الجمهورية الجزائرية الديمقراطية الشعبية

وزارة التعليم العالي والبحث العلمي

نموذج مطابقة
و مواءمة

عرض تكوين ليسانس أكاديمي
2025 – 2026

التخصص	الشعبة	ميدان
السنة الأولى جذع مشترك		علوم المادة

People's Democratic Republic of Algeria
Ministry of Higher Education and Scientific Research

Compliance and Harmonisation Template
Training Offer
Academic Bachelor's Degree (L.M.D. System)
2025 – 2026

Domain	Field	Specialty
MATERIAL SCIENCES		**L1 – Socle Commun (Common Core)**

Semester Organisation Sheet – Speciality (S1 and S2)

L1 – Common Core in Material Sciences – Semester 1

Teaching Unit	Subjects	THW	Weekly Hours			Other	Coeff.	Credits	Evaluation Mode	
	Title	15 weeks	Lectures	TS*	LS*				Continuous assessment	Final exam
Fundamental Unit FU 1 Credits : 18 Coefficient : 09	Mathematics 1	67h30	1h30	3h00		82h30	3	6	33%	67%
	Physics 1	67h30	3h00	1h30		82h30	3	6	33%	67%
	Chemistry 1	67h30	3h00	1h30		82h30	3	6	33%	67%
Methodology Unit MU 1 Credits : 9 Coefficient : 5	Physics Lab 1	22h30			1h30	27h30	1	2	50%	50%
	Chemistry Lab 1	22h30			1h30	27h30	1	2	50%	50%
	Computer Science 1	60h00	1h30		2h30	65h00	3	5	50%	50 %
Discovery Unit DU 1 Credits : 1 Coefficient : 1	University Study Methods	22h30	1h30			2h30	1	1		100%
Transversal Unit TU 1 Credits : 2 Coefficient : 2	English 1 (A2 Level)	45h00	1h30		1h30	5h00	2	2		100%
Total Semester 1		375h00	12h00	6h00	7h00	375h00	17	30		

- Tutorial sessions
- Lab sessions

Semestre 2 :

| Teaching Unit | Subjects | THW | Weekly Hours | | | Other | Coeff. | Credits | Evaluation Mode | |
| | Title | | Lectures | TS* | LS* | | | | Continuous assessment | Final exam |
		15 weeks								
Fundamental Unit FU 1 Credits : 18 Coefficient : 09	Mathematics 2	67h30	1h30	3h00		82h30	3	6	33%	67%
	Physics 2	67h30	3h00	1h30		82h30	3	6	33%	67%
	Chemistry 2	67h30	3h00	1h30		82h30	3	6	33%	67%
Methodology Unit MU 1 Credits : 9 Coefficient : 5	Physics Lab 2	22h30			1h30	27h30	1	2	50%	50%
	Chemistry Lab 2	22h30			1h30	27h30	1	2	50%	50%
	Computer Science 2	60h00	1h30		2h30	65h00	3	5	50%	50 %
Discovery Unit DU 1 Credits : 1 Coefficient : 1	Business Economics	22h30	1h30			2h30	1	1		100%
Transversal Unit TU 1 Credits : 2 Coefficient : 2	English 2 (B1 Level)	45h00	1h30		1h30	5h00	2	2		100%
Total Semester 2		375h00	12h00	6h00	7h00	375h00	17	30		

- Tutorial sessions
- Lab sessions

Detailed Programme by Subject

Semester *: 1*

Fundamental Unit (UEF 1)
Course Code: FU 1
Course Title: Mathematics 1

Course Objectives:
Of paramount importance for any scientist, this course enables students to acquire the fundamental mathematical foundations necessary to rigorously express the laws of physics and chemistry. The course covers vector calculus, differential calculus, and their applications to problems in physical and chemical modelling.

Note: Although the introduction to logic and reasoning methods is not included as a separate chapter due to time constraints, it must be incorporated into the exercise sets directly.

Course Structure: 1h30 lecture + 3h00 tutorial sessions per week.

Syllabus:

Chapter 1 – Numbers and Vectors (3 weeks: 3 lectures, 6 tutorial sessions)

- Real numbers: definition, absolute value, radicals (square root, cube root, n-th root and properties), integer part.
- Vectors: definition, operations (sum, scalar multiplication), examples in 2D and 3D.
- Linear dependence and independence, basis and dimension.
- Vector projection in Cartesian coordinates.
- Polar and cylindrical coordinate systems.

Chapter 2 – Real-valued Functions (3 weeks)

- Review of elementary functions.
- Trigonometric functions: periodicity, parity, graphs, solving equations and inequalities.
- Hyperbolic functions: definition, parity, monotonicity, graphs.
- Continuous functions: fundamental theorems, intermediate value theorem.
- Inverse functions and the monotonic bijection theorem.
- Applications: inverse trigonometric and hyperbolic functions.

Chapter 3 – Differential Calculus (3 weeks)

- Differentiability at a point (right and left derivatives), geometric interpretation.
- Derivatives of composite and inverse functions.
- Fundamental theorems: Rolle's theorem, mean value theorem, L'Hospital's rule.
- Higher-order derivatives.

Chapter 4 – Integral Calculus (3 weeks)
- Antiderivatives and indefinite integrals: definitions, properties.
- Definite integrals: definition, Chasles relation, mean value formula.
- Integration methods: by parts, by substitution, of rational functions.
- Applications: area calculation, physics and chemistry problems.

Assessment Method:
Continuous assessment: 33% – Final exam: 67%

Semester : 1
Fundamental Unit (FU 1)
Course Title: Physics 1

Course Objectives:
To provide students with fundamental concepts of classical mechanics related to the material point, through kinematics, dynamics, and work-energy principles.

Prerequisites:
A solid understanding of physics at the secondary school level.

Syllabus:

Mathematical Review (2 weeks)

- Dimensional analysis
- Error calculation
- Vectors

Kinematics of a Point (5 weeks)

- Rectilinear motion
- Motion in space
- Special types of motion
- Polar, cylindrical, and spherical coordinates
- Relative motion

Dynamics of a Point (5 weeks)

- Inertia principle and Galilean frames
- Newton's laws of motion
- Force laws
- Angular momentum, torque

Work and Energy (3 weeks)

- Work of a force
- Kinetic and potential energy (gravitational, elastic)
- Non-conservative forces

Assessment Method:
Continuous assessment: 33% – Final exam: 67%

References (books and handouts, websites, etc.):
- T. HANNI, *Mécanique générale cours et exercices,* OPU (1996).
- J. TAYLOR, *Mécanique classique,* Ellipses, Paris, (2007)
- J TAYLOR, *Incertitudes et analyse des erreurs dans les mesures physiques*, Dunod, Paris, (2000).
- H. LUMBROSO, *Mécanique du point,* 1ère an. MPSI - PCSI - PTSI - Problèmes résolus, Dunod, Paris (2002)
- D. TEYSSIER, *Mécanique du point : exercices corrigés*, Ed. Ellipses Paris, (2005)
- J. FAGET, J. MAZZASCHI, *Travaux Dirigés de Physique Généralités,* Ed. Vuibert Paris, (1970)
- J. FAGET, J. MAZZASCHI, *Travaux Dirigés de Physique Mécanique,* Ed. Vuibert Paris, (1970)

Semester : 1
Fundamental Unit (FU 1)
Course Title: Chemistry 1

Course Objectives:
To introduce students to fundamental chemical formalism, focusing on the atom and chemical bonding, chemical elements, the periodic table, and energy quantisation.

Prerequisites:
A solid understanding of physical sciences at the secondary school level.

Syllabus:

- Atomic structure: nucleus, atomic mass, radioactivity, nuclear reactions.
- Energy quantisation: Bohr model, quantum theory, Schrödinger equation.
- Quantum numbers, probability density, hydrogen atom orbitals.
- Electron configuration, poly-electronic atoms (shielding effect).
- Periodic classification: periodicity, chemical properties, atomic radius, ionisation energy, electron affinity, electronegativity.
- Chemical bonding: covalent and ionic bonds, molecular orbitals, σ and π bonds, hybridisation, molecular geometry (Gillespie method).

Assessment Method:
Continuous assessment: 33% – Final exam: 67%

References (books and handouts, websites, etc.):

- M. FAYARD, *Structure électronique atomes et molécules simples,* Hermann, France, (1969).
- Y. JEAN, *Structure électronique des molécules : 1 de l'atome aux molécules simples* 3ème Ed. Dunod, Paris, (2003).
- M. GUYMONT, *Structure de la matière* ; Belin Coll., Paris, (2003).
- G. DEVORE, *Chimie générale : T1, étude des structures*, Coll. Vuibert Paris, (1980).
- M. KARAPETIANTZ, *Constitution de la matière*, Ed. Mir, Moscou, (1980).

Course Objectives:

- Reinforce theoretical knowledge acquired in the *Mechanics of the Material Point* (Physics 1) course, including error calculation.
- Enable students to observe and visualise phenomena related to classical mechanics through hands-on experiments.

Prerequisites:
A solid understanding of physical sciences at the secondary school level.

Syllabus: *(Select at least 5 lab sessions)*

- Error calculation
- Study of rectilinear motion
- Verification of Newton's Second Law
- Study of a physical pendulum
- Free fall
- Simple pendulum
- Maxwell's pendulum
- Study of the rotation of a solid
- Verification of the fundamentals of circular motion – conservation of mechanical energy

Assessment Method:
Continuous assessment: 50% – Final exam: 50%

References (books and handouts, websites, etc.):

- T. HANNI, *Mécanique générale cours et exercices*, OPU (1996).
- J TAYLOR, *Incertitudes et analyse des erreurs dans les mesures physiques*, Dunod, Paris, (2000).
- H. LUMBROSO, *Mécanique du point,* 1ère an. MPSI - PCSI - PTSI - Problèmes résolus,
- F. FAGET, M. MAZZASCHI, *Mécanique du point, Exercices corrigés*, Ed. Dunod Paris, (1999)

Semester : 1

Course Code: MU 1
Course Title: Chemistry Lab Sessions 1

Course Objectives:

- Introduce students to safe laboratory practice in chemistry.
- Teach basic chemistry laboratory techniques and the use of measuring instruments.

Prerequisites:
A solid understanding of physical sciences at the secondary school level.

Syllabus:

- Safety rules and introduction to chemistry lab work
- Preparation of a solution
- Determination of molar mass
- Acid-base titrations
- Redox titrations

Assessment Method:
Continuous assessment: 50% – Final exam: 50%

References (books and handouts, websites, etc.):

- Y. JEAN, *Structure électronique des molécules : 1 de l'atome aux molécules simples* 3ème Ed, Dunod, Paris, (2003).
- M. GUYMONT, *Structure de la matière* ; Belin Coll., Paris, (2003).
- M. KARAPETIANTZ, *Constitution de la matière*, Ed. Mir, Moscou, (1980).

Semester : 1

Course Code: MU 1

Course Title: Computer Science 1 – Introduction to Algorithmic Thinking and Control Structures in Python

Course Objectives:

- Understand the concept of algorithms and their importance in problem-solving.
- Master the basics of Python syntax, data types, and fundamental operations.
- Learn to implement sequential algorithms and essential control structures (conditions and loops).

Syllabus:

Chapter 1 – Introduction to Computer Science and Algorithms
- What is a computer and a program?
- Brief history of computing.
- Introduction to algorithms and their importance.
- Programming languages and algorithmic languages.
- Components of an algorithm.

Chapter 2 – Getting Started with Python
- Installing and setting up a development environment.
- Basic Python syntax.
- Variables and constants.
- Fundamental data types (integers, floats, booleans).
- Operators (arithmetic, comparison, logical).
- Input (`input()`) and output (`print()`) statements.
- Assignments and expressions.

Chapter 3 – Conditional Structures in Python
- Introduction to control structures.
- Simple conditional (if).
- If-else structures.
- Nested conditionals (if-elif-else).

Chapter 4 – Loops in Python
- Introduction to loops.
- While loop: syntax and behaviour.
- For loop: syntax and iteration over sequences (strings and lists introduction).
- Loop control statements (break, continue).

Chapter 5 – Representing Algorithms
- Sequential algorithms and their Python implementation.
- Representing algorithms using flowcharts.
- Introduction to pseudocode.

Assessment Method:
Continuous assessment: 50% – Final exam: 50%

Bibliography :

- *"Introduction to Algorithms"* by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
- "Python Programming: An Introduction to Computer Science" by John Zelle

Semester : 1
Discovery Unit
Course Title: University Study Methods

Course Objectives:
This course enables students to learn how to study and work effectively at the university level, covering various aspects such as reading, writing, and research using both traditional and digital resources.

Note: It is strongly recommended to deliver this course online to allow for interactive workshops.

Prerequisites: None

Syllabus:

Documentation

- Traditional documentation
- Audiovisual documentation
- Internet-based documentation

Bibliography Skills

- How to read effectively
- Using the paratext of a journal or book to assess relevance
- Navigating a text to identify key arguments
- Knowledge organisation (reading notes, filing systems)

Note-taking

- Reading notes
- Lecture or conference notes
- Abbreviations
- Organising and using notes

Writing a Synthesis Report

- Writing tips
- Types of texts for different purposes
- Writing strategies
- Writing an internship report
- Writing a thesis or dissertation

Preparing an Oral Presentation

- Oral expression skills
- Presentation preparation
- Clarity and timing
- Effective delivery

Training the Future Researcher

- Analysing a problem
- Recommending an action plan
- Teamwork skills

References:

- Bertrand, D., Azrour, H., *Réapprendre à apprendre au collège, à l'université et en contexte de travail* (2004)
- Chassé, D., Prégent, R., *Préparer et donner un exposé – Guide pratique* (1990)
- Dionne, B., *Pour réussir : guide méthodologique pour les études et la recherche* (2004)
- Université du Québec, *Programme de développement des compétences informationnelles* (2007)

Assessment Method:
100% Final exam

Semester 1
Transversal Unit (TU 1)
Course Title: English 1 – Level A2

Syllabus:

- Sentences
- Tenses
- Nouns, adjectives, articles, adverbs, etc.
- Introduction to phonetics and phonology
- Speech mechanism
- Sounds of English (vowels, diphthongs, consonants)
- Transcription and classification

Additional Recommendation:
It would be beneficial to include a **practical lab session in English** focusing on collaborative activities to enhance team spirit while developing language and communication skills.
Such sessions promote an active, hands-on approach conducive to cooperation.
Online teaching can be used to efficiently deliver multimedia content adapted to the training programme.

Assessment Method:
100% final exam

Some references:
D. Bertrand, H Azrour, *Réapprendre à apprendre au collège, à l'université et en contexte de travail : Gestion et maîtrise des compétences transversales. Montréal: Guérin universitaire(2004).*   *D Chassé, R. Prégent. Préparer et donner un exposé guide pratique. Montréal: Éditions de l'École, (1990)*
B. Dionne, Pour réussir : guide méthodologique pour les études et la recherche (4 éd.). Laval, Québec: Beauchemin. (2004)
Université du Québec. Programme de développement des compétences informationnelles, (2007). http://pdci.uquebec.ca/. 43.

Semester: 2
Fundamental Unit (FU): Mathematics 2

Course Objectives:
This course is of critical importance for students in the sciences. It provides the foundational mathematical skills necessary for the rigorous formulation of physical and chemical laws. Students will learn to solve ordinary differential equations (ODEs), perform matrix calculations, compute determinants, solve linear systems, work with matrices and linear transformations, and diagonalize matrices. Additional essential tools include polynomial approximations of functions and the study of functions of two variables.

Course Structure: 1.5 hours of lecture and 3.0 hours of tutorial sessions per week.

Learning Outcomes

By the end of this course, students will be able to:

1. Solve first- and second-order ordinary differential equations with various techniques.
2. Perform matrix operations, compute determinants, and determine matrix rank.
3. Solve linear systems using methods such as Cramer's Rule, inverse matrices, and Gaussian elimination.
4. Apply Taylor expansions and polynomial approximations to analyze functions.
5. Work with functions of several variables, including computing partial derivatives and applying gradient and Laplacian concepts.

Course Content

Chapter 1: Ordinary Differential Equations (ODEs) *(2 weeks)*

- First-order linear ODEs
    - General form of a first-order linear ODE
    - Solution of the associated homogeneous equation
    - Particular solution using the method of variation of constants
    - Examples
    - *Note:* The Cauchy problem (ODE with initial conditions) and the principle of superposition will be covered through exercises in tutorial sessions. Additional lecture material is required.
- Second-order linear ODEs with constant coefficients
    - General form of a second-order linear ODE with constant coefficients
    - Solution of the homogeneous equation (no forcing term)
    - Particular solutions (table summarizing the main types of forcing terms)
    - Examples
    - *Note:* The method of variation of constants, ODEs with initial conditions, and the principle of superposition will be introduced in tutorial sessions. Additional lecture material is required.

Chapter 2: Linear Algebra *(5 weeks)*

- Matrices and Linear Transformations
    - Definition of a matrix; common types of matrices
    - Matrix operations: equality, addition, scalar multiplication, matrix multiplication
    - Elementary row and column operations (row echelon form)
    - Rank of a matrix and of a set of vectors

- Linear transformations from $\mathbb{R}^n$ to $\mathbb{R}^m$ (definition, examples, matrix representation, and correspondence between transformations and matrices)
- Determinants
  - Determinants of order 2 and 3
  - Definition, cofactors, properties, general case
- Inverse Matrices
  - Definition and computation using cofactors; other methods covered in tutorial sessions
- Systems of Linear Equations
  - Definition and examples; matrix form; augmented matrices
  - Solving square systems (Cramer's rule, inverse matrix method)
  - Solving general systems (Gaussian elimination)

Chapter 3: Polynomial Approximation of Functions *(3 weeks)*

- Taylor formulas with Lagrange and Young remainders (special case near 0)
- Taylor Series Expansions
  - Definition near 0
  - Series obtained using Taylor's formula (basic examples; a reference table of expansions is essential)
  - Operations on series expansions (*covered entirely in tutorial sessions with applied exercises; additional lecture material is required*)
  - Expansions near an arbitrary point
  - Applications of series expansions (*covered entirely in tutorial sessions with applied exercises; additional lecture material is required*)

Chapter 4: Functions of Several Variables *(2–3 weeks)*

- Definition of a function of two variables
- Graphical representation of functions of two variables (examples: plane, paraboloid, cone, etc.)
- First-order partial derivatives
  - Definition and examples
  - Tangent plane, gradient, divergence
  - Directional derivatives and derivatives along a vector
  - Mixed partial derivatives
- Second-order partial derivatives (definition, Laplacian)

References:

- Belorizky, E., *Mathematical Tools for Scientists and Engineers*, EDP Sciences, Paris (2007).
- Appel, W., *Mathematics for Physics and Physicists*, 4th ed., H&K Editions, Paris (2008).
- Aslangul, C., *Mathematics for the Sciences: Concepts, Methods, and Techniques for Modeling*, De Boeck, Brussels (2011).
- Aslangul, C., *Mathematics for the Sciences 2: Detailed and Commented Solutions to Exercises and Problems*, De Boeck, Brussels (2013).
- Piskounov, *Differential and Integral Calculus*, Vol. 2, MIR Publishers (1976).
- http://www.les-mathematiques.net

Semester: 2
Fundamental Unit: (FU) : Physics 2 – Electricity and Electromagnetism

Course Description

This course provides students with the foundational concepts and principles of electricity and electromagnetism. Topics include electrostatics, conductors, direct-current (DC) circuits, magnetostatics, and magnetic induction. Emphasis is placed on both theoretical understanding and practical problem-solving skills relevant to physical science and engineering applications.

Learning Outcomes

By the end of this course, students will be able to:

- Apply Coulomb's law and Gauss's theorem to calculate electric fields and potentials.
- Analyze electrostatic properties of conductors and capacitors, including capacitance calculations.
- Solve direct-current circuit problems using Ohm's law, Joule's law, and Kirchhoff's laws.
- Explain magnetostatic phenomena and apply the Biot–Savart law and Ampère's law to compute magnetic fields.

Weekly Topics and Schedule

Weeks 1–3: Electrostatics

- Electric charge and electric fields
- Electrostatic potential
- Electric dipoles
- Electric flux
- Gauss's theorem

Weeks 4–5: Conductors

- Definition and properties of conductors in electrostatic equilibrium
- Electrostatic pressure
- Capacitance of conductors and capacitors

Weeks 6–8: Direct-Current (DC) Circuits

- Electrical conduction
- Ohm's law
- Joule's law
- Basic electrical circuits
- Application of Ohm's law to networks
- Kirchhoff's laws

Weeks 9–11: Magnetostatics

- Lorentz force

- Laplace's law
- Biot–Savart law
- Magnetic dipoles

Weeks 12–15: Magnetic Induction

- Fundamental principles and applications (details covered in lectures and tutorials)
- Understand and apply the principles of electromagnetic induction to basic physical systems.

Assessment Methods

- **Continuous Assessment:** 33% (quizzes, assignments, participation in tutorial sessions)
- **Final Exam:** 67% (comprehensive written exam)

References

- Granjon, Y., *Exercises and Problems in Electricity*. Dunod, Paris (2003).
- Caubarrere, J. L., *Electricity and Waves: Lectures and Lab Sessions*. OPU, Algiers (1986).
- Ediscience Collective, *University Physics: Electrostatics and Direct-Current Circuits, Years 1 and 2*. Ediscience International (2010).
- Sanz, M.-N., Chardon, D., Vandenbrouck, F., Salamito, B., *Physics All-in-One PC, PC*: Lectures and Solved Exercises. Dunod, Paris (2014).
- Serway, R. A., Jewett, J. W., Ducharme, A., Périard, M., *Physics – Vol. 2: Electricity and Magnetism*. De Boeck (2013).
- Fedullo, D., Gallauziaux, T., *Electricity: How to Build Your Own Electrical Installation*. Eyrolles (2012).

Semester: 2

Fundamental Unit: (FU) : Chemistry 2 – Thermodynamics & Chemical Kinetics

Course Description

This course introduces students to the fundamental formalism of thermodynamics, covering its core principles, thermodynamic quantities, and state functions such as enthalpy and entropy. It also provides an introduction to the chemical kinetics of reactions, including reaction rate laws and the factors influencing reaction speed.

Learning Outcomes

By the end of this course, students will be able to:

1. Define and describe thermodynamic systems, state variables, and state functions.
2. Apply the first law of thermodynamics to various processes involving ideal gases and chemical systems.
3. Interpret and use the second and third laws of thermodynamics in the context of natural processes and equilibrium.
4. Calculate thermodynamic properties such as enthalpy, entropy, and Gibbs free energy.
5. Analyze chemical equilibrium using the law of mass action and equilibrium constants.
6. Explain the basic concepts of chemical kinetics and determine how temperature and concentration affect reaction rates.

Weekly Topics and Schedule

- **General Concepts in Thermodynamics**

    - - Systems, system states, variables, and state functions
    - - Equilibrium and system transformations
    - - Temperature concepts and different forms of energy
    - - Ideal gas equation

- **First Law of Thermodynamics**

    - - Internal energy, work, and heat
    - - Statement of the first law
    - - Differential form of the first law
    - - Applications: transformations of an ideal gas (isochoric, isothermal, isobaric, adiabatic)
    - - Chemical systems: heat of reaction, bond energy
    - - Examples of applications to physical systems

- **Second Law of Thermodynamics**

    - - Natural processes
    - - Entropy, Gibbs free energy, and heat engines
    - - Chemical equilibria: law of mass action, equilibrium constant
    - - Factors affecting equilibrium
    - - Statement of the third law of thermodynamics

- **Introduction to Chemical Kinetics**

    - - Definition of reaction rate

- - Main factors influencing reaction rates: concentration, temperature
- - Integrated rate laws

Assessment Methods

Continuous Assessment: 33% (tutorial participation, assignments, quizzes)

Final Exam: 67% (comprehensive written exam)

References

- Becherravy, T., Vibrations et Ondes, Vols. 1–4, Hermes-Lavoisier (2010).
- Djelouah, H., Vibrations et Ondes Mécaniques, OPU (2011).
- Bruneaux, J., Vibrations et Ondes, Ed. Marketing (2010).
- Granjon, Y., Exercises and Problems in Electricity, Dunod, Paris (2003).
- Borel, L., Favrat, D., Thermodynamics and Energy Systems, Vol. 1: From Energy to Exergy, PPUR, Mechanical Engineering Collection (2011).
- Foussard, J.-N., Mathe, S., Thermodynamics – Fundamentals and Applications, Lectures and Solved Exercises, 2nd ed., Dunod (2010).
- Mauduit, R., Thermodynamics in 20 Summaries, Dunod (2013).

Semester: 2
Methodology Unit (MU) Physics Lab Sessions 2 – Electricity

Course Description

This laboratory course consolidates the theoretical knowledge acquired in the Electricity module (Physics 2) and develops practical skills in experimental techniques. Students will learn how to set up, operate, and interpret measurements in various electrical experiments, enabling them to visualize and better understand the phenomena studied in lectures and tutorials.

Learning Outcomes

By the end of this course, students will be able to:

1. Perform accurate measurements of electric fields and potentials using laboratory instruments.
2. Construct and analyze basic electrical circuits, applying Ohm's law and measuring resistance.
3. Use the Wheatstone bridge method for precise resistance measurement.
4. Operate oscilloscopes and signal generators, including transformer-based systems.
5. Measure and analyze the behavior of capacitors, including series/parallel combinations and charge–discharge cycles.
6. Verify the Biot–Savart law experimentally.
7. Determine the Earth's magnetic field using appropriate apparatus.

Lab Schedule and Topics

1. Measurement of electric field and potential (rheographic tank)
2. Electrical circuits: Ohm's law, resistor combinations, resistance measurements
3. Wheatstone bridge
4. Oscilloscope and current generator (transformer)
5. Capacitors: combinations, capacitance measurement, charge–discharge experiments
6. Verification of Biot–Savart law
7. Measurement of Earth's magnetic field

References

- Caubarrere, J. L., *Electricity and Waves: Lectures and Lab Sessions*. OPU, Algiers (1986).
- Bentounsi, A., *General Electricity, Vol. 2: Solved Exercises*. OPU, Algiers (1992).
- Ediscience Collective, *University Physics: Electrostatics and Direct-Current Circuits, Years 1 and 2*. Ediscience International (2010).
- Fedullo, D., Gallauziaux, T., *Electricity: How to Build Your Own Electrical Installation*. Eyrolles (2012).
- Largeaud, H., *Electrical Schematics*. Eyrolles (2006).

Semester: **2**

Methodology Unit (MU) Chemistry Lab Sessions 2 – Thermodynamics & Chemical Kinetics

Course Description

This laboratory course consolidates the theoretical knowledge acquired in the Thermodynamics & Chemical Kinetics module (Chemistry 2). Students will gain hands-on experience in performing experiments related to thermodynamic properties of substances, energy transformations, and reaction kinetics. The course emphasizes experimental techniques, data acquisition, analysis, and interpretation to strengthen understanding of physical chemistry concepts.

Learning Outcomes

By the end of this course, students will be able to:

1. Measure the heat capacity of liquids accurately.
2. Determine thermodynamic properties of ideal gases.
3. Measure the ratio of specific heats of a gas experimentally.
4. Apply the first law of thermodynamics in experimental contexts.
5. Conduct kinetic studies of reactions such as sucrose inversion, ester saponification, and hydrogen peroxide decomposition.
6. Analyze and interpret experimental results, comparing them with theoretical predictions.

Lab Schedule and Topics

Thermodynamics

1. Measurement of the heat capacity of liquids
2. Thermodynamic properties of ideal gases
3. Measurement of the ratio of specific heats of a gas
4. First law of thermodynamics

Kinetics
5. Sucrose inversion
6. Ester saponification (second-order reaction)
7. Decomposition of hydrogen peroxide

References

- Mauduit, R., *Thermodynamics in 20 Summaries*. Dunod (2013).
- Fremaux, B., *Elements of Kinetics and Catalysis*. Tec & Doc (1989).
- Diu, B., et al., *Thermodynamics*. Hermann, Paris (2007).

Semester: 2
Methodology Unit (MU) : Computer Science 2 – Data Structures, Functions, and Error Handling in Python

Course Description

This course builds upon the foundations of Python programming introduced in Computer Science 1. Students will deepen their understanding of Python data types such as strings, lists, and tuples; learn how to define and use functions for modular programming; explore variable scope and parameter passing; and gain an introduction to error handling to create more robust programs.

Learning Outcomes

By the end of this course, students will be able to:

1. Create, manipulate, and apply common operations to strings, lists, and tuples in Python.
2. Define and use functions to modularize and organize code effectively.
3. Apply concepts of variable scope (local and global) and parameter passing.
4. Implement basic error handling techniques to manage exceptions in Python programs.
5. Write and debug Python programs that integrate data structures, functions, and error handling for practical applications.

Weekly Topics and Schedule

Chapter 1 – Strings in Python

- Creation and character access
- Basic operations (concatenation, slicing, length)
- Common string methods

Chapter 2 – Lists and Tuples in Python

- Creation, access, and manipulation of lists (adding, removing, modifying elements, slicing)
- Introduction to tuples: creation, access, immutability
- Common uses of lists and tuples

Chapter 3 – Functions in Python

- Defining and calling functions
- Positional and keyword arguments
- Return values
- Variable scope (local and global)
- Parameter passing (by value and by reference – introduction)

Chapter 4 – Error Handling in Python

- Introduction to exceptions
- The try–except block
- Handling different types of errors

Assessment Methods

- Continuous Assessment: assignments, lab projects, and quizzes
- Final Exam: comprehensive programming exam

References

- Zelle, John. *Python Programming: An Introduction to Computer Science*.
- Sweigart, Al. *Automate the Boring Stuff with Python* (for practical applications and functions).

Semester: 2
Discovery Unit (DU) : Business Economics

Course Description

This course introduces students to the fundamentals of business and its role in the economy. It covers the concept of the firm, its environment, organizational structure, core functions, and basic tools for economic analysis. Students will also explore different modes of business growth and their implications in practice.

Learning Outcomes

By the end of this course, students will be able to:

1. Define and explain the concept of a business and its role in the economy.
2. Identify the different elements of a business environment and their impact.
3. Describe the organizational structure and main functions of a business.
4. Apply basic tools for the economic analysis of a business.
5. Explain the main modes of business growth and development strategies.

Weekly Topics and Schedule

- Concept of the business
- The business and its environment
- Business organization
- Business functions
- Tools for economic analysis of the business
- Modes of business growth

Assessment Methods

- Continuous Assessment: participation, assignments, and short tests
- Final Exam: written exam covering all course topics

References

- Addoun, Nacer Dadi. *Économie de l'entreprise*. Office des Publications Universitaires, Algeria.
- Kourtel, Farid. *Communication et prise de décision*. Éditions Kanouz El Maaref, Amman, Jordan, 2011.

Semester: 2

Transversal Unit (TU) : **English 2 – Level B1**

Course Description

This course develops students' English proficiency to the B1 level, focusing on enhancing reading, writing, listening, and speaking skills in academic and professional contexts. Special emphasis is placed on collaborative activities that foster team spirit and improve communication skills. Practical lab sessions provide an active, hands-on approach to language learning, encouraging cooperation and problem-solving in English. Online learning tools are integrated to deliver multimedia resources tailored to the training program.

Learning Outcomes

By the end of this course, students will be able to:

1. Communicate effectively in English in familiar academic and everyday contexts.
2. Understand and produce texts on topics of personal, academic, and professional interest.
3. Participate in collaborative tasks and discussions, expressing opinions clearly.
4. Use appropriate vocabulary and grammatical structures at the B1 level.
5. Apply listening and speaking strategies in group and team-based activities.

Weekly Topics and Activities

- Grammar and vocabulary development (B1 level)
- Reading comprehension strategies
- Listening to authentic English materials (lectures, interviews, discussions)
- Writing structured paragraphs and short essays
- Speaking activities: presentations, debates, role plays
- Collaborative lab sessions: problem-solving tasks, group projects
- Online learning integration: multimedia exercises and interactive activities

Assessment Methods

- Continuous Assessment: class participation, lab work, assignments, quizzes
- Final Exam: written and oral components

References

- Cambridge English, *English Grammar in Use* (B1–B2 Edition).
- McCarthy, M., O'Dell, F., *English Vocabulary in Use – Intermediate*.
- Online platforms such as BBC Learning English, Cambridge Learning Management System, and other multimedia resources.