اللائحة الدراسية:

<table>
<thead>
<tr>
<th>الفصل الدراسي</th>
<th>الفرقة والمستوى</th>
<th>عدد الساعات الأسبوعية</th>
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المحتوى العلمي:

الفرقة الأولى علوم طبيعية
كود أو رقم المقرر : 101
اسم المقرر: كيمياء عامة
محتويات المقرر:

Part I: Physical chemistry (2h/w)
- Physical chemistry
- Gaseous state
- Thermochemistry
- Chemical equilibrium,
- Solutions and problems in physical chemistry

Part II: Inorganic chemistry (2h/w)
- Inorganic chemistry
- Chemical calculations
- Atomic structure
- Electronic configuration of atoms
- Periodic table and the general properties of representative elements
- Types of chemical bonds

Part III: Practical (4h/w)
- Introduction and safety in laboratories
- Determination of density of liquids
- Determination of viscosity of liquids
- Determination of surface tension of liquids
- Determination of empirical formula of an oxide
- Determination of hydrate
- Stoichiometric determination
- Determination of the molecular weight of volatile liquid
- Determination of the heat of formation of mgo
- Determination of heat of neutralization (strong acid and strong base)
- Determination of heat of neutralization (strong acid and weak base)
- Determination of heat of neutralization (weak acid and weak base)
- Revision

كود أو رقم المقرر : 101 ف
اسم المقرر: ضوء
محتويات المقرر:

Part I: (2h/w)
- Nature of light
- Refraction through lenses
- Optical instruments
- Dispersion
- Photometry

Part II: Practical (2h/w)
- Covex lenses
- Convex mirrors
- Liquid leses
- Triangular prism
- Jouly’s photometer

Part I: (2h/w)
- Charge and matter
- Coulomb’s law
- Electric field
- Electric field for a group of point
- Electric field of continuous charges
- Electric dipole
- Electric potential and applications
- Electric field flux and gauss’s law and its applications
- Condensers
- Electric current
- Dc circuits
- Dc network analysis
- Transient current

Part II: Practical (2h/w)
- Ohm’s law
- The relation between the filament’s current and the applied voltage
- The sensitivity of a galvanometer
- The current leakage
- Determination the resistance of a voltmeter
- The meter bridge and measuring a small resistance

- Reviewing of some basic concepts of functions
- Limits and the continuity
- Derivatives
- The mean value Theorem and curve sketching
- Integration
- Application of integration
- Inverse functions
- Exponential function
- Logarithmic function
- Inverse Trigonometric functions
- Techniques of Integrations

- Vectors
- Two dimensional forces acting at a point
- Moments and couple
- The plane force acting on a rigid body
- Fraction
- Work and kinetic energy
- Potential function

Polar and cartesian coordinates in the level systems
A straight line
Operations on the axes of coordinates
Pairs of lines
The circle
Cuttings cone
The general equation of 2nd degree in two variables

---

**Part I: Physical chemistry (1h/w)**

- Physical chemistry
- The phenomena of electrolysis
- Faraday's laws
- Electrical conductance
- Emf
- Electrode potential
- Chemical and electrical energy
- Cell reaction and electrochemical series
- Solid state
- Crystallographic systems

**Part II: Inorganic chemistry (1h/w)**

- The VSEPR model
- V.B. theory (hybridization of orbitals)
- Molecular geometry and resonance
- M.O. theory
- Oxidation- reduction reactions

**Part III: Practical (4h/w)**

- Introduction of acidic radicals
- Detection of dilute Hcl group
- Detection of H2SO4 group
- Detection of miscellaneous groups
- Scheme of general investigation of acidic radicals
- Introduction of basic radicals
- Detection of groups i, ii-a, and ii-b
- Detection of groups iii and iv
- Detection of groups v and vi
- Scheme of general investigation of basic radicals
Detection of acidic and basic radicals of unknown salts
Analysis of cationic radicals in a mixture

Introduction to organic chemistry
Nomenclature
Preparation and reactions of alkanes
Nomenclature
Preparation and reactions of alkenes
Nomenclature
Preparation and reactions of alkynes
Nomenclature
Preparation and reactions of alcohols
Nomenclature
Preparation and reactions of ethers
Nomenclature
Preparation and reactions of aldehydes and ketones
Nomenclature
Preparation and reactions of carboxylic acids
Nomenclature
Preparation and reactions of carboxylic acid derivatives
Nomenclature
Preparation and reactions of amines
Revision

Part I: (2h/w)
Temperature and thermometers
Heat estimation
Thermal expansion
Change of phase
Heat transfer
Kinetic theory of gases
Units and dimensions fundamental units
Derived units
Dimension theory and its applications
Scalar and vectors
Linear motion
Planer motion
Newton’s, second law
Simple harmonic motion
Simpsonent of inertia for some bodies
Simple pendulum
Hook’s law
- Elasticity modulii
- Relation between elasticity modulii
- Stress-strain curves
- Pressure
- Pascal’s rule
- Archimede’s rule
- Bernoulli’s equation
- Surface tension and Bernoulli’s equation
- Viscosity poiseuill’s formula
- Stokes law

**Part II: Practical (2h/w)**
- The Joul’s coefficient
- The specific heat of a solid using mixing method
- Searl’s method
- The latent heat and temperature of an amorphous material
- The Newton’s law for cooling
- The simple pendulum
- The Young’s modulus of a wire
- The Hook’s law
- The Stock’s law of viscosity
- The Poissel’s law of viscosity

Part I: (2h/w)
- Magnetic elements
- The Biot-Savart law
- Ampere’s law
- Applications of magnetic field's-magnetic field due to a current in a straight conductor
- Magnetic field of circular conductor
- Magnetic field of a solenoid
- Magnetic field of a toriod
- The force between two complete circuits
- Magnetic dipole
- Tangent and Helmoholtz galvanometers
- Charged particles in magnetic fields
- Orbits of charged particles in magnetic fields
- Applications on motion particles in magnetic fields
- Cyclotron
- Q/m of electrons
- Hall effect
- Mass spectrograph
- Motion of a conductor in a magnetic field
- Faraday law
- Self and mutual inductance
- Inductors connection

**Part II: Practical (2h/w)**
- The magnetic field distribution of a small magnet
- The horizontal component of the magnetic field of the earth,
- To compare the intensities of two magnets
- The Robson’s magnet
- The inverse square law in magnetism
- The circular coil

Polar coordinates and its applications
- Partial derivatives
- Multiple integrals
- Improper integrals
- Taylor and Maclaurin series

Sets theory
- Relations
- Mapping
- Some basic concepts of group theory
- Mathematical induction
- Partial fractions
- Matrices and linear equations
- Complex numbers

Kinematics of a particle (rectilinear motion)
- Simple harmonic motion
- Motion of a variable mass particle
- Motion in a resisting medium
- Projectiles motion
- Principle of virtual work
- Equilibrium stability

Types of common rocks
- Writing paragraph + topic sentence
- Countable and non-countable nouns
- Animal cell structure
- Punctuation
- The use and non-use of articles + using a Relvative clause
- Solar energy - Cohesion + signaling
- Subject verb agreement + Quit & Rather
- Lightining
Definition of differential equations and basic concepts
- First order differential equations
- Second order linear differential equations
- Systems of differential equations
- Laplace transformation
- Series solutions

Introduction on probability
- The sample space
- Events and type of events
- Diagram Venn
- The definition of probability
- Harmonic analysis
- Conditional probability and independence
- Law of total probability
- The theory of Bayesian and its applications
- Random variables (discrete and continuous)
- Probability mass functions
- Probability density function
- Mathematical expectation
- Variances and standard deviation
- Cumulative distribution function and its properties and how derived from the probability distributions
- Some probability distributions (discrete): binomial distribution
- Poisson distribution
- Geometric and hyper geometric distributions
- Continuous distributions: exponential distribution
- Regular distributions
- Gamma distribution
- Beta distribution negative binomials
- Normal distribution and standard normal distribution
- Probability generating function
- Moments generating function
- Characteristic function

Vector analysis
- Centroid
- Moment
- Products of inertia
- Fluid static
Part II: (2h/w)
- Fundamental concepts of thermodynamics
- Thermodynamic systems
- Thermodynamic equilibrium
- Equation of state
- Internal energy
- Work, heat
- Heat capacity and heat enthalpy and est.
- First law of thermodynamics
- Second law of thermodynamics
- Reversible and Kelvin temperature
- Entropy
- Combined first and second laws of thermodynamic
- Engines and heat pumps
- Third law of thermodynamics

Part II: Practical (2h/w)
- Determination of the thermal conductivity of wood by Lee’s method
- Verification of the Stefan’s law of radiation
- Mechanical equivalent of heat
- Determination of Stefan’s constant of radiation
- Determination of the thermoelectric force (EMF)
- Determination of the thermal conductivity of a rubber tube

Part I: (4h/w)
- Inductor-Capacitance-Series-parallel combination-Natural response of RL and RC circuits
- Step response of RL and RC circuits
- Natural and step response of parallel and series RLC circuits
- Induced Emf in a rotating coil
- Phase and phase difference
- Average value
- Root mean square value

The real number system
Countability
Properties of sequences of real numbers
Properties of infinite series
Tests for convergence of real series
Sequences and series of functions
- Resistance-capacitance-inductance in AC circuit
- Series connections: RC-RL-RLC square value
- Resistance-capacitance-inductance in AC circuit
- Series connections: RC-RL-RLC series circuits
- Parallel Ac Circuits
- Types of filters: low -pass and high -pass filters- band-pass and band-stop filters
- Power and corrections of power factor
- R-L-C resonance in series circuits
- R-L-C resonance in parallel circuits-quality factor
- AC bridges: Wheatstone-Owen-Maxwell-Robison
- Mutual inductance bridge
- Sharing bridge
- Mutual inductance bridge-She circuits
- Step response of RL and RC circuits-natural and step
- Response of parallel and series RLC circuits ring bridge
- Transient current in electric circuits
- Complex impedance
- Solutions of AC circuits

**Part II: Practical (4h/w)**

- Determination of the thermal conductivity of wood by Lee’s method
- Verification of the Stefan’s law of radiation
- Mechanical equivalent of heat
- Determination of Stefan’s constant of radiation
- Determination of the thermoelectric force (EMF)
- Determination of the thermal conductivity of a rubber tube

**Code or Number of the Resolution: 204**

**Subject:** Mechanical equivalent of heat

**Topics:** Identification of human rights and its international importance

**Code or Number of the Resolution: 205**

**Subject:** System of linear equations and matrices

**Topics:** Cartesian and parametric equation of line in space

**Code or Number of the Resolution:**

**Subject:** System of linear equations and matrices

**Topics:** Cartesian and parametric equation of plane in space
- Relation between lines
- Planes and spheres in space
- General theory of quadratic surface
- Sphere
- Ellipsoid
- Hyperboloid and parabolic
- Cylinder
- Cone
- Tangent plane of surfaces in space
- The general equation of 2\textsuperscript{nd} degree in 3 variable

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Part I: (1h/w)
- Introduction to OOP language
- Data type in OOP
- Writing a program and Variables in an OOP
- Flow control and more variables
- 3-functions and debugging
- Intro to OOP and classes
- Class members and more classes
- Events and using windows and controls and review

Part II: Practical (2h/w)
- GUI of the software and menus
- The first program
- Using controls in the language
- Built in functions
- Design functions
- Introduction to class and more class

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- Part I: (2h/w)
- Introduction
- The structure of atom
- Band theory of solids
- Intrinsic semiconductor
- The Doping of Semiconductors
- P- and N-Type Semiconductors
- P-N junction
- Light emitting diodes
- The Zener effect
- Some other diodes
- Rectification introduction and half wave rectifier
- Rectification full wave rectifier
- Filters capacitor filter
- Transistors construction and operation
- The common-emitter circuit
- The common-emitter amplifier
- The common-collector amplifier
- Transistor bias
- Crystal structure and crystal geometry
- Ceramic crystals
- Planar and linear density unit cell
- Crystal structure analysis

Part II: Practical (4h/w)
- P - n junctions (si diode)
- P - n junctions (Gr diode)
- P-n junctions (LED diode)
- P-n junctions (Zener diode)
- Half wave rectifier
- Full wave rectifier
- Bridge rectification
- Filters
- Young’s modulus by using bending rod
- Young's modulus by using Searl's method
- Shearing modulus by using Searl's method
- Shearing modulus by using torsional pendulum
- Forced oscillation

- Cathode ray
- Electromagnetic radiation
- Atomic models
- Atomic hydrogen spectra
- Bohr theory & hydrogen atom
- Summer field theory
- Fine structure
- Fine structure spectra of hydrogen like ions
- Spectra of alkali atom
- Schrodinger wave equation
- Simple one-electron atom model
- Photo electric effect
Part I: (2h/w)
  - Simple harmonic motion
  - Interference
  - Diffraction of light
  - Polarization of light

Part II: Practical (2h/w)
  - Determination of the wavelengths of a mercury lamp using a diffraction grating
  - Determination of the wavelength of a sodium lamp using Newton’s rings
  - Determination of the wavelength of a monochromatic light using Michelson interferometer
  - Specific rotation (Polarimeter)
  - Abbe’s refract meter
  - Microwave optics
  - Diffraction of laser

- Calculating: Liquids and Gases
- Reporting: The origins of life
- Describing: The Universe
- Predicting: The weather
- Experimenting: Electricity and magnetism
- Giving evidence: Smoking, Drugs, and Alcohol
- Cause and Effect: Color, Light, and Sound
- Comparing: The Elements
- Classifying: The Composition of Matter
Mathematical preliminaries and error analysis
Solutions of equations in one variable
Interpolation and polynomial approximation
Numerical differentiation and integration
Solutions of linear systems

Introduction to Rings
Integral Domains
Ideal and Factor Rings
Homomorphisms
Sentence Composition
The Basic Logical Operations
Truth values
Converse and Contrapositives
Logical Forms and Truth Tables
Boolean Algebra
Operations
Axioms for a Boolean Algebra
Subalgebra
Isomorphisms
Boolean algebra and propositional Logic

Algebraic of complex numbers
Complex functions and some mappings
Limits, continuity
Derivative and analytic functions with applications
Elementary functions (exponential, logarithmic, complex exponents)
Complex integration
Cauchy integral theorems
Liouville's theorem and morris theorem
Power series
Taylor series and laurent series
Classification of singularities
Residue theorem with applications to evaluate real integrals
Some additional topics such as conformal mapping
Joint probability density functions for discrete and continuous random variables
Marginal probability density functions for discrete and continuous random variables
Bivariate cumulative distribution functions
Marginal cumulative distribution functions
Conditional probability density functions for discrete and continuous random variables
Conditional cumulative distribution functions
The mean and variance for sum-product-quotient random variables
The covariance and correlation coefficient for discrete and continuous random variables
Conditional expectation and conditional variance for discrete and continuous random variables,
Joint moment generating function and joint moments (raw- about the means)
Application of Bivariate probability distribution function for discrete random variables as Trinomial distribution
Application of Bivariate probability distribution functions for continuous random variables as Bivariate normal distribution
Distribution of functions of normal variables
Distribution of functions of random variables

Introduction to computer evolution
Inter connection and Basics of PCI bus
Characteristics: Hierarchy and Cache memory
Principles, Cache design and Locality of reference
Static RAM and Dynamic RAM
Some Types of ROM, Magnetic disk
Basics of RAID
Optical memory and Magnetic disk
INPUT & OUTPUT
Interrupt
Driven I/O and DMA
I/O channels and processors and COMPUTER ARITHMETIC: Floating point representation and Arithmetic
INSTRUCTION SET
Organization of processors of registers
Instruction cycle
Instruction pipe lining and Pentium processor,
Characteristic – Large register cycle and Register optimization and Architecture
RISE VS CISE characteristic and pipe ling
الجزء الثاني: برمجة

- Introduction to linear programming problem (lpp)
- Graphical method for solving lpp
- Simplex method
- Special cases of simplex method
- Artificial variable technique
- Duality in linear programming
- Integer programming problem
- Parametric programming
- Revised simplex method

الجزء الأول: معادلات تفاضلية

- Existence and unique of solutions
- System of first order linear equations
- Series solutions of second order differential equations
- Basic stability theory
- Oscillation of second order equations
- Boundary value problems

الجزء الثاني: معادلات تفاضلية جزئية

- Basic concepts of partial differential equations.
- Linear partial differential equations of first order.
- Nonlinear partial differential equations of first order.
- Homogeneous linear partial differential equations with constant coefficients
- Nonhomogeneous linear partial differential equations with constant coefficients
- Linear partial differential equations of order two with variable coefficients
- Nonlinear partial differential equations of order two with variable coefficients

الجزء الثاني: تركيب بيانات

- Introduction to data structures
- Abstraction and algorithms
- Deal with string and text
- Linear list and its operations
- Linked lists
- Stacks and its applications
- Queues and its applications
- Sorting Algorithms
- Trees and Tree Traversal Algorithms
- Binary Search Trees
- Graph and matrix
- Graph and linked list
- Hash Tables and Hash Functions

- Absolute extremum
- Conditional extremum
- The variation of a functional and its properties
- An elementary problem in the calculus of variations Euler's equation
- Generalizations of the elementary problem of the calculus of variations
- Invariance of Euler's equation
- Field of extremals. Sufficient conditions for the extremum of a functional
- Conditional extremum
- Moving boundary problems
- Discontinuous problems (one sided variations)
- The Hamilton Jacobi theory (the variational principles of mechanics)
- Euler's finite difference method
- Ritz method
- Kantorovich method and Variational methods for finding eigenvalues and eigenfunctions

- Number systems and codes
- Logic gates
- Inverting logic gates
- Reduction logic gates
- Exclusive or and exclusive nor gates
- Arithmetic circuits
- Comparator
- Decoding
- Encoding
- Code converters
- Gray code
- Multiplexers and demultiplexers and flip – flops

- Gamma and Beta functions
- Legendre Polynomials
- Bessel Function
- Hermit Polynomials
Some review of probability theory and general concept of Stochastic Processes

Classification of Stochastic processes
Stationary Stochastic Processes
Definitions of Stationary of order n, Strictly stationary, Covariance stationary,
Auto-correlation and Cross-correlation; Spectral density functions- Examples
Bernoulli processes - Definitions of Bernoulli processes as an example of stochastic process-Random walk as an example of Bernoulli processes

Deducing the binomial process as the distribution of the number of successes in the first n- Bernoulli trials- Definition of the times at which the successes of a Bernoulli process occur- Relation between the times of successes and the number of successes in the first n- Bernoulli trials.

Discrete-time Markov chain Definitions and Examples -Higher transition probabilities- Determination of Higher transition probabilities

Classification of States and Chains-Stability of a Markov chain: Limiting Behaviour

Markov Processes with Discrete State Space: Poisson Process
Poisson Process and related Distributions
Generalizations of Poisson Process Champagne
Pure Birth, and Birth and Death processes

Markov Processes with Discrete State Space (Continuous time Markov chains)

The migration of birds (Reading)
Coral reefs (Reading)
Smuggling of Nuclear materials (Reading)
Chemical Reactions (Reading)
Enquiry (Reading)
Argument (Reading)
Roots (Vocabulary)
Prefixes (Vocabulary)
Suffix (Vocabulary)
Relative Clauses (Grammar)
Adjectives and Adverbs (Grammar)
Writing A summary (Writing)
Summarizing process (Writing)
The summary Report (Writing)
Cause and Effect Research Paper (Writing)
The fourth section: Numerical and Computer Science

Course Code: 406
Course Name: Special Functions

Section One: Special Functions

- Laguerre polynomials
- Chebyshev polynomials
- Gegenbauer and Jacobi polynomials
- Hypergeometric functions
- Other special functions

Section Two: Analysis

- Metric spaces.
- Complete metric spaces
- Contraction mapping. The fixed point theorem.
- Completion of metric spaces
- Normed spaces, Banach spaces.

- Linear operator. Inverse operator
- Bounded and continuous linear operator
- Linear functional
- Normed spaces of operators. Dual space
- Hahn-Banach Theorem.

Course Code: 420
Course Name: Topology

Section One: Topology

- Topology of the line and plane
- Topological spaces
- Bases and sub bases
- Continuity and topological equivalence
- Topological properties
- Countability
- Separation axioms

Course Code: 421
Course Name: Inference and Statistics

Section One: Inference

- Introduction in statistical inference: sampling distribution for statistical population and means sample.
- Central limits theorem for sample proportion
- Sampling distribution of two independent statistical populations, the difference between two means and difference between two proportions
• Estimation statistical point estimation by the method of moments and maximum likelihood.
• Confidence intervals for mean, variance proportion, difference between means, difference between proportion, ratios of two variances
• Tests of statistical hypotheses, test concerning mean, difference between means, and standard mean population, two standard mean population.
• Test concerning proportions, concerning variances and ratios two variances
• Test $x^2$ chi- square, chi-square of fit test, independent, homogeneous.
• Non-parametric test: sign test of one sample, pair of sample, sign ranks test, rank sums test, test of Kruskal-Wallis
• Analysis of variance: one and two vectors

الجزء الثانى: حزم احصائية

• Introduction about statistical package
• Data handing
• Dealing with New Variables
• Compute the estimator Statistic value
• Correlations analysis
• Regression analysis
• Multivariate Statistics(confidence intervals)
• Multivariate Statistics(hypotheses)
• Non-parametric Testing
• Solve open problems.

الجزء الثاني: حزم وقواعد البيانات

• Introduction to artificial intelligent
• intelligence agents
• Solving problems by searching
• Introduction to statistical learning theory
• Fuzzy logic

الجزء الثاني: تحليل نظم وقواعد البيانات

• Overview of Database Management System
• Entity and Relationship Model
• Relational Model
• The roles of Database Design
• Introduction of system analysis
• System characteristics and classifications
• System Development Life Cycle
• Project Planning and System Analysis Tools
Numerical solutions of ordinary differential equations
- Euler's method
- Heun's Method
- Taylor series methods
- Runge kutta methods
- Predictor-corrector methods
- Numerical solution of systems of ordinary differential equations
- Numerical solutions of Boundary value problems
- Linear shooting method
- Finite difference method
- Numerical solutions of partial differential equations
- Hyperbolic equations
- parabolic equations
- Elliptic equations

Non-linear programming: Single variable Optimization
Non-linear programming: Multivariable Optimization without constrains (Local and global maxima, Gradient vector and Hessian matrix and The method of steepest ascent)
Non-linear programming: Multivariable Optimization with constrains: (Standard forms, Lagrange multipliers and Kuhn-Tucker conditions)
Network analysis (Networks, Shortest-route problems and Maximal-flow problems)
Quadratic programming, Geometric programming

Mathematical Preliminaries
Automata ( DFAs and NFAs)
Regular Languages and Grammars
Properties of Regular Languages
Context-Free Languages
Simplification of Context-Free Grammars and Normal Forms
Properties of Context-Free Languages, Computability and Computational Complexity

- Counting and binomial coefficients
- Sequences (special numbers)
- Generating functions
- Recurrence relations
- The inclusion-exclusion principle
- Pigeonhole principle with ramsey numbers

الجزء الثاني: مبادئ تصميم المؤلفات

- Introduction
- Lexical analysis
- Syntax analysis
- Syntax-directed translation
- Intermediate code generation
- Review

الجزء الثاني: لغات تصويرية

- Introduction
- NN
- Clustering
- Feature selection

الجزء الثاني: قواعد بيانات

- Query optimizer
- Security and recovery
- Physical database
- OODBMS
- Distributed and parallel DBMS
- Data Mining and DBMS
- Recent challenges in DBMS

- Introduction to an essay or research
- Choosing the subject of the essay or research
- Main topics of the essay or research
- Collecting materials
- Revisions of the collected materials
- Collection of references in the essay
- Writing the essay
- Revisions of the written materials
- Editing of the materials and an overall revision for presentation

- Meteorology
- Physics, Chemistry, Matter, Mass and Molecules
- For & Against Essays
- Opinion Essays
- Providing solution to problems Essays
- Assessing good and pad points
- Gerund and infinitive
- Noun Clauses
- Conjunctions and prepositions
- Linking ideas
- Structure and cohesion

- Mathematics package
- One of the Programming Language
- Web design
- Application software