avoidingfavoringdimensionalmetrology: 1. Titrimetry 2. Electricalresistancemeasurement 3. Density measurement 4. Focometrics 5. Diffractometricmeasurements 6. Moment of inertia in mechanics 7. Analysis of certain sources of errors. Thermometry 8. Application of descriptive statistics to the processing of measurement data using a spreadsheet						
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**						

Basic Teaching Unit:1.1	*Coefficient :3*	*Credits:3*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Languages, Culture and Communication 1**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student must have acquired a methodology of intellectual work and ease of expression in Arabic, French and English.					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** 1. Resumption of basic knowledge, 2. Consolidation of grammatical skills, 3. Development of written and oral know-how, 4. Mastery of intellectualwork (listening, note-taking, understanding of texts, organization of speech), 5. Written expression (mastery of the language, appropriation of vocabulary, correction of syntax, standard of presentation of documents), 6. Oral expression (prepared and improvised speaking).					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Basic Teaching Unit:1.1	*Coefficient :2*	*Credits:2*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Socio Professional Knowledge and Practices**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student must understand the functional organization of a company and know how to use the means of communication used in companies.					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**Knowledge of the company and professions** 1. The different types of businesses and professions 2. The functionalorganization of the company 3. The company and itseconomicpartners 4. Techno-economic management 5. Strategy **Communication in the company** 1. Office automation 2. Rules of industrial design, and introduction to the software tool 3. Internal and external information systems					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Basic Teaching Unit:1.1	*Coefficient :3*	*Credits:3*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Electricity 2**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student must be aware of the importance of uncertainty as an integral part of a result. He must know how to determine measurement uncertainty based on available information or knowledge.					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**Courses and Tutorials** 1. Electrostatics:field, potential, capacitors, electrostatic energy, applications (sensors, etc.) 2. Electromagnetism:magnetic excitation field H, magnetic induction field B, induction flux. Laplace'slaw. Work of magnetic forces. Induction laws (application of eddycurrents). Electromagnetic energy. Magnetic circuits, hysteresis. 3. Electrotechnics: single-phase currents, three-phase currents, high currents. Single-phase transformer. Power measurement. Principle of rotating machines. Electricalsafety concept. 4. Technology: passive components, magnetic components (electromagnet, permanent magnets, relays, etc.) **Practicalwork :** 1. Laplace forces. 2. Study of an electricmotor 3. Study of a transformer. 4. Implementation of inductive sensors: LVDT, angular position sensor, etc.					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

<table>
<tr><td colspan="2">Basic Teaching Unit:1.1</td><td>Coefficient :3</td><td>Credits:3</td><td colspan="4">VH:52h30</td></tr>
<tr><td colspan="4"></td><td>L</td><td>T</td><td>TW</td><td>Other</td></tr>
<tr><td>Titled</td><td colspan="3">Mechanics 2</td><td>15h 00</td><td>15h 00</td><td>22h 30</td><td>55h</td></tr>
<tr><td>Objectifs</td><td colspan="7">At the end of this module, the student must be aware of the importance of uncertainty as an integral part of a result. He must know how to determine measurement uncertainty based on available information or knowledge.</td></tr>
<tr><td>Focusedabilities</td><td colspan="7"></td></tr>
<tr><td></td><td colspan="6"></td><td>Level requirement</td></tr>
<tr><td>Content (blocks of skill)</td><td colspan="6">The subject's content :
Courses and Tutorials
Concepts of resistance of materials:
1. Constraints
2. Deformations
3. Extensometry (treated as an application of the staticschapter)
Practicalwork :
1. Demonstration of Hooke'slaw.
2. Bending of a Beam.
3. Extensometry. Handling of strain gauges.</td><td></td></tr>
<tr><td>Type of control and monitoring</td><td colspan="6">Continuous monitoring: 60%; Exam: 40%</td><td></td></tr>
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Basic Teaching Unit:1.1	*Coefficient :3*	*Credits:3*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Thermal Transfers**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	Know temperature sensors. Know how to measure heat flows during transfers in a solid, at the fluid-solid interface, and by radiation in a one-dimensional steady state. Know how to find the temperature profile.					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** 1. Thermometry (temperaturescales, absolutescale, temperaturesensors). 2. Conduction. 3. Convection. 4. Radiation. Radiative properties of materials (reflectivity, transmittivity, absorbtivity, and emissivity), Radiosity, Form factor. 5. Heat exchangers **Practicalwork** 1. Temperaturemeasurements and sources of error. 2. Measurements of heattransfer coefficients 3. Heat exchangers					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Basic Teaching Unit:1.1	*Coefficient :3*	*Credits:3*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Optical systems 2**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student must have carried out optical fiber conditioning and implemented optical sensors.					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** 1. Photometricquantities, 2. Sources, and theirproperties 3. concepts of colorimetry and lighting. 4. Guidedoptical propagation (opticalfibers, waveguides) 5. Optical sensors. **Practicalwork** • Focometry. • Use of sights and collimators • Creation of an optical instrument on a bench. • Study of the prism					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Basic Teaching Unit:1.1	*Coefficient :3*	*Credits:3*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Material structure**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student must know how to identify the main classes of materials					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** 1. The different classes of materials 2. Order and disorder in materials 3. Bonds in solids 4. Band structures Phase diagrams. **Practicalwork** 1. Crystallography (X-ray diffraction). 2. Metallography. 3. BinaryDiagrams 4. Synthesis of a polymer. 5. Degree of polymerization					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Basic Teaching Unit:1.1	*Coefficient :3*	*Credits:3*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Electronics1**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student should know the basic electronic functions and their characteristics.					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** 1. Functions:Switching, rectification, amplification, filtering. 2. Amplification. Thévenin and Norton's model of an amplifier 3. Transfer functions. Quadrupoles. 4. Input and output impedancemeasurement. 5. Field effect transistor, bipolar transistor (switching and linearregime) 6. Operational amplifier (applications: tracker, trigger, comparators, etc.). 7. Frequency response (first-order passive and active filters, gain-band product, Bode diagram **Practicalwork :** 1. Filtering rectification (diode bridge) 2. Passive and active quadrupoles:studies of transferfunctions. 3. Operationalamplifier:adder-subtractor, follower, comparator, etc. 4. Harmonicresponse of a first-order system (active and passive).					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Basic Teaching Unit:1.1	*Coefficient :3*	*Credits:3*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Mathematics 2**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student must know how to carry out the mathematical treatment of physics problems which will be addressed later in the training.					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** 1. Approximation of functions: Smoothing of curves. 2. Vector fields. 3. Functions with several variables. 4. Taylor's formulas. Limited developments 5. Curvilinear integrals, vector functions, parameterized curves 6. The double integral, the triple integral 7. Linear algebra: vector spaces, bases, linear applications, matrices, determinants					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Basic Teaching Unit:1.1	*Coefficient :2*	*Credits:2*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Computer science**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student should be able to design and implement an algorithm and know how to create small utilities.					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** 1. Logic tests, nested conditionals, nested loops. 2. Functions and procedures. 3. Structure of algorithms: sequentiality, conditions, loops, tables, functions 4. Data Types 5. Inputs, outputs 6. One- and two-dimensional arrays. **Practical work** The application will be in an object-oriented language. Practical work in numerical analysis. Practical work on computers mainly with textual language.					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Basic Teaching Unit:1.1	*Coefficient :3*	*Credits:3*	**VH:52h30**			
			L	*T*	*TW*	*Other*
Titled	**Languages, Culture and Communication 2**		**15h 00**	**15h 00**	**22h 30**	**55h**
Objectifs	At the end of this module, the student must have learned to practice documentary research and writing documents in Arabic, French and English.					
Focusedabilities						
						Level requirement
Content (blocks of skill)	**The subject's content :** Expression in the three languages 1. Acquisition of scientific and technical vocabulary (work on technical and popularization documents) 2. Mastery of intellectual work (analysis, document criticism, information search) 3. Written expression (summary file) 4. Cultural openness (handling current issues)					
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**					

Content (blocks of skill)	**The subject's content :** **Courses and Tutorials** 1. Approximation of functions: Smoothing of curves. 2. Vector fields. 3. Functions with several variables. 4. Taylor's formulas. Limited developments 5. Curvilinear integrals, vector functions, parameterized curves 6. The double integral, the triple integral 7. Linear algebra: vector spaces, bases, linear applications, matrices, determinants	
Type of control and monitoring	**Continuous monitoring: 60%; Exam: 40%**	