DAV UNIVERSITY JALANDHAR

DAV University, Jalandhar

Department of Chemistry

Proposed Syllabus for

B.Sc. (Hons.) Chemistry

(Semester I – VI)

2013

Scheme of Courses B.Sc.Program ID- 5

DAV UNIVERSITY JALANDHAR

Semester-1

S No.	Paper Code	Course Title	L	T	P	C	% Weightage				E
							A	B	C	D	
1	CHE101	Organic Chemistry-I	4	1	0	4	25	25	25	25	100
2	CHE102	Inorganic Chemistry-I	4	1	0	4	25	25	25	25	100
3	CHE103	Physical Chemistry-I	4	1	0	4	25	25	25	25	100
4	MTH160	Mathematics for chemists-I	4	0	0	4	25	25	25	25	100
5	PHY153	Optics and Lasers	4	0	0	4	25	25	25	25	100
6	EVS102	Environment education	3	0	0	2	25	25	25	25	50
7	SGS102	General Knowledge and current affairs	2	0	0	2	25	25	25	25	50
8	CHE104	Organic Chemistry Lab-I	0	0	3	2	0	0	0	0	50
9	PHY154	Optics Lab	0	0	4	2	0	0	0	0	50
			25	**3**	**6**	**28**					**700**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY JALANDHAR

Instruction for candidates (Theory Paper)

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed.

* Wherever specific instructions are required these are given at the starting of that particular subject/paper

DAV UNIVERSITY JALANDHAR

Instruction for candidates (Theory Paper)

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed.

* Wherever specific instructions are required these are given at the starting of that particular subject/paper

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Marks
4	1	0	4	100	40

Title: ORGANIC CHEMISTRY

Course Code: CHE101

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Organic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Organic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Fundamentals of Organic Chemistry (10Hrs)

Organic Compounds: Atomic orbitals, Hybridization, Shapes of molecules (Methane, Ethane, Ethene, and Ethylene), Influence of hybridization on bond properties. Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, van der Waals interactions, inclusion compounds, clatherates, change transfer complexes.

Resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen boding. Curved arrow notation, drawing electron movements with arrows, half-headed and double headed arrows, hemolytic and Heterolytic bond breaking. Types of reagents-electrophiles and nucleophiles.

Electronic Displacement effects: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strength. Homolytic and Heterolytic fission with suitable examples. Electrophiles and

Nucleophiles; Nucleophlicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes.

Types of organic reactions and their mechanism: Addition, Elimination and Substitution reactions with suitable examples, energy considerations.

PART B

Chemistry of Hydrocarbon (5Hrs)

Alkanes

Formation of alkanes, Physical and Chemical properties of alkanes, Wurtz Reaction, Wurtz-Fittig Reactions, Free radical substitutions: Halogenation - relative reactivity and selectivity.

Cycloalkanes and Conformational Analysis (5Hrs)

Cycloalkanes, nomenclature, methods of formation, their types and relative stability, Baeyer strain theory, Conformational analysis of alkanes, Energy diagrams of cyclohexane: Chair, Boat and Twist boat forms; Relative stability with energy diagrams, the case of cyclopropane ring: Banana bond .

Alkenes, cycloalkenes and Dienes (5Hrs)

Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations. Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/ Anti Markownikoff addition), hydroboration-oxidation, ozonolysis, reduction (catalytic and chemical), syn and anti hydroxylation (oxidation), polymerization of alkenes Industrial applications of ethylene and propene.

Methods of formation, conformations and chemical reactions of cycloalkenes.

Nomenclature, classification of dienes, structure of allenes, butadienes, methods of formation, polymerization, 1, 2 and 1, 4 additions.

PART C

Alkenes and Alkynes (6Hrs)

Diels-Alder reaction; Substitution at Allylic and vinylic position, Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions, hydroboration-oxidation, metal-ammonia reductions Alkylation of terminal alkynes, oxidation and polymerization.

Aromatic Hydrocarbons (9Hrs)

Nomenclature of benzene derivatives. The aryl group. Aromatic nucleus and side chain. Structure of benzene: Molecular formula and Kekule structure. Stability and carbon-carbon bond

lengths of benzene, resonance structure, MO picture. Aromaticity: Huckel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Anti-aromatic and Non-aromatic compounds

Electrophilic aromatic substitution: π and σ complexes, halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Energy profile diagrams, Directing effects of the groups. Side chain reactions of benzene derivatives, Birch reduction.

PART D

Stereochemistry of Organic compounds (10Hrs)

Fischer, Saw-horse and Newman projection formulae and their interconversion, Chirality-optical activity, enantiomers and diasteroisomerism involving one and two chiral centres. Configuration: D/L, erythrose, threose and R/S nomenclatures. Geometrical isomerism and E/Z nomenclatures. Conformations of n-butane, difference between configuration and conformation.

Suggested Books:

1. Morrison, R.N.and Boyd,R.N. *Organic Chemistry*. 7th edition, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2011.

2. Finar, I.L.*Organic Chemistry*(Volume 1). Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

3. Eliel, E.L. and Wilen,S.H. *Stereochemistry of Organic Compounds*. London:Wiley 1994.

4. Solomons,*Fundamentals of Organic Chemistry*. John Wiley, 1996.

5. Carey, F.A. *Organic Chemistry (4th Ed.).*McGraw Hill, Inc.

6. Wade Jr., L.G. *Organic Chemistry(5th Ed.).*Prentice Hall.

This syllabus is as per national syllabus given by UGC and it covers 20% more syllabus than UGC model curriculum as per the requirement of honors course.

DAV UNIVERSITY JALANDHAR

Course Title: Inorganic Chemistry-I

Course Code: CHE102

Time: 04 Hours

L	T	P	Credits	Marks	Pass marks
4	1	0	4	100	40

Course Objectives:

This course is intended to learn the basic concepts of Inorganic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus aregrouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Inorganic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Atomic Structure **(14 Hrs)**

Wave mechanical model of Hydrogen atom, The de Broglie relationship, The uncertainty principle, Schrodinger wave equation and its derivation, Significance of Ψ and Ψ^2, Quantum numbers, Normal and orthogonal wave functions, Radial and angular probability distribution curves, Pauli's exclusion principle, Hund's rule of maximum multiplicity, Aufbau principle and its limitations. Concept of extra stability of half and completely filled electronic configuration, Electronic configuration of elements, Penetration and shielding (The Slater's rules).

Periodic table and its properties

The origin and distribution of the elements, The structure of the periodic table, Atomic parameters and their variation in periodic table, Electronegativity and various scales, Variation of electronegativity with partial charges and hybridization.

PART B

Bonding in Ionic Compounds (15 Hrs)

Properties of ionic substances, Occurrence of ionic bonding, The radius ratio rules, Efficiency of packing, Hexagonal close packing, Cubic close packing, Structures of different crystal lattices, Sodium chloride, Cesium chloride, Wurtzite, Zinc blende, Fluorite, Rutile, Cristobalite, Nickel arsenide, Pervoskite, Calcium carbide, The calcite and aragonite structures.

Lattice energy, Born-Haber cycle, The calculations of the lattice energy on the basis of Born-Lande equation, Covalent character in predominantly ionic compounds, Imperfections of crystals, Conductivity in ionic solids, Band theory, Intrinsic and photo excited semiconductors, Transistors, High temperature superconductors, Polarizing power and polarizabilty of ions, Fajan's rule.

PART C

The Covalent Bond (15 Hrs)

The Lewis theory, Valence bond theory - A mathematical approach, Resonance, Valence Shell Electron Pair Repulsion Model (VSEPR theory), Prediction of structures and variation of bond angles on the basis of VSEPR theory, Shortcomings of VSEPR theory.

Concept of hybridization, Rules for obtaining hybrid orbitals, Extent of d-orbital participation in molecular bonding (SO_2, PCl_5, SO_3), Molecular orbital theory (LCAO method), Symmetry of molecular orbitals, Applications of MOT to homo- and hetero-nuclear diatomic molecules, Molecular orbital energy level diagrams (Be_2, N_2, O_2, F_2, LiH, NO, CO, HCl, NO_2, BeH_2, NO_2^-), Molecular orbital treatment involving delocalized π bonding (CO_3^{2-}, NO_3^-, SO_3, NO_2^-, N_3^-).

PART D

Acids and Bases (5 Hrs)

Bronsted-Lowry concept of acid-base reaction, solvated proton, relative strength of acids, types of acid-base reactions, levelling solvents,Lewis acid-base concept, Classification of Lewis acids, Hard and Soft Acids and Bases (HSAB) Application of HSAB principle.

Suggested Books:

1. Shriver, D.F.C. Atkins, P.W. and. Langford, C.H. *Inorganic Chemistry*. ELBS: Oxford, 1991.

2. Huheey, J.E., Keiter, E.A. and Keiter,R.L. *Inorganic Chemistry*, (*4th Ed*,).Singapore: Pearson Education, 1999.

3. Lee, J.D. *Concise Inorganic Chemistry*, ELBS: Oxford, 1994.

This syllabus has been designed as per national syllabus suggested by UGC and cover 15% extra syllabus as per requisite of honors degree.

DAV UNIVERSITY JALANDHAR

Course Title: Physical Chemistry I

Course Code: CHE103

Time: 04 Hours

L	T	P	Credits	Marks	Pass Marks
4	1	0	4	100	40

Course Objectives:

This course is intended to learn the basic concepts of Physical Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of physical chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

I. Gaseous States **(15 Hrs)**

Postulates of kinetic theory of gases, deviation from ideal behavior, Vander Waal's equation of state.

Critical Phenomena: PV isotherms of real gases, continuity of states, the isotherms of Vander Waal's equation, relationship between critical constants and Vander Waals constants, the law of corresponding states, reduced equation of state.

Molecular Velocities: Root mean square, average and most probable velocities. Qualitative discussions of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter, Liquefaction of gases

PART B

Liquid State **(10 Hrs)**

Kinetic molecular description, Intermolecular forces in liquids, Vapour pressure and its determination, surface tension and determination of surface tension using capillary rise method

and drop formation method, viscosity and measurement of viscosity –Ostwald method, refractivity and its measurement, Optical activity and its measurement using polarimeter.

PART C

The First Law of Thermodynamics (7 Hrs)

Thermodynamic terms and basic concepts, Intensive and extensive properties, State functions and differentials, partial derivative relations, thermodynamic processes, reversibility, irreversibility, Nature of heat and work, Conservation of energy, various statements of first law, Manipulations of first law, internal energy (U) and enthalpy (H). Work done in reversible isothermal expansion, Molar heat capacity at constant pressure Cp and at constant volume CV, relation between Cp and Cv, work of adiabatic expansion, Joule Thomson effect.

Thermochemistry (5Hrs)

The reaction enthalpy, standard enthalpies, Hess's law and reaction enthalpies, Kirchhoff's equation, Relation between H and U for reactions, calorimetric measurements, varieties of enthalpy changes.

PART D

The Second Law of Thermodynamics (15 Hrs)

Spontaneous change, Carnot Cycle, conclusions from Carnot cycle, efficiency of heat engines, second law of thermodynamics, entropy, entropy as a state function, clausius inequality, entropy as criterion of spontaneity, natural processes, different types of entropy changes under isothermal and non-isothermal conditions, entropy change in irreversible processes.

Helmholtz function (A), Gibbs function (G), standard molar free energy changes, Maxwell relations, dependence of free energy functions on temperature and pressure, total differential equations, Gibbs Helmholtz equations, thermodynamic criteria for spontaneity, Heat capacity at low temperature, Nernst heat theorem, third law of thermodynamics, third law entropies

Suggested books:

1. Atkins, P.W. *Physical Chemistry(8th Ed.).* Oxford University Press, 2006 (Indian Print).
2. Engel, T. and Reid, P. *Physical Chemistry(1st Ed.).* Pearson Education, 2006.
3. Castellan, G. W. *Physical Chemistry (3rd Ed.).* Addison Wisley/Narosa, 1985. (Indian Print)
4. Barrow, G. M.*Physical Chemistry, (6th Ed.).* New York: McGraw Hill, 1996.

5. Silbey, R. J. Albert, R. A. and Bawendi, M.G. *Physical Chemistry, (4th Ed.).* New York: John Wiley, 2005.

This syllabus has been designed as per national syllabus suggested by UGC and covers 10% extra syllabus as per requisite of honors degree.

DAV UNIVERSITY JALANDHAR

Course Title: Mathematics for Chemists-I
Course Code: MTH 160
Time: 04 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course familiarizes the students with trigonometry, permutations and combinations, the theory of matrices which are used in solving equations in mechanics and other streams used in Mathematics, Physics etc. The objective is to provide basic understanding of the geometry of two and three dimensions.

PART A **10 hours**

Trigonometry:

T- Ratios, addition and subtraction formulae, multiple angles, sub-multiple angles, trigonometric equations, inverse trigonometrical functions (proofs of articles are not required).

PART B **10 hours**

Algebra: Fundamental principle of counting, Permutation and Combination with simple applications. Principle of mathematical induction, statement of Binomial Theorem and its applications.

PART C **10 hours**

Determinants and Matrices:

Introduction to matrix, Different kinds of matrices, Addition, Multiplication, Symmetric and Skew symmetric matrix, Transpose of matrix. Determinant of matrix, properties of determinant, product of two determinant of third order. Adjoint and Inverse of matrix, Rank of matrices, Condition of Consistency of system of linear equations, Eigen vectors and Eigen values using matrices, Cayley's Hamilton Theorem (without proof).

PART D **(12 + 8) hours**

Co-ordinate Geometry:

Polar & Cartesian co-ordinates in plane, different forms of straight lines. Angle between two Straight lines. Conditions of parallelism and perpendicularity. Standard equations of circle, Parabola, ellipse and Hyperbola (without proof) and simple problems.

Solid Geometry: Sphere, Cone, Cylinder

Reference Books:

1. Mathematics, *A Text book for Class XI and XII (Parts I & II*). New Delhi: NCERT 2003.
2. Jain, R K, and K Iyengar S R.*Advanced Engineering Mathematics*, New Delhi: Narosa Publishing House, 2003.
3. Thomas, George B. and Finney Ross L. *Calculus and Analytic Geometry*. New Delhi Addison Wesley, 1995
4. Narayan, Shanti. *A text book of Matrices*. New Delhi: S Chand & co Ltd, 2004.

DAV UNIVERSITY JALANDHAR

Course Title: Optics and Lasers

Course Code: PHY153

Time: 04 Hours

L	T	P	Credits	Marks
4	0	0	4	100

AIM: The aim and objective of the course on **Optics and Lasers** for the students of B.Sc. (Hons) Chemistry, Mathematics, Microbiology is to enable them to understand the different phenomenon exhibited by the light as well as the basics of the laser light.

PART A

INTERFERENCE **(12)**

Young's double slit experiment, Coherent Source, Theory of interference fringes, Types of interference, Fresnel's biprism, thickness of thin transparent sheet, Interference in thin films, Newton's rings and their application, Michelson Interferometer, Application of thin film interference; Anti reflection coatings; dielectric mirrors; interference filters; Holography.

PART B

DIFFRACTION **(12)**

Difference between Fresnel and Franunhoffer diffraction, Franunhoffer diffraction at a single slit and its discussion, Fraunhoffer diffraction at double slit, missing orders in a double slit, Diffraction of N slits and its discussion, Diffraction grating, Missing orders, dispersive power, Rayleigh Criterion for resolving power, resolving power of a diffraction grating.

PART C

POLARIZATION **(11)**

Polarized light and its production; polarizers and analyzers; anisotropic crystals;Polarization by transmission and reflection, Malus Law, Brewster's Law, Polarization by refraction, anisotropic crystals, Theory of double refraction, Elliptically and circularly polarized light, Quarter wave and half wave plates, Production and detection of polarized light, Optical activity, specific rotation. Half shade polarimeter; LCD's.

PART D

LASERS **(10)**

Attenuation of light in an optical medium; thermal equilibrium; interaction of light with matter; Einstein relations; light amplification; population inversion; active medium, pumping; metastable

states; principle pumping schemes; optical resonant cavity; axial modes; gain curve and laser operating frequencies, transverse modes; types of lasers; Qswitching; laser beam characteristics and applications.

Reference Books:

1. Subramanayam, N.,Lal, B. and Avadhamulu; M. N. *Textbook of Optics.* New Delhi: S. Chand & Company, 2006.
2. F.A. Jenkins, H.E. White, *Fundamentals of Optics.*USA: McGrawHill Publication,
3. Ghatak,A. *Optics.* New Delhi:Tata McGraw Hill Publication, 2008.

DAV UNIVERSITY JALANDHAR

Course Title: Environment Education

Paper Code: EVS102

Time: 03 Hours

L	T	P	Credits	Marks
3	0	0	2	50

Course Objective: This course aims at understanding the students in aspects of environmental problems, its potential impacts on global ecosystem and its inhabitants, solutions for these problems as well as environmental ethics which they should adopt to attain sustainable development.

UNIT 1

The multidisciplinary nature of environmental studies (2 Hours)

Definition, scope and importance, Need for public awareness

Natural Resources: Renewable and non-renewable resources: (8 Hours)

Natural resources and associated problems.

(a) **Forest resources:** Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

(b) **Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

(c) **Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

(d) **Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

(e) **Energy resources:** Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

(f) **Land resources:** Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Ecosystem: (4 Hours)

- Concept of an ecosystem

- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Unit 2

Biodiversity and its conservation **4 Hours**

- Introduction – Definition: Genetic, Species and Ecosystem Diversity
- Bio-geographical classification of India
- Value of biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, global and national efforts.
- Genetically modified crops
- Cartagena Protocol
- Biodiversity Act

DAV UNIVERSITY JALANDHAR

Environmental Pollution **8Hours**

- Definition, causes, effects and control measures of:
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear pollution
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

Indoor Pollution: **2 Hours**

- Practical tips on how to save the self from self-inflicted pollution.
- Basics of toxicity.
- Problems of lifestyle based diseases.
- Solutions needed for safety.

Unit 3

Social Issues and the Environment **7 Hours**

- Population growth, variation among nations, Population explosion – Family Welfare Programmes.
- Environment and human health,
- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.

- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environmental Laws: The Environment Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981; The Water (Prevention and control of Pollution) Act 1974; The Wildlife Protection Act, 1972; Forest Conservation Act, 1980.
- Issues involved in enforcement of environmental legislation
- Public Awareness

Unit 4

Human Population and Environment5 Hours

- Population Growth and Variations among Nations
- Population Explosion
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

Global environmental issues **5 Hours**

- Stockholm Conference
- Brundtland Commission
- Montreal Protocol
- Kyoto protocol
- Earth Summit
- World Summit

Field Work **5 Hours**

- Visit to a local area to document environmental assets river/ forest/ grassland/hill/mountain
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-Pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

References:

1. Botkin, D.B. and Kodler, E.A.*Environmental Studies: The Earth as a living planet.*New York: John Wiley and Sons Inc., 2000.
2. De, A.K. *Environmental Chemistry*. New Delhi: Wiley Eastern Ltd., 1990.
3. Odum, E.P.*Basic Ecology*. Japan:Halt Saundurs, International Edition, 1983.
4. Sharma, P.D.*Ecology and Environment*. Meerut.:Rastogi Publications, 2004.
5. Singh, J.S., Singh, S.P. and Gupta, S.R. *Ecology, Environment and Resource Conservation*. New Delhi: Anamaya Publishers, 2006.

This syllabus has been designed as per national syllabus suggested by UGC and cover 20% extra syllabus as per requisite of honour degree.

DAV UNIVERSITY JALANDHAR

Course Title: General Knowledge and Current Affairs
Course Code: SGS-102

L	T	P	Credits	Marks
2	0	0	2	50

Course Objectives

The study of General Knowledge and Current Affairs has become even more important today. It is not only a major constituent of most competitive examinations but also aids in acquiring general awareness.

The objectives of this course are:

- To introduce students with the course and contents of various competitive examinations
- To prepare a foundation for appearing in various competitive examinations
- To sensitize the students about the current issues and events of national and international importance
- To provide opportunity to the students to study inter disciplinary subjects like Geography, Science, Economy, Polity, History, International Relations etc.

Learning Outcomes:

- Students would get an opportunity to aspire, plan and prepare for various competitive examinations in advance.
- It would polish their personalities and sharpen the skills of debates, group discussions, communication, interview etc.
- Students would acquire general awareness of National and International Events.

Unit — A

General Geography
World Geography:

The Universe, The Solar System, The Earth, Atmosphere, The World we live in, Countries rich in Minerals, Wonders of the World, Biggest and Smallest. **3 hours**

Indian Geography:

Location, Area and Dimensions, Physical Presence, Indian States and Union Territories, Important sites and Monuments, Largest-Longest and Highest in India. **3 hours**

General History

Glimpses of India History, Ancient Indian, Medieval India, Modern India, Various Phases of Indian National Movement, Prominent Personalities. Glimpses of Punjab history with special reference to period of Sikh Gurus. **3 hours**

Glimpses of World History
Important Events of World History, Revolutions and Wars of Independence, Political Philosophies like Nazism, Fascism, Communism, Capitalism, Liberalism etc. **3 hours**

Unit — B

General Polity **3 hours**

World Politics – Major Actors and their political relations,UNO and other organizations viz: WTO, EU, SAARC,ASEAN, BRICS, WTO, OIC, OAU, OPEC, GCC etc.

Indian Polity : Constitution of India : **3 hours**
Important Provisions, Basic Structure, Union Government, Union Legislature and Executive, State Government: State Legislature and Executive, Indian Judiciary, The Election Commission, Panachayati Raj System, RTI etc.

General Economy :
The process of liberalization, privatization, globalization and Major World Issues. Indian Economy, Indian Financial System, Major Economic Issues, Economic Terminology. **3 hours**

Unit — C

General Science :
General appreciation and understandings of science including the matters of everyday observation and experience. Inventions and Discoveries. **3 hours**

Sports and Recreation : **3 hours**
The World of Sports and recreation. Who's Who is sports, Major Events, Awards and Honours. Famous personalities, Festivals. Arts and Artists.

Current Affairs :
National and International Issues and Events in News. Governments Schemes and Policy Decisions. **3 hours**

India and Neighbours:
Current phase relations with China, Pakistan, Bangladesh, Nepal, Sri Lanka and Afghanistan **3 hours**

Unit — D

Miscellaneous Information
Who is who **2 hours**
Books and Authors, Persons in News, Awards and Honours, Abbreviations and Sports

Total: 35 Hours

Reference Books:

1. Aggarwal,R. S.*Advance Objective General Knowledge*, S. Chand Publisher (2013)
2. Sen,S. *Concise General Knowledge Manual 2013*, Unique Publishers,2013
3. Verma, R P. *Encyclopedia of General Knowledge and General Awareness,* Penguin Books Ltd (2010)
4. Thorpe, Edgar. And Thorpe, Showick.*General Knowledge Manual 2013-14*, the Pearson, Delhi.
5. Mohanty, Muktikanta.*General Knowledge Manual 2013-14*, Macmillan Publishers India Ltd., Delhi.
6. India 2013, *Government of India (Ministry of Information Broadcasting*), Publication Division, 2013.
7. Methew, Mammen.*Manorama Year Book 2013-14*, Malayalam Manorama Publishers, Kottayam, 2013.
8. *Spectrum's Handbook of General Studies – 2013-14*, Spectrum Books (P) Ltd., New Delhi
9. *Unique Quintessence of General Studies – 2013-14*, Unique Publishers, New Delhi.

Current Affairs

Magazines
Economic and Political Weekly, Yojna, the Week, India Today, Frontline, Spectrum.
Competition Success Review, Competition Master, Civil Services Chronicle, Current Affairs, World Atlas Book

Newspapersthe Hindu, Times of India, the Hindustan Times, the Tribune

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass marks
0	0	3	2	50	20

Course Title: Organic Chemistry Lab -I

Course Code: CHE104

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Organic Chemistry Laboratory. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand the basic objective of experiments in organic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

1. Calibration of Thermometer

80-82^{o} (Naphthalene), 113-114^{o} (acetanilide).

132.5-133^{o} (Urea), 100^{o} (distilled Water)

2. Determination of melting point

Naphthalene 80-82^{o}, Benzoic acid 121.5-122^{o}

Urea, 132.5-133^{o}, Succinic acid 184-185^{o}

Cinnamic acid 132.5-133^{o}, Salicylic acid 157-5-158^{o}

Acetanilide 113-5-114^{o}, m-Dinitrobenzene 90^{o}

P-Dichlorobenzene 52^{o}. Aspirin 135^{o}.

3. Determination of boiling points

Ethanol 78^{o}, Cyclohexane 81.4^{o}, Toluene 110.6^{o}, Benzene 80^{o}.

4. Mixed melting point determination

Urea-Cinnamic acid mixture of various compositions (1:4, 1:1, 4:1)

5. Distillation

Simple distillation of ethanol-water mixture using water condenser,

Distillation of nitrobenzene and aniline using air condenser.

6. Crystallization

Concept of induction of crystallization

Phthalic acid from hot water (using fluted filter paper and stemless funnel), Acetanilide from boiling water,

Naphthalene from ethanol,

Benzoic acid from water.

7. Decolorisation and crystallization using charcoal

Decolorisation of brown sugar (sucrose) with animal charcoal using gravity filtration.

Crystallization and Decolorisation of impure naphthalene (100g of naphthalene mixed with 0.3g of Congo Red using 1g decolorising carbon) from ethanol.

8. Sublimation (Simple and Vacuum)

Camphor, Naphthalene, Phthalic acid and Succinic acid.

9. Extraction: the separatory funnel, drying agent:

Isolation of caffeine from tea leaves

10. Steam distillation

Purification of aniline/nitrobenzene by steam distillation.

Suggested Books:

1. Vogel A.I., Tatchell A.R., Furnis B.S., Hannaford A.J. and Smith, P.W.G.,*Vogel's Text Book of Practical Organic Chemistry (5th Edn.).*Oxford: ELBS, 1989.

2. Pavia D.L., Lampanana G.M., Kriz G.S. Jr., *Introduction to Organic Laboratory Techniques*, (*3rd Edn.).* Thomson Brooks/Cole, 2005.

3. Mann F.G., Saunders. P.C., *Practical Organic Chemistry*. Green & Co. Ltd., London, 1978.

4. Svehla, G., *Vogel's Qualitative Inorganic Analysis (revised)(7thEd.).* Orient Longman, 1996.

5. Bassett, J., Denney, R.C., Jeffery, G.H., Mendham, J., *Vogel's Textbook of Quantitative Inorganic Analysis (revised)(4th ed.).* Orient Longman, 1978.

DAV UNIVERSITY JALANDHAR

Course Title: Optics Lab

Course Code: PHY 154

L	T	P	Credits	Marks	Pass marks
0	0	4	2	50	20

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results

List of Experiments: Students are expected to perform at least eight experiments out of following list.

1. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
2. To determine the Dispersive Power of the Material of a given Prism using Mercury Light.
3. To determine the Resolving Power of a Prism.
4. To determine wavelength of sodium light using Fresnel Biprism.
5. To determine wavelength of sodium light using Newton's Rings.
6. To determine the Thickness of a Thin Paper by measuring the Width of the Interference Fringes produced by a Wedge Shaped Film.
7. To determination Wavelength of Sodium Light using Michelson's Interferometer.
8. To determine the wavelength of Laser light using Diffraction of Single Slit.
9. To determine the wavelength of (1) Sodium and (2) Mercury Light using Plane Diffraction Grating.
10. To determine the Dispersive Power of a Plane Diffraction Grating.
11. To determine the Resolving Power of a Plane Diffraction Grating.
12. To determine the (1) Wavelength and (2) Angular Spread of HeNe Laser using Plane Diffraction Grating.

13. To study the wavelength of spectral lines of sodium light using plane transmission grating.
14. To study the specific rotation of sugar solution Laurents half shade polarimeter method
15. To study the numerical aperture and propagation losses using HeNe laser Optical fibre set up.
16. To compare the focal length of two lenses by Nodal slide method.

DAV UNIVERSITY JALANDHAR

Scheme of Courses B.Sc.
B.Sc. (Hons.) Chemistry (Semester 2)

S No.	Paper	Course Title	L	T	P	C	% Weightage	E

DAV UNIVERSITY JALANDHAR

							A	B	C	D	
1	CHE105	Organic Chemistry-II	4	1	0	4	25	25	25	25	100
2	CHE106	Inorganic Chemistry-II	4	1	0	4	25	25	25	25	100
3	CHE107	Physical Chemistry-II	4	1	0	4	25	25	25	25	100
4	EVS103	Road safety and legal awareness	2	0	0	2	25	25	25	25	50
5	PHY155	Modern Physics	4	0	0	4	25	25	25	25	100
6	ENG151	Basic Communication Skills	4	0	0	3	25	25	25	25	75
7	SGS101	Human Values and Ethics	2	0	0	2	25	25	25	25	50
8	CHE108	Inorganic Chemistry Lab-I	0	0	3	2	0	0	0	0	50
9	PHY156	Modern Physics Lab	0	0	4	2	0	0	0	0	50
10	ENG152	Basic Communication Skills Lab	0	0	2	1	0	0	0	0	25
			24	**3**	**9**	**28**					**700**

A:Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test

C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY JALANDHAR

Course Title: Organic Chemistry-II (Functional Groups)

Course Code: CHE105

Time: 04 Hours

L	T	P	Credits	Marks	Pass marks
4	1	0	4	100	40

Course Objectives:

This course is intended to learn the basic concepts of Organic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Organic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Alkyl and Aryl Halides (8 Hrs)

Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides, SN2 and SN1 reactions with energy profile diagrams. Polyhalogen compounds: chloroform, carbon tetrachloride. Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs. allyl, vinyl and aryl halides. Synthesis and uses of DDT and BHC.

Alcohols (6 Hrs)

Classification and nomenclature. Monohydric alcohol - nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols.

Dihydric alcohols - nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage and pinacol-pinacolone rearrangement.

Trihydirc alcohols - nomenclature and methods of formation, chemical reactions of glycerol.

PART B

Phenols (6 Hrs)

Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols - electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben-Hoesch reaction, Laderer-Manasse reaction and Reimen-Tiemann reaction.

Ethers and Epoxides (3 Hrs)

Nomenclature of ethers and methods of their formation, physical properties. Chemical reactions - cleavage and autoxidation, Ziesel's method.

Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.

PART C

Aldehydes and Ketones (13 Hrs)

Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives.

Wittig reaction. Mannich reaction. Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. Meerwein-Ponndorf-Verley reaction, Clemmensen, Wolff-Kishner, $LiAlH_4$, and $NaBH_4$ reductions. Halogenation of enolizable ketone. An introduction to α, β unsaturated aldehydes and ketones.

PART D

Carboxylic Acids (6 Hrs)

Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard- Zelinsky reaction. Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions

of halo acids. Hydroxy acids: malic, tartaric and citric acids. Methods of formation and chemical reactions of unsaturated monocarboxylic acids.

Dicarboxylic acids: methods of formation and effect of heat and dehydrating agents.

Carboxylic Acid Derivatives (3 Hrs)

Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.

Preparation of carboxylic acid derivatives, chemical reactions. Mechanisms of esterification and hydrolysis (acidic and basic).

Suggested Books:

1.Morrison, R.N. and Boyd, R.N. *Organic Chemistry*. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2011.

2. Solomons, *Fundamentals of Organic Chemistry*. John Wiley, 1996.

3. Carey, F.A. *Organic Chemistry.* McGraw Hill, Inc.

4. Wade Jr., L.G. *Organic Chemistry*. Prentice Hall.

5. Mukherji, S.M., Singh, S.P. and Kapoor, R.P.*Organic Chemistry Vol. I, II & III.* Wiley Eastern Ltd (New Age International).

This syllabus is as per national syllabus given by UGC and it covers 20% more syllabus than UGC model curriculum as per the requirement of honors course.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass marks
4	1	0	4	100	40

Course Title: Inorganic Chemistry-II

Course Code: CHE106

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Inorganic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Inorganic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Comparative Study of s and p Block Elements (12 Hrs)

IA-VII A and Zero Groups: General remarks about each group, trends in electronic configuration, structure of elements, atomic and ionic, Radii, ionization potential, electron affinity, electronegativity, oxidation states, inert pair effect, catenation and heterocatenation, first and second row anomalies, the use of d orbitals by non-metals, the use of p orbitals in bonding.

The s-Block Elements

Alkali Metals: Oxides, hydroxides, peroxides and super oxides, halides, halides, hydrides, solutions of metals in liquid ammonia, complexes crowns and cryptands and podands.

Alkaline Earth Metals: Solutions of the metals in liquid ammonia, hydroxides, oxides, sulfates, hydrides, halides, carbides, structures of calcium carbide, structures of basic beryllium acetate $Be_4O(CH_3COO)_6$, beryllium oxalate complexes $Be(OX)_2$. Structure of chlorophyll `a'.

PART B

Group III (Boron Group) (13 Hrs)

Oxides, halides and hydrides of group III elements, electronic and/or crystal structures of borides, boranes and carboranes, metallocarboranes and their chemistry. Boron halides. Boric acid, borates, boron-nitrogen compounds, $LiAlH_4$ – its uses as a reducing and hydrogenating reagent, structure of alumina and aluminates. Chemistry of manufacture and setting of Portland cement, organometallic compounds of Al.

Group IV (Carbon Group): Structure and allotropy of the elements, types and structure of carbides, oxides of carbon and silicon, types and structures of silicates, Organo-silicon compounds and the silicones, halides of IV group elements.

PART C

The p-Block Elements (12 Hrs)

Group V (Nitrogen Group): Hydrides, properties and structure of ammonia, hydrazine, hydroxylamine, trihalides and Pentahalides of V groups elements, oxides of nitrogen, structure of N_2O, NO, N_2O_3, N_2O_4 and N_2O_5, oxo acids of nitrogen and phosphorous, phosphazenes and cyclophosphazenes.

Group VI (Oxygen Group): Structure and allotropy of the elements. Oxides of sulfur (structure of SO_2 and SO_3) oxoacids of sulfur halides of sulfur, structures of halides, oxides and oxyacids of Se & Te, compounds of Sulfur and nitrogen (S_4N_4).

Group VII: Oxides of halogens (OF_2, O_2F_2, Cl_2C, ClO_2, Cl_2O_6, BrO_2, I_2O_5) (structures), Preparation, reaction and structure interhalogen compounds. (ClF_3, BrF_3, I_2, Cl_5, IF_5, IF_7) Polyhalides, basic properties of halogens.

PART D

Zero group (10 Hrs)

Chemical Reactivity, group trends, chemistry of preparation of fluorine, hydrogen halides, HF as a solvent, polyhalide and polyhalonium ions; polyatomic cations of halogens, oxides and oxyacid of halogens.

Noble gases

Chemical reactivity and group trends, Clathrate compounds; preparation, structure & bonding of noble gas compounds (XeF_2, XeF_4, XeF_6, XeO_3, XeO_2F_2, and XeO_4).

Suggested Books:

1. Shriver, D.F.C. Atkins, P.W. and. Langford, C.H. *Inorganic Chemistry*. ELBS: Oxford, 1991.

2. Huheey, J.E., Keiter, E.A. and Keiter,R.L. *Inorganic Chemistry*, (*4th Ed*,).Singapore: Pearson Education, 1999.

3. Lee, J.D. *Concise Inorganic Chemistry*, ELBS: Oxford, 1994.

This syllabus has been designed as per national syllabus suggested by UGC and cover 20% extra syllabus as per requisite of honors degree.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass Marks
4	1	0	4	100	40

Course Title: Physical Chemistry II

Course Code: CHE107

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Physical Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of physical chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Phase Equilibria (10 Hrs)

Statement and meaning of the terms, Phase, component, degree of freedom, deduction of Gibbs phase rule.Phase equilibria of one component systems – H_2O, CO_2 and S systems.Phase equilibria of two component systems-determination of solid –liquid equilibria, simpleeutectic diagrams of Bi-Cd, Pb-Ag systems, desilverization of Pb.Solid solutions – compound formation with congruent M. Pt. – CuCl-$FeCl_3$, Fe_2Cl_6 –H_2O and Mg-Zn.Compound formation with incongruent M.Pt. (peritectic reactions) – NaCl – H_2O, $FeCl_3$ H_2O,and CuSO4. H_2O system.

Three Component Systems

Method of graphical representation, partially miscible three-liquid system –one partially miscible pairs, two partially miscible pairs, three partially miscible pairs, Applications of ternary liquid diagrams.

PART B

Thermodynamics of Simple Mixtures (10Hrs)

Partial molar quantities, Gibbs-Duhem Equation for G, Thermodynamic functions for mixing of perfect gases, Chemical potential of liquids, Raoult's law, Henry's law. Thermodynamic

functions for mixing of liquids (ideal solutions only), Mixtures of volatile liquids, Vapour pressure diagrams, Lever's rule, distillation diagrams, Real solutions and activities, standard states for solvent and solute.

PART C

Chemical Equilibrium (5 Hrs)

Direction of spontaneous change in a chemical reaction, extent of reaction, stoichiometric coefficients, equilibrium constant in terms of G, Temperature and pressure dependence of equilibrium constant, homogeneous & heterogeneous equilibria.

Changes of State, Physical Transformation of Pure Materials (7 Hrs)

Stability of phases, clapeyron equation. Clausius-clapeyron equation and its application to solid-liquid, liquid-vapour and solid-vapour equilibria.First and second order phase transitions, Attainment of low temperature and energetics of refrigeration, adiabatic demagnetization

PART D

Colligative Properties (5Hrs)

Solutions of non-volatile solutes, colligative properties, elevation in boiling point, depression in freezing point, osmosis and osmotic pressure

Electrochemical Cells (8Hrs)

Interfacial potential difference, the electrodes, potential at interfaces, electrode potentials, galvanic cells, emf, direction of spontaneous reactions, Concentration dependence of emf, equilibrium Constant from electrode potential, standard electrode potentials and their determination, Measuring activity co-efficient, thermodynamic data from cell emf. The temperature dependence of emf. Applications of emf. Measurements – solubility product, potentiometric titrations, pK and pH, measurements of pK and pH, Acid-base titrations. Concentration cells with & without transference.

Suggested Books

1. Atkins, P.W. *Physical Chemistry (8th Ed.).* Oxford University Press, 2006 (Indian Print).
2. Engel, T. and Reid, P. *Physical Chemistry (1st Ed.).* Pearson Education, 2006.
3. Castellan, G. W. *Physical Chemistry (3rd Ed.).* Addison Wisley/Narosa, 1985. (Indian Print)
4. Barrow, G. M.*Physical Chemistry, (6th Ed.).* New York: McGraw Hill, 1996.

5. Silbey, R. J. Albert, R. A. and Bawendi, M.G. *Physical Chemistry, (4th Ed.).* New York: John Wiley, 2005.

This syllabus has been designed as per national syllabus suggested by UGC and covers 30% extra syllabus as per requisite of honors degree.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass Marks
2	0	0	2	50	20

Course Title: Road Safety and Legal Awareness

Paper Code: EVS103

Course Objective: This course aims to aware the students about safety measures taken during driving and commuting on roads.

Unit I

Road Safety **15 Hours**

- Road safety: Concept and its importance.
- Attitude of people towards road safety
- Role of traffic police in road safety
- Traffic rules
- Traffic signs
- How to obtain driving license
- Traffic offences, penalties and procedures
- Common driving mistakes
- Significance of first-aid in road safety
- Role of civil society in road safety and Traffic police-public relationship
- Motor Vehicle Act 1998 (2010)

Unit II

Legal Awareness **10 Hours**

- Legal literacy
- Child labour
- Domestic Violence
- Right to Education

References:

1 .De, A.K. *Environmental Chemistry*. New Delhi: Wiley Eastern Ltd., 1990.

2. Sharma, P.D.*Ecology and Environment.* Meerut.:Rastogi Publications, 2004.

3. Singh, J.S., Singh, S.P. and Gupta, S.R. *Ecology, Environment and Resource Conservation*. New Delhi: Anamaya Publishers, 2006.

DAV UNIVERSITY JALANDHAR

Course Title: Modern Physics
Course Code: PHY155
Total Lectures 45

L	T	P	Marks
4	0	0	100

The aim and objective of the course on Modern Physics for the student of B.Sc. (Hons.) Physics is to equip them with the knowledge of wave particle duality, quantum mechanics and atomic nucleus and radioactivity

- The question paperforendsemesterexamination will have a weightage of 25%. It willconsistof100 objective questions of equal marks. Allquestionswill becompulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consistof 20 objective type, 5short questions/problemson the UGCNET (objective type) pattern as well as one long answer type question. The student is expected toprovide reasoning/solution/workingfortheanswer. Thecandidateswill attemptall question. Choice will be given only in long answer type.Thequestionpaperis expected tocontainproblemstotheextent of40%of totalmarks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 2025 questions.
- Thebooksindicatedas textbook(s)aresuggestiveHowever, anyotherbookmaybefollowed

PART A

Wave Particle Duality (10)

Quantum theory of light, Xrays and their diffraction, Compton effect, pair production, Wave Properties of Particles;de Broglie waves, waves of probability, the wave equation, phase and group velocities, particle diffraction, uncertainty principle and its applications.

PART B

Quantum Mechanics (11)

Difference between classical and quantum mechanics, wave function and wave equations. Schrodinger's equation, time dependent and steady state forms, Expectation values, particle in a box, reflection and transmission by a barrier, tunnel effect, harmonic oscillator.

PART C

Quantum Theory of Hydrogen Atom (12)

Schrodinger's equation for the hydrogen atom, separation of variables, quantum numbers, principal quantum number, orbital quantum number,

Magnetic quantum number, electron probability density, radiative transitions, selection rules. Zeeman Effect, Anomalous Zeeman effect, Xray Spectra.

PART D

Atomic Nucleus and Radioactivity (12)

Nonexistence of electrons in the nucleus, The neutron, stable nuclei, nuclear sizes and shapes, binding energy, liquid drop model, shell model, meson theory of nuclear forces Radioactivity; Radioactive decay, Half-life, radioactive dating, radioactive series, alpha decay and its theory, beta decay, gammadecay, radiation hazards and radiation units.

Books:

1. Beiser, A.*Concepts of Modem Physics*:McGraw Hill, 1987.
2. Ghatak and Loknatham. *Quantum Mechanics*:(Springer), 2004.
3. Kuhn, H.*Atomic Spectra*:. (Longman Green). 1969.
4. Hyde, K. *Basic ideas and Concepts in Nuclear Physics*: (Institute of Physics), 2004.

DAV UNIVERSITY JALANDHAR

Course Title: Basic Communication Skills

Course Code: ENG151

No. Of Lectures: 60

L	T	P	Credits	Marks
4	0	0	3	75

Course Objective:

- To enhance students' vocabulary and comprehensive skills through prescribed texts.
- To hone students' writing skills.

The books indicated as text-book(s) are suggestive However, any other book may be followed.

Unit – A Applied Grammar (Socio-Cultural Context)	
• Parts of Speech: Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, Interjection	4 hours
• Tenses (Rules and Usages in Socio-cultural contexts)	5 hour
• Modals: Can, Could, May, Might, Will, Would, Shall, Should, Must, Ought to	4 hours
• Passives	3 hours
• Reported/Reporting Speech	3 hour
Unit – B Reading (Communicative Approach to be Followed)	
• J M Synge: Riders to the Sea (One Act Play)	5 hours
• Anton Chekhov : Joy (Short Story)	4 hours
• Swami Vivekananda : The Secret of Work (Prose)	5 hours
Unit – C Writing	
• Paragraph and Essay Writing	4 Hours
• Letter Writing: Formal and Informal	4 hours
• Notice and Email	4 hours

References:

a. Books

1. Kumar, Sanjay and Pushp Lata. *Communication Skills*. India: OUP, 2012.Print.
2. Vandana, R. Singh. *The Written Word* by. New Delhi: Oxford University Press, 2008. Print.

b. Websites

1. www.youtube.com.Web.(to download videos for panel discussions)
2. www.letterwritingguide.com.Web.
3. www.teach-nology.com.Web.
4. www.englishforeveryone.org. .Web.
5. www.dailywritingtips.com. .Web.
6. www.englishwsheets.com.Web.
7. www.mindtools.com.Web.

DAV UNIVERSITY JALANDHAR

Course Title : Human Values and Ethics
Course Code : SGS - 101

L	T	P	Credits	Marks
2	0	0	2	50

Course Objectives

- To sensitize students about the role and importance of human values and ethics in personal, social and professional life.
- To encourage students to read and realize the values of enlightened human beings.
- To enable students to understand and appreciate ethical concerns relevant to modern lives.

Learning Outcomes*:*

Students becoming responsible citizens and better professionals who practise Values and Ethics in every sphere of life.

Unit - A

Human Values

1. **Concept of Human Values:** Meaning, Types and Importance of Values. **2 hours**
2. **Human Values :** Lessons from the lives and teachings of great thinkers. 3 **hours**
3. **Value Education :** The content of value education **2 hour**
4. **Value crisis and its redressal.** **1 hour**

Unit - B

Being Good and Responsible

1. Self Exploration and Self Evaluation **2 hour**
2. Acquiring Core Values for Self Development **2 hour**
3. Living in Harmony with Self, Family, Society and Nature **3 hours**
4. Values enshrined in the Constitution : Liberty, Equality Fraternity and Fundamental Duties. 3 **hours**

Unit - C

Value – based living

1. Vedic values of life **2 hour**
2. *Karma Yoga* and *Jnana Yoga* **2 hours**
3. *Ashta Marga* and *Tri-Ratna* **2 hours**
4. Truth, Contentment and Wisdom **2 hours**

Unit - D

DAV UNIVERSITY JALANDHAR

Ethical Living:

Ethics: Difference between Ethics and Values

1.	Personal Ethics	**2 hours**
2.	Professional Ethics	**3 hours**
3.	Ethics in Governance	**2 hours**
4.	Ethics in Education	**2 hours**
		Total = 35 hours

Reference Books:

1. Sreedharan,E. and Wakhlu,Bharat. Ed.*Restoring Values.* New Delhi: Sage Publications Ltd., 2010.
2. Nagarajan, K. *Indian Ethos and Values*.New Delhi: Tata McGraw Hill, 2011
3. Tripathi,A N.*Human Values*.New Delhi: New Age International Publishers, 2009
4. Sankar.*Indian Ethos and Values in Management*. New Delhi: Tata McGraw Hill Education Pvt. Ltd.
5. Osula.*Values and Ethics.* New Delhi: Asian Books, 2001.
6. Surbiramanian,R. *Professional Ethics*. New Delhi: Oxford University Press, 2013.
7. Anand,Rishabh. *Human Values and Professional Ethics,* New Delhi: Satya Prakashan, 2012
8. Bhalla, Sanjeev.*Human Values and Professional Ethics*.New Delhi: Satya Prakashan, 2012.
9. Soryan, Ritu.*Human Values and Professional Ethics*. New Delhi: Dhanpat Rai & Co. Pvt. Ltd., 2010.
10. Jayshree,Suresh, and B S, Raghavan.*Human Values and Professional Ethics.* New Delhi: S Chand & Co. Ltd.,2007.
11. Shukla,Dr. R K, Misra, Anuranjan. *Human Values and Professional Ethics*, A B Publication, 2010.
12. Sharma,Vayu.*Human Values and Professional Ethics*. New Delhi: Education of India Language publishers, 2012.
13. Kannan,S, and Srilakshmi,K.*Human Values and Professional Ethics*.New Delhi: Taxmann Publication, Pvt. Ltd., 2009
14. Srivastava, Smriti.*Human Values and Professional Ethics*. New Delhi: S K Kataria & Sons, 2001

15. Singh,Yogendra, and Garg, Ankur. *Human Values and Professional Ethics*. New Delhi:Aitbs publishers, 2011.

16. Kumar, Vrinder.*Human Values and Professional Ethics*. Ludhiana: Kalyani Publishers, 2013.

17. Gaur,R R, Sangal,R. Bagaria, GP. *Human Values and Professional Ethics*.New Delhi: Excel Books, 2010.

18. Osula, Dr. Bramwell and Upadhyay, Dr. Saroj.*Values and Ethics*, New Delhi :Asian Books Pvt. Ltd., 2011.

19. *Complete works of Swami Vivekanand*,Calcutta: Advaita Ashram, 1931.

20. Radhakrishnan, S. *Indian Philosophy*,George Allen & Unwin Ltd., New York: Humanities Press INC, 1929.

21. Dwivedi, A N.*Essentials of Hinduism, Jainism and Buddhism,*New Delhi: Books Today– 1979

22. Saraswati, Maharishi Dayanand. *Light of Truth: Satyarth Parkash*. New Delhi: Arya Swadhyay Kendra, 1975.

23. Bhan, Suraj.*Dayanand : His life and work.* New Delhi : DAVCMC, 2001.

24. Raghavan,V, and Iyer,N. *Moral and Political Thoughts of Mahatma Gandhi.* New Delhi : Oxford University Press India, 2000.

25. Singh,Narain.*Guru Nanak Dev's view of life*.Amritsar: Bhagat Puran Singh All India Pingalwara Society, 2010.

26. Dwivedi, Kapil Dev.*Esence of Vedas*. Hoshiarpur : Katyayan Vedic Sahitya Prakashan,1990.

27. Chaubey,B B.*Vedic* Concepts.Hoshiarpur: Katyayan Vedic Sahitya Prakashan, 1990.

28. Radhakrishnan, Saravapalli. *Mahatma Gandhi : Essays and Reflections on his life*.Mumbai: Zaico Publication, 1977.

29. Hardayal, Lala.*Hints for Self Culture*,Mumbai:Jaico Publishing House, 1961.

30. Saraswati Dayanand, *The Light of Truth (The Satyartha Prakashan)*.New Delhi:

31. Krishnamurti J.*The First and Last Freedom*

32. Maharishi, Sri Raman.*Who Am I.*

33. Balsekar,Ramesh S. *Peace and Harmony in Daily Living*. New Delhi: Yogi Impressions.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass marks
0	0	3	2	50	20

Course Title: Inorganic Chemistry Lab -I

Course Code: CHE108

Time: 03 Hrs

Course Objectives:

This course is intended to learn the basic concepts of Inorganic Chemistry Laboratory. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand the basic objective of experiments in inorganic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

Qualitative Analysis

Identification of cations and anions in a mixture which may contain combinations of acid ions. These must contain interfering acid anions and one, the insoluble.

a) Special Tests for Mixture of anions

I. Carbonate in the presence of sulphate.

II. Nitrate in the presence of nitrite

III. Nitrate in the presence of bromide and iodide.

IV. Nitrate in the presence of chlorate.

V. Chloride in the presence of bromide and iodide.

VI. Chloride in the presence of bromide.

VII. Chloride in the presence of iodide.

VIII. Bromide and iodide in the presence of each other and of chloride.

IX. Iodate and iodide in the presence of each other.

X. Phosphate, arsenate and arsenite in the presence of each other.

XI. Sulphide, sulphite, thiosulphate and sulphate in the presence of each other.

XII. Borate in the presence of copper and barium salts.

XIII. Oxalate in the presence of fluoride.

XIV. Oxalate, tartrate, acetate, citrate in the presence of each other.

b) Separation and identification of cations in mixtures

i) Separation of cations in groups.

ii) Separation and identification of Group I, Group II (Group IIA and IIB), Group III, Group IV, Group V and Group VI cations.

c) Identification of cations including less familiar elements by spot tests assisted by group analysis (3 cations).

Suggested Books:

1. Svehla, G. andSivasankar, B.*Vogel's Qualitative Inorganic Analysis (revised) (*7thEd).Pearson, 1996.

2. Bassett, J. Denney, R. C. Jeffery, G. H. and Mendham, J.*Vogel's Textbook of Quantitative Inorganic Analysis* (revised). Orient Longman, 1978.

3. Palmer, W. G. *Experimental Inorganic Chemistry*; (1st Ed.). Cambridge, 1954.

DAV UNIVERSITY JALANDHAR

Course Title: Modern Physics Laboratory
Course Code: PHY156

L	T	P	Credits	Marks	Pass marks
0	0	4	2	50	20

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results

1. Determination of Planck's constant using photocell.
2. Study of SolarCell characteristics
3. To find half-life period of a given radioactive substance using GM counter
4. Study of C.R.O. as display and measuring device, Study of Sinewave, square wave signals (half wave and full wave rectification)
5. Determination of ionization potential of mercury.
6. Study of excitations of a given atom by Franck Hertz set up.
7. To determine charge to mass ratio (e/m) of an electron by Thomson method.
8. Study of Arc emission spectrum of given samples (Fe and Cu).
9. To determine the heat capacity of given materials.
10. To find conductivity of given semiconductor crystal using four probe method.
11. To determine the Hall coefficient and mobility of given semiconductors.
12. To determine the operating plateau and dead time of a given G.M. Counter.
13. To find the coefficient of thermal conductivity of a bad conductor by Lee’s method.
14. To find the ionization potential of mercury using gas filled diode.

15. To determine the thermionic work function of tungsten using directly heated diode.
16. To determine the speed of light in air.
17. To study the various laws of thermal radiation.
18. To demonstrate diaparaferro magnetism in an inhomogeneous magnetic field.
19. To measure the wave lengths of Balmar series of visible emission line from hydrogen.
20. To determine the electronic charge by Millikan oil drop method.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks
0	0	2	1	25

Course Title: Basic Communication Skills

Course Code: ENG 152

No. Of Lectures: 30

Course Objective:

- To improve fluency in speaking English.
- To promote interactive skills through Group Discussions and role plays.

Learning Outcomes:

Unit – A Speaking/Listening	
• Movie-Clippings	10 hours
• Role Plays	10 hours
• Group Discussions	10 hours

References:

Books

1. Gangal, J. K. *A Practical Course In Spoken English.* India: Phi Private Limited, 2012. Print.
2. Kumar, Sanjay and Pushp Lata. *Communication Skills*. India: OUP, 2012. Print.

Websites

1. www.youtube.com..web.(to download videos for panel discussions)
2. www.englishforeveryone.org.web.
3. www.talkenglish.com.web.
4. www.mindtools.com.web.

DAV UNIVERSITY JALANDHAR

Scheme of Courses B.Sc.
B.Sc. (Hons.) Chemistry

S No.	Paper Code	Course Title	L	T	P	C	% Weightage				E
							A	B	C	D	
1	CHE201	Organic Chemistry-III	4	1	0	4	25	25	25	25	100
2	CHE202	Physical Chemistry-III	4	1	0	4	25	25	25	25	100
3	MTH260	Mathematics for Chemists -II	4	0	0	4	25	25	25	25	100
4	ENG180	English	4	0	0	4	25	25	25	25	100
5	PHY253	Electricity, Magnetism and Electronics	4	0	0	4	25	25	25	25	100
6	CSA252	Computers for Chemists	2	0	0	2	25	25	25	25	50
7	CHE203	Physical Chemistry Lab-I	0	0	3	2	25	25	25	25	50
8	PHY254	EM and Electronics Lab	0	0	4	2	0	0	0	0	50
			22	**2**	**7**	**26**					**650**

Semester 3

DAV UNIVERSITY JALANDHAR

Scheme

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks

DAV UNIVERSITY JALANDHAR

Course Title: Organic Chemistry-III

Course Code: CHE201

L	T	P	Credits	Marks	Pass marks
4	1	0	4	100	40

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Organic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Organic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Organic Compounds of Nitrogen (10 Hrs)

Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid. Halonitroarenes: Reactivity.

Structure and nomenclature of amines, physical properties. Stereochemistry of amines. Separation of mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Amine salts as phase-transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Synthetic transformations of aryl diazonium salts, azo coupling.

PART B

Carbohydrates (8 Hrs)

Classification and nomenclature. Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D (+)-glucose. Mechanism of mutarotation. Structures of ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

Amino Acids, Peptides, Proteins and Nucleic Acids (6 Hrs)

Classification, structure and stereochemistry of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation and reactions of α -amino acids.

Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Structures of peptides and proteins. Levels of protein structure. Protein denaturation/ renaturation. Nucleic acids: Introduction. Constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical structure of DNA.

PART C

Fats, Oils and Detergents (2 Hrs)

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Saponification value, iodine value, acid value. Soaps, synthetic detergents, alkyl and aryl sulphonates.

Synthetic Dyes (8 Hrs)

Colour and constitution (electronic concept). Classification of dyes. Chemistry and synthesis of methyl orange, Congo red, Malachite green, Crystal violet, Phenolphthalein, Fluorescein, Alizarin and Indigo.

PART D

Electromagnetic Spectrum: Absorption Spectra (10 Hrs)

Ultraviolet (UV) absorption spectroscopy – absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic,

hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones. Infrared (IR) absorption spectroscopy, molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

Suggested Books:

1.Carey, F.A. *Organic Chemistry(4thEd.).*McGraw Hill Inc.

2.Morrison, R.N. and Boyd,R.N.*Organic Chemistry.* Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), 2011.

3. Dyer, J.R. *Applications of spectroscopy of organic compounds.* Prentice Hall,1965.

This syllabus is as per national syllabus given by UGC and it covers 10% more syllabus than UGC model curriculum as per the requirement of honors course.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass Marks
4	1	0	4	100	40

Course Title: Physical Chemistry III

Course Code: CHE202

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Physical Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of physical chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Transport properties (11 Hrs.)

Transport phenomena in gases, Flux, Molecular diffusion, rate of diffusion, Fick's first law of diffusion, kinetic theory of diffusion in gases, Thermal conductivity, kinetic theory of thermal conductivity in gases, Viscosity of gases, kinetic theory of gas viscosity, molecular diameters and intermolecular force constants from viscosity.

Thermodynamics of diffusion (5Hrs.)

Thermodynamic view of diffusion. Relation between transport properties. Einstein relation, Nernst-Einstein relation, Stoke's Einstein relation. Diffusion in non-steady state, Fick's second law of diffusion, Theory of diffusion in liquids.

PART B

Equilibrium Electrochemistry (10 Hrs)

Transport of ions in solution, conductivity, Kohlrausch's law, Ostwald dilution law, Mobilities of ions, transport number and its measurement. Arrhenius theory of Conductivity, Debye-Huckel-

Onsager theory of conductivity, Applications of conductivity, conductometeric titrations, solubility of sparingly soluble salts, degree of dissociation of weak electrolytes.

PART C

Thermodynamics of Electrolytic Solutions (6 Hrs.)

Activities of ions in solutions, a model of ions in a solution, qualitative idea of Debye-Huckel theory, ionic strength, mean ionic activity coefficient and the Debye-Huckel limiting law for activity coefficients.

PART D

Chemical Kinetics (15 Hrs.)

Rate of reaction, rate constant and rate laws, the order of reaction, first, second & third and zero order reactions, half-lives; determination of reaction order, Temperature dependence of reaction rates, reaction mechanism, rate-determining step approximation, steady-state approximation. From rate-law to mechanism, unimolecular reactions, bimolecular reactions.

Kinetics of Complex reactions Reversible first order reactions, consecutive first order reactions, parallel first order reactions, Chain reactions, Explosive/branched chain reactions, catalysis, homogeneous catalysis, autocatalysis, oscillation reactions, bistability. Enzyme catalysis, heterogeneous catalysis.

Suggested Books:

1. Atkins P.W., *Physical Chemistry*. Oxford University Press,2002.
2. Adamson A.W., *Physical Chemistry of Surfaces*.John Wiley & Sons, 1982.
3. Laidler, Keith J. *Chemical Kinetics*.New York :Harper & Row, 1987.
4. Castellan G.W., *Physical Chemistry*. Addison Wisley/Narosa (1985) (Indian Print).
5. Barrow G. M., *Physical Chemistry.* McGraw Hill, New York (1996).
6. Maron, S.H., & Prutton, C.F. *Principles of Physical Chemistry*. Oxford and IBH Publishing, 1958.

This syllabus has been designed as per national syllabus suggested by UGC and covers 40% extra syllabus as per requisite of honors degree

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Mathematics for Chemists-II

Paper Code: MTH 260

Course Objective: This course is designed to introduce the fundamental concepts of continuity, differentiation and integration of functions of one variable. Its objective is to acquaint students with various applications of these topics relating to extreme value problems, problems of finding areas and distance travelled, moreover to describe connection between integral and differential calculus through Fundamental Theorem of Calculus.

UNIT-A **08hours**

Function, Limit and Continuity:

Functions and graphs, Domain and Co-Domain, range, Inverse Functions, Exponential and Logarithmic Functions, limit of Functions, Algebraic Computations of limits, Continuity of Functions at a point, Continuity of Functions in interval.

UNIT-B **08hours**

Differential Calculus I:

An Introduction to the Derivative, Differentiation of standard Functions, Formulae on derivative of sum, difference, product and quotient of functions, chain rule, derivative of Trigonometric functions, Inverse Trigonometric functions, Exponential and Logarithmic Functions.

Differential Calculus II: **08hours**

Differentiation of implicit functions, Derivative of functions expressed in parametric form, derivative of higher order, Increasing and decreasing functions, Sign of derivative, Maxima and Minima of a single variable. Introduction to Partial differentiation**.**

UNIT-C **10hours**

Differential Calculus III:

Rolle's, Lagrange and Cauchy mean values theorems and their applications, Taylor theorem And Maclaurian's theorem with Lagrange's form of remainder and applications of formal expansions of functions. (Proofs of theorems are not required).

UNIT-D **09hours**

Integral Calculus:

Integration as inverse of differentiation, Indefinite Integral of standard forms, Methods of Substitution, Methods of fractions, Integration by parts, Definite Integral.

Reference Books:

1. Narayan, Shanti and Mittal P K .*Differential Calculus*. New Delhi: S Chand & Co Ltd, 2005.
2. Narayan, Shanti and Mittal P K. *Integral Calculus*, New Delhi: S Chand & Co Ltd, 2004.
3. Mathematics, *A Text book for Class XI and XII (Parts I & II*). New Delhi: NCERT 2003.

DAV UNIVERSITY JALANDHAR

Course Title: English
Course Code: ENG180
Total Lectures: 60

L	T	P	Marks
4	0	0	100

Course Objective: To familiarize students of non-literary programmes with some of the basics of literary studies through a critical study of the prescribed texts

Learning Outcomes:

Unit – A Never Never Nest by Cedric Mount	
• Consumerist Lifestyle	3 hours
• Bank Loans and Modern Times	3 hours
• Character Analysis	5 hours
• Stylistic Analysis	4 hours
Unit – B Guide by R. K. Narayana	
• Interpersonal Relationships	4 hours
• Religious Beliefs/Rituals in Rural India	4 hours
• Character Analysis	4 hours
• Stylistic Analysis	3 hour
Unit – C Twelfth Night by Shakespeare	
• Salient Features of Shakespearean Comedy	5 hours
• Character Analysis	5 hours
• Stylistic and Thematic Analysis	5 hours
Unit – D Animal Farm by George Orwell	
• Marxist Principles	5 hours
• As a Progressive Text	5 hours
• Symbolic Analysis	5 hours

Suggested Reading:

1. Falvey,Peter ,Peter Kennedy. *Learning Language Through Literature: A Sourcebook for Teachers of English in Hong Kong.* HKU:Hong Kong University Press, 1997.
2. www.britishcouncil.com
3. Kumar, Sukrita Paul. *Language, Literature And Creativity*. New Delhi: Orient Blackswan Pvt Ltd, 2010.

4. Swann, Joan , Robert Pope and Ronald Carter. *Creativity in Language and Literature: The State of the Art.* USA : Palgrave MacMillan, 2011.

L	T	P	Credits	Marks	Pass marks
4	0	0	4	100	40

Course Title: Electricity Magnetism and Electronics

Course Code: PHY253

Total Lecture 45

AIM

The aim and objective of the course on **Electricity Magnetism and Electronics**is to equip the students of with knowledge ofbasic features of electricity and magnetism and electronics that can enable them to understand the working of electronic equipments.

Unit I **(12)**

Vector Analysis

Vectors and Vector properties, Components of Vectors, Unit Vectors, Product of Vectors.

Electric Charges and Field

Electric Charges, Conductors, Insulators and Induced Charges,Coulomb Law, Electric Field and Forces, Electric field Calculations, Electric field lines. ElectricDipoles.

Gauss law

Charges & Electric Flux and calculations, Gauss's Law, Electric Potential Energy and Potential Gradient.

Unit II **(10)**

Magnetism

Magnetism, magnetic field, Magnetic field lines and flux, motion of charges particle in Magnetic field, BioSavart law, Ampere law, Magnetic Materials, Faraday's Law, Maxwell equations Dielectric: Dielectric and Gauss's Law in Dielectric.

Electromotive Force

Electromotive force & Circuits, Mutual Inductance, Self-Induction and Inductors

Unit III **(12)**

Conduction in Semiconductors

Electrons and holes in semiconductor, carrier concentration, donor and acceptor impurities, charge densities, Fermi Level in semiconductors, diffusion, carrier lifetimes, continuity equation

Diode Characteristics

Qualitative theory of pn junction, pn diode, band structure of an open circuit diode, current components, qualitative theory of diode currents, VI Characteristics.

Unit IV **(11)**

Transistors

Junction Transistors, Transistor current components, transistor as an amplifier, CB and CE configuration

Applications

Half Wave rectifier, ripple factor, full wave rectifier, filters, photoconductivity, Photodiode

Reference Books:

1. Sears's University Physics with Modern Physics, Hugh D Young and Roger A Freedman, 12thEdition (Pearson Education, 2008).
2. Fundamentals of |Physics, Resnick&Hlleday, 8th Edition (Wiley)
3. Electronic Devices and Circuits: J. Millman and C.C. Halkias (Tata McGraw Hill, 1991)

DAV UNIVERSITY JALANDHAR

Course Title: Computer for Chemists
Course Code: CSA252
Course Duration: 45 Hours

L	T	P	Credits	Marks
2	0	0	2	50

Course Objective: The objective of the course is to introduce students to the basic knowledge about the structure and functioning of computers, algorithm designing and implementing chemistry formulae's using C programming Concepts.

UNIT-A **15 Hours**

Introduction to Computers

- Basic Structure and Functioning of Computer with a PC
- Different Component of a Computer, Hardwar and Software
- Input-Output Devices, Binary Number and Arithmetic
- Introduction to Computer Language, Operating System
- Data Processing, Algorithms and Flow Charts.

Principle of Programming in C

- Data Types, Constants, Variables
- Arithmetic Operators, Unary Operators, Relational Operators,
- Logical Operators, Assignment and Conditional Operators, Library functions.

UNIT-B **10 Hours**

Data Input and Output

- Single Character Input, Single Character Output, Entering Input Data
- More About Scan Functions, Writing Output Data, More About Print Functions
- Gets and Puts Functions, Interactive Programming.

Control Structures

- Introduction, Decision Making with If – Statement, If Else and Nested If,
- While And Do-While, For Loop.
- Jump Statements: Break, Continue, goto, Switch Statement.

UNIT-C **12 Hours**

Functions

- Introduction To Functions, Function Declaration, Function Categories
- Standard Functions, Parameters And Parameter Passing, Pass – By Value/Reference
- Recursion, Global and Local Variables, Storage Classes.

Arrays

- Introduction to Arrays, Array Declaration, Single and Multidimensional Array, Memory Representation, Matrices, Strings, String Handling Functions.

UNIT-D **8 Hours**

Programming in Chemistry

- Development of Small Computer Code involving Simple Formulae in Chemistry
- How to run Standard Programs and packages
- Execution of Linear Regression
- X-Y Plot, Numerical Integration and Differentiation
- Differential Equation Solution Programs

Reference Books

1. Hunt, R. andShelley, J.*Computers and Common Sense*. Prentice Hall
2. Norris, A.C.*Computational Chemistry*.
3 Brookshear,.J.Gein *Computer Science: An Overview*. Wesley.
4. Kanetkar, Y.P.*Let us C*, BPB Publications, New Delhi.
5. mBalagurusami, E*. Programming in ANSI C*. Tata McGraw Hill.
6. Gottfried, B.S.*Programming in C.* McGraw Hills.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass Marks
0	0	3	2	50	20

Course Title: Physical Chemistry Lab -I

Course Code: CHE203

Time: 04 Hours

Course Objectives:

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (Hons.) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

Expected Prospective:

The students will be able to understand the basic objective of experiments in physical chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

1. Treatment of experimental data

Recording of experimental data. Significant number, accuracy and precision, error analysis.

2. Liquids and Solutions

(i) To determine relative viscosities of aqueous solutions of glycerol at different concentrations.

(ii) Calculate partial molar volume of glycerol at infinite dilution from density measurement.

(iii) To determine viscosity-average molecular weight, number-average molecular weight and mean diameter of polyvinyl alcohol molecule from intrinsic viscosity data.

3. Thermochemistry

(i) To determine heat capacity of a calorimeter and heat of solution of a given solid compound.

(ii) To determine heat of solution of Solid calcium chloride and calculate lattice energy of calcium chloride using Born-Haber cycle.

(iii) To determine heat of hydration of copper sulphate.

4. Distribution Law

(i) To determine distribution (i.e. partition) coefficient of a solute between water and a non-aqueous solvent.

5. Surface Phenomena

To study the adsorption of acetic acid/oxalic acid from aqueous solution on charcoal. Verify Freundlich and Langmuir adsorption isotherms.

6. Colorimetery

(i) To verify Lambert-Beer law.

7. pH metry

(i) To titrate a strong acid against a strong base pH-metrically.

(ii) To titrate a weak acid against a strong base and determine the ionization constant of the weak acid.

Suggested Books

1. Levitt, B.P., *Findlays Practical Physical Chemistry*. London & New York: LongmanGroup Ltd 1978.

2. Khosla, B.D., Garg, V.C. and Gulati, A., *Senior Practical Physical Chemistry*.New Delhi: R.Chand& Co., 2002.

3. Das, R.C. and Behra, B., *Experimental Physical Chemistry.*Tata McGraw Hill Publishing Co. Ltd. 1983.

4. SvehlaG.,*Vogel's Qualitative Inorganic Analysis (revised)*.New Delhi: OrientLongman, (1987).

5.Christian G.D.*Analytical Chemistry*. John Wiley & Sons Inc

L	T	P	Credits	Marks	Pass

DAV UNIVERSITY JALANDHAR

					Marks
0	0	4	2	50	20

Course Title: EM and Electronics Lab

Course Code: PHY 254

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note:

- Students are expected to perform at least eighteen experiments out of following list. Theexperimentsperformedin firstsemestercannotbe repeatedinsecond Semester.
- Theexaminationforboththecourseswill beof3hoursduration.
- Total marks of practical will include 20% weightage of Continuous Assessment and 80% end semester exam including Notebook / Viva / Performance/ written test**.**

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results

1. To verify the Thevenin, Norton, Superposition, and Maximum Power Transfer Theorem.
2. To measure the Input and Output Impedance of an Unknown Network and to convert it into Equivalent T and π Circuits.
3. To study (a) Halfwave Rectifier and (b) Fullwave Bridge Rectifier and investigate the effect of C, L and π filters.
4. To study the characteristics of pnjunction diode.
5. To study the Forward and Reverse characteristics of a Zener Diode and to study its use as a Voltage Regulator.
6. To study the Characteristics of a Photodiode.

7. To determine the Characteristics of pn junction of a Solar Cell.
8. To study the CE Characteristics of a Transistor.
9. To study the various Transistor Biasing Configurations.
10. To study the Frequency Response of Voltage Gain of a RCCoupled Amplifier.
11. To design an Oscillator of given specifications using Transistors.
12. To study the characteristics of Junction Field Effect Transistor.
13. To study the characteristic of Metal Oxide Semiconductor Field Effect Transistor.
14. To study the magnetic field produced by a current carrying solenoid using a pickupcoil/Hall sensor and to find the value of permeability of air.
15. To determine the frequency of A.C. mains using sonometer.
16. Determination of given inductance by Anderson's bridge.
17. To determine the value of an air capacitance by deSauty Method and to findpermittivity of air. Also, determine the dielectric constant of a liquid.
18. Study of R.C. circuit with a low frequency a.c. source.
19. Studies based on LCR Board: Impedance of LCR circuit and the phase and between voltage and current.
20. To measure low resistance by Kelvin’s double bridge/ Carey Foster’s bridge.
21. To study the basic ideas of equal a priori probability, law of two independent events, and probability distribution of identical particles in two compartments for a two option system using colored dice.

DAV UNIVERSITY JALANDHAR

Scheme of Courses B.Sc.
B.Sc. (Hons.) Chemistry (Semester 4)

S No.	Paper Code	Course Title	L	T	P	C	% Weightage				E
							A	B	C	D	
1	CHE204	Organic Chemistry-IV	4	1	0	4	25	25	25	25	100
2	CHE205	Inorganic Chemistry-III	4	1	0	4	25	25	25	25	100
3	CHE206	Physical Chemistry-IV	4	1	0	4	25	25	25	25	100
4	CHE207	Spectroscopy -I	4	1	0	4	25	25	25	25	100
5	MTH261	Mathematics for Chemists-III	4	0	0	4	25	25	25	25	100
6	CHE208	Organic Chemistry Lab-II	0	0	3	2	0	0	0	0	50

7	CHE209	Inorganic Lab-II	0	0	3	2	0	0	0	0	50
			20	**4**	**6**	**24**					**600**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass Marks
4	1	0	4	100	40

Course Title: Organic Chemistry-IV

Course Code: CHE204

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Organic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Organic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Stereochemistry (10 Hrs)

Conformational analysis of cycloalkanes, effect of conformation on reactivity, conformation of sugars, steric strain due to unavoidable crowding. chirality, molecules with more than one chiral center, threo and erythro isomers, methods of resolution, optical purity, enantiotopic and diastereotopic atoms, groups and faces, stereospecific and Stereoselective synthesis. Asymmetric synthesis. Optical activity in absence of chiral carbon (biphenyls, allenes and spiranes), chirality due to helical shape. Stereochemistry of the compounds containing nitrogen, sulphur and phosphorus.

PART B

Kinetic Isotope Effect (4 Hrs)

Theory of isotope effects. Primary and secondary kinetic isotope effects. Heavy atom isotope effects. Tunneling effect. Solvent effects.

Structural Effects on Reactivity (8 Hrs)

Linear free energy relationships (LFER). The Hammett equation, substituent constants, theories of substituent effects. Interpretation of -values. Reaction constant ρ. Deviations from Hammett

equation. Dual-parameter correlations, inductive substituent constant. The Taft model, σI- and σR-scales.

PART C

Solvation and Solvent Effect (6 Hrs)

Qualitative understanding of solvent-solute effects on reactivity. Thermodynamic measure of salvation. Effects of salvation on reaction rates and equilibria. Various empirical indexes of salvation based on physical properties, solvent-sensitive reaction rates, spectroscopic properties and scales for specific salvation. Use of salvation scales in mechanistic studies. Solvent effects from the curve-crossing model.

Acids, Bases, Electrophiles, Nucleophiles and Catalysis (6 Hrs)

Acid-base dissociation. Electronic and structural effects, acidity and basicity. Acidity function and their applications. Hard and soft acids and bases. Nucleophilicity scales. Nucleofugacity. The α -effect. Ambivalent nucleophiles. Acid-base catalysis- specific and general catalysis. Bronsted catalysis. Nucleophilic and electrophilic catalysis. Catalysis by non-covalent binding micellar catalysis.

PART D

Steric and Conformational Properties (6 Hrs)

Various type of steric strain and their influence on reactivity. Steric acceleration. Molecular measurements of steric effects upon rates. Steric LFER. Conformational barrier to bond rotation spectroscopic detection of individual conformers. Acyclic and monocyclic systems. Rotation around partial double bonds. Winstein-Holness and Curtin-Hammett principle.

Principles of Reactivity (5 Hrs)

Mechanistic significance of entropy, enthalpy and Gibb's free energy. Arrhenius equation. Transition state theory. Uses of activation parameters, Hammond's postulate. Bell-Evans-Polyanyi principle. Potential energy surface model. Mercus theory of electron transfer. Reactivity and selectivity principles.

Suggested Books:

1. Lowry, T.H. and Richardson,K.C.*Mechanism and Theory in Organic Chemistry.*Harper and Row.

2. Smith, W.B. *Introduction to Theoretical Organic Chemistry and Molecular Modelling.*Wiley-VCH, Weinheim, 1996.

3. Issacs, N.S. *Physical Organic Chemistry.* ELBS/Longman.

4. Lehn, J.M. *Supramolecular Chemistry, Concepts and Perspectives*. VCH, Weinheim, 1995.

5. Maskill, H. *The Physical Basis of Organic Chemistry*. Oxford University Press, 1985.

This syllabus is as per national syllabus given by UGC and it covers 10% more syllabus than UGC model curriculum as per the requirement of honors course.

DAV UNIVERSITY JALANDHAR

Course Title: Inorganic Chemistry-III

Course Code: CHE205

L	T	P	Credits	Marks	Pass marks
4	1	0	4	100	40

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Inorganic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Inorganic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Transition elements (12 Hrs)

General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, and ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer diagrams). Comparison of 3d elements with 4d & 5d elements. Various oxidation states, their oxidizing and reducing nature and stability w.r.t. Ti, V, Cr, Mn, Fe and Co. Structure and chemical reactivity of following compounds: chromate, dichromate and chromium trioxide, KMnO4, peroxo compounds of chromium,V_2O_5, $K_4[Fe(CN)_6]$, $K_3[Fe(CN)_6]$, $Na_3[Co(NO_3)_6]$, $Na_3[Fe(CN)_5NO]$

PART B

Coordination chemistry (11 Hrs)

Werner's theory, nomenclature of coordination complexes, isomerism in coordination complexes, chelating agents, metal chelates and chelate effects, names and abbreviations of important ligands, polydenate ligands, polypyarzolyborates, macrocylic ligands, macrocylic

effect, ketoenolates, troplonates, tripod ligands, conformation of chelate rings, stereochemistry of coordination numbers 2-12, factors determining kinetic and thermodynamic stability.

PART C

Chemistry of 2^{nd} and 3^{rd} row d-block elements (12 Hrs)

Comparison of the chemistry of elements of second and third row series with that of elements of the first transition series. Aqueous chemistry of Zr(IV). Chemistry of Nb(V) and third row series with that of elements of the first series. Dinitrogen complexes of Molybdenum. Mo-Mo and Re-Re quadrupole bonds. Chemistry of complexes of Rh(III), Pt(II) and Pd(II).

Chemistry of Lanthanide elements:

Chemistry of Lanthanide elements, their isolation from one another, their coordination chemistry.

PART D

Chemistry of actinide (10 Hrs)

Their electronic configurations. Chemistry of Thorium and Uranium.

Non-Aqueous solvents:

Physical properties of a solvent, Types of solvents and general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.

Suggested Books:

1. Cotton, F. A.,Wilkinson, G.,Murillo, C. A. andBochmann, M.*Advanced Inorg. Chemistry*.John Wiley India, 2003.

2. Shriver, D. F. Atkins,F. W. and Langford,C. M. *Inorganic Chemistry*.Oxford University Press, 1999.

3. Huheey,J. E. Keiter,E. A. and Keiter,R. L. *Inorganic Chemistry: Principles of Structure and Reactivity*. Harper Collins, 1993.

4. Massey Allan,G.*Main Group Chemistry*. Ellis Horwood, New York 1990.

This syllabus has been designed as per national syllabus suggested by UGC and cover 20% extra syllabus as per requisite of honors degree.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass Marks
4	1	0	4	100	40

Course Title: Physical Chemistry- 1V

Course Code: CHE206

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Physical Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of physical chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Molecular Interactions and other topics (11Hrs)

Electrical properties: Permanent dipole moment, polarizability, polarizability and refractive index,

optical activity. Intermolecular forces: dipole, dipole induced dipole, dispersive forces, repulsive forces and total interaction, Molecular interactions in beams, liquid crystals, difference between liquid crystals solid and liquid, classification, structure of nematic and cholestric phases, movement in liquids, Ionic solids, Magnetic properties, magnetic susceptibility, permanent magnetic moment, induced magnetic moment.

PART B

Solid State (10 Hrs)

Perfect and imperfect crystals, intrinsic and extrinsic defects-point defects, line and plane defects, Schottky and Frenkel defects, colour centres, non-stoichiometry and defects, solid state

reactions. Metals, insulators and semiconductors, intrinsic and extrinsic semiconductors, doping semiconductors, superconductors, magnetic materials (ferrites) and their classification.

PART C

Statistical Thermodynamics-I (12 Hrs)

Molecular energy levels and the Boltzmann distribution: configurations and weights, most probable configuration; the molecular partition function, physical interpretation of the partition function. The canonical ensemble, canonical partition function and its relation to molecular partition function for independent particles. The statistical entropy; heat, work and entropy; entropy and partition function, entropy of a monoatomic gas. Factorization of partition function; calculation of translational, rotational vibrational and electronic contributions, the overall partition function.

PART D

Statistical Thermodynamics-II (4 Hrs)

Calculation of thermodynamic functions in terms of partition functions. Mean energies and equipartition principle, heat capacities, residual entropies, equilibrium constant.

Molecular reaction dynamics (7 Hrs)

Collision theory, Diffusion controlled reactions Activated complex theory; reaction co-ordinates and transition state, formation and decay of the activated complex, Derivation and use of Eyring equation, Thermodynamic aspects; reactions between ions, Dynamics of molecular collisions; reactive encounters, potential energy surfaces, attractive and repulsive surfaces, reaction trajectories.

Suggested Books

1Atkins, P.W. *Physical Chemistry (8th Ed.).* Oxford University Press, 2006 (Indian Print).

2. Engel, T. and Reid, P. *Physical Chemistry (1st Ed.).* Pearson Education, 2006.

3. Castellan, G. W. *Physical Chemistry (3rd Ed.).* Addison Wisley/Narosa, 1985. (Indian Print)

4. Barrow, G. M.*Physical Chemistry, (6th Ed.).* New York: McGraw Hill, 1996.

5. Silbey, R. J. Albert, R. A. and Bawendi, M.G. *Physical Chemistry, (4th Ed.).* New York: John Wiley, 2005.

.This syllabus has been designed as per national syllabus suggested by UGC and covers 20% extra syllabus as per requisite of honors degree.

DAV UNIVERSITY JALANDHAR

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass Marks
4	1	0	4	100	40

Course Title: Spectroscopy-I

Course Code: CHE207

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic of spectroscopy. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the spectroscopy and its applications. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Pure Rotational Spectra (12 Hrs)

Classification of molecules according to their moment of inertia. Rotational energy levels of hydrogen chloride. Determination of molecular geometry by rotational spectrum, isotopic substitution effects. Stark effect, Estimation of molecular dipole moments, Selection rules, Rotational Raman Spectra, anisotropic polarizabilty, specific selection rule in Raman Spectra, Stokes and anti – Stokes lines.

PART B

Vibrational Spectra (12 Hrs)

Diatomic molecules, Force constants, Fundamental vibration frequencies, anharmonicity of molecular vibrations and its effect on vibrational frequencies, second and higher harmonies. Frequencies of the vibrational transitions of HCl. Vibrational rotation spectra of CO. P, Q and R branches.

DAV UNIVERSITY JALANDHAR

PART C

Infrared and Raman Spectra (9 Hrs)

Vibrations of polyatomic molecules. Examples of CO_2, H_2O.Mechanics of measurement of infrared and Raman spectra absorption of common functional groups. Their dependence on chemical environment (bond order, conjugation, hydrogen bonding), the number of active infrared and Raman active lines. Fermi resonance, combination bands and overtones, complications due to interactions of vibrations of similar frequency. Application of IR in structure elucidation of organic compounds.

PART D

UV and Visible Spectroscopy (12 Hrs)

Measurement technique, Beer – Lambert's Law, molar extinction coefficient, oscillator strength and intensity of the electronic transition, Frank Condon Principle, Ground and first excited electronic states of diatomic molecules, relationship of potential energy curves to electronic spectra. Chromophores, auxochromes, electronic spectra of polyatomic molecules. Woodward rules forconjugated dienes, unsaturated carbonyl groups, extended conjugation. Red shift, blue shift, hypo and hyperchromic effects.

Suggested Books:

1. Drago,R.S.*Physical Methods in Chemistry.* Reinhold Publishing Corporation,1965.

2. Silverstein, R.M. Bassler,G.C. and Morrill, T.C. *Spectrometric Identification of Organic Compounds*. Wiley 1991.

3. Kemp, W. *Organic Spectroscopy*. Macmillan, 1987.

4. Dyer,J. R.*Application of Absorption Spectroscopy of Organic Compounds*. Prentice Hall, 1965.

5. Williams,D. H. and Fleming, I.*Spectroscopic Problems in Organic Chemistry*. McGraw Hill, 1967.

6.Banks,R.C.,Matjeka,E.R. and Mercer, G.*Introductory Problems in Spectroscopy*. Benjamin/Cummings, 1980.

7. Barrow, G.M. *Introduction to Molecular Spectroscopy.* McGraw Hill.

8. Banwell, C.N.*Fundamentals of Molecular Spectroscopy*. McGraw Hill,1966.

9. Pavia, D.L., Lampan and Kriz, G. S.*Introduction to Spectroscopy*. Hartcourt College Publishers, 2001.

This syllabus has been designed as per national syllabus suggested by UGC and covers 40% extra syllabus as per requisite of honors degree.

DAV UNIVERSITY JALANDHAR

Course Title: Mathematics for Chemists-III

Paper Code: MTH 261

Course Objective: This course provides a comprehensive understanding of the origin and development of ideas to exhibit the techniques of solving ordinary and partial differential equations.

UNIT-A **8 hours**

Integral calculus:

Integral calculus: double, triple integrals, determination of C.G. using double and triple integrals. Integration by trapezoidal and Simpson's rule.

UNIT-B **(8+7) hours**

Differential Equations:

Ordinary differential equations. Formation of differential equation, solution of linear differential equation of the first order and first degree. Solution of homogeneous and non-homogeneous differential equations with constant coefficient. The chemical application of the first differential equations.

Series solutions of Bessel and Legendre differential equations. Bessel function and Legendre Polynomials. Recurrence and orthognality relations, Rodrigue's Formulae.

UNIT-C **8hours**

Parital differential equations

Formation of partial differential equations. Solution by Charpit's Method. Solution of homogeneous partial differential equations with constant coefficients.

UNIT-D **(7+8) hours**

De-Moivre's theorem and its applications: Functions of complex variables. Analytic functions. C-R equations, complex line integral. Cauchy's integral theorem & Cauchy's integral formula. Taylor's theorem. Laurent's theorem. Cauchy's residue Theorem. Integration round unit circle.

Reference Books:

1. Grewal, B.S. *Higher Engineering Mathematics*. New Delhi: Khanna Publication, 2009
2. Kreyszig, Erwin.*Advanced Engineering Mathematics*. New Delhi: Wiley Eastern Ltd., 2003.
3. Jain, R K, and K Iyengar S R.*Advanced Engineering Mathematics*, New Delhi: Narosa Publishing House, 2003.
4. Thomas, George B. and Finney Ross L. *Calculus and Analytic Geometry*. New Delhi Addison Wesley, 1995.
5. Dence, Joseph B. *Mathematical Techniques in Chemistry*. New Delhi: Wiley, 1975

DAV UNIVERSITY JALANDHAR

Course Title: Organic Chemistry Lab -II

Course Code: CHE208

L	T	P	Credits	Marks	Pass marks
0	0	3	2	50	20

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Organic Chemistry Laboratory. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand the basic objective of experiments in organic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

A. Thin Layer and Column Chromatography

(a) Determination of Rf value and purity of organic compounds by use of thin layer chromatography.
(b) To analyze the analgesic drug APC by thin layer chromatography.
(c) Separation of o-nitroaniline and p-nitroaniline by column chromatography

B. Qualitative analysis

To perform qualitative analysis of single organic compound for identification of functional groups (hydrocarbons, aldehydes, ketones, phenols, carboxylic acids and derivatives, amines, amides, nitro compounds and carbohydrates).

C. Synthesis of Organic compounds

1. Acetylation of salicylic acid, aniline.
2. Preparation of m-dinitrobenzene from nitrobenzene.
3. Preparation of p-nitroacetaanilide from acetanilide.
4. Preparation of p-bromoacetanilide from acetanilide.
5. Preparation of benzoic acid from toluene/benzyl chloride.

Suggested Books

1. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J., Smith, P.W.G.,*Vogel's Text Book of Practical Organic Chemistry*,5th edition., Pubs: ELBS, 1989.
2. Pavia D.L., Lampanana G.M., Kriz G.S. Jr., *Introduction to Organic Laboratory Techniques*, 3rd edition, Pubs: Thomson Brooks/Cole, 2005.
3. F.G., Mann and Saunders, P.C.*Practical Organic Chemistry*, Green & Co. Ltd., London, 1978.
4. Svehla, G.*Vogel's Qualitative Inorganic Analysis (revised);* 7th edition, Pubs: Orient Longman, 1996.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass marks
0	0	3	2	50	20

Course Title: Inorganic Chemistry Lab -II

Course Code: CHE209

Time: 04 Hrs

Course Objectives:

This course is intended to learn the basic concepts of Inorganic Chemistry Laboratory. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand the basic objective of experiments in inorganic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

(1) **Acidimetry and Alkalimetry**

Determination of a mixture of carbonate and hydroxide.

(2) **Oxidation – Reduction Titrations:**

(a) $KMnO_4$ Titratons

(i) Standardization with sodium oxalate.

(ii) Determination of Fe(II)

(iii) Determination of Ca^{2+}

(iv) Determination of H_2O_2

(b) Ceric Sulphate Titrations:

(i) Standardization with Mohr's salt.

(ii) Determination of Cu(II)

(iii) Determination of nitrites.

(iv) Determination of oxalates.

(c) $K_2Cr_2O_7$ Titrations:

(i) Standardization with Fe(II)

(ii) Determination of ferric iron (Ferric ammonium sulphate).

(d) Iodometry and Iodimetry Titrations:

(i) Standardization of sodium thiosulphate with $K_2Cr_2O_7$ / KIO_3

(ii) Determination of Cu(II)

(iii) Determination of H_2O_2

(iv) Determination of available chlorine in bleaching powder.

(v) Standardization of I_2 with As_2O_3.

(vi) Determination of Sb(III).

(e) KIO_3 Titrations:

(i) Determination of copper.

(ii) Determination of hydrazine.

(3) **Precipitation Titrations**

(i) $AgNO_3$standardization by Mohr's method / by using absorption indicator.

(ii) Determination of chloride.

(iii) Determination of ammonium / potassium thiocyanate.

(iv) Volhard's method for chloride determination.

(v) Determination of ammonium / potassium thiocyanate.

(4) **Complexometric Titrations (EDTA)**

(i) Standardization of EDTA with $Pb(NO_3)_2$ / $ZnSO_4$. $7H_2O$

(ii) Determination of Mg^{2+}

(iii) Determination of Ca^{2+} (by substitution method).

(iv) Determination of total hardness of water (permanent and temporary).

(v) Determination of Ni^{2+} (back titration).

(vi) Determination of Cu^{2+} and Ni^{2+} by using masking reagent.

Suggested Books:

1. Svehla, G. and Sivasankar, B.*Vogel's Qualitative Inorganic Analysis (revised) (*7thEd). Pearson, 1996.

2. Bassett, J., Denney, R.C., Jeffery, G.H., Mendham, J., *Vogel's Textbook of Quantitative Inorganic Analysis (revised)(4th ed.).* Orient Longman, 1978.

3. Palmer, W. G. *Experimental Inorganic Chemistry*; (1st Ed.). Cambridge, 1954.

DAV UNIVERSITY JALANDHAR

Scheme of Courses B.Sc.
B.Sc. (Hons.) Chemistry

Semester 5

S No.	Paper Code	Course Title	L	T	P	C	% Weightage				E
							A	B	C	D	
1	CHE301	Organic Chemistry-V	4	1	0	4	25	25	25	25	100
2	CHE302	Inorganic Chemistry-IV	4	1	0	4	25	25	25	25	100
3	CHE303	Environmental Chemistry	4	1	0	4	25	25	25	25	100
4	PHY353	Mechanics and Waves	4	0	0	4	25	25	25	25	100
5	MTH360	Mathematics for Chemists-IV	4	0	0	4	25	25	25	25	100
6	CHE304	Physical Chemistry Lab-II	0	0	3	2	0	0	0	0	50
7	CHE305	Organic Chemistry Lab-III	0	0	3	2	0	0	0	0	50
8	PHY354	Mechanics and Waves Lab	0	0	4	2	0	0	0	0	50
			20	**3**	**10**	**26**					**650**

DAV UNIVERSITY JALANDHAR

A:Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY JALANDHAR

Course Title: Organic Chemistry-V (Reaction Mechanisms)

Course Code: CHE301

Time: 04 Hours

L	T	P	Credits	Marks	Pass marks
4	1	0	4	100	40

Course Objectives:

This course is intended to learn the basic concepts of Organic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Organic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Nature of Bonding in Organic Molecules (5 Hrs)

Aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons,

Huckel's rule, annulenes, anti-aromaticity, ψ -aromaticity, homo-aromaticity.

Reactive Intermediates: Structure and Reactivity (5 Hrs)

Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes and nitrenes.

PART B

Aliphatic Nucleophilic Substitution (12 Hrs)

The SN2, SN1, mixed SN1 and SN2 and SET mechanisms. The neighboring group mechanism, neighboring group participation by π and σ bonds, anchimeric assistance. Nucleophilicity and SN2 reactivity based on curve cross model. Classical and nonclassical carbocations, phenonium ions, norbornyl system, common carbocation rearrangements. Application of NMR spectroscopy in the detection of carbocations. The SNi mechanisum. Nucleophilic substitution at an allylic, aliphatic trigonal and a vinylic carbon. Reactivity effects of substrate structure, attacking

nucleophile, leaving group and reaction medium, phase transfer catalysis and ultrasound, ambident nucleophile, regioselectivity.

PART C

Aliphatic Electrophilic Substitution (5 Hrs)

Bimolecular mechanisms- SE2 and SE1. The SE1 mechanism, electrophilic substitution accompanied by double bond shifts. Effect of substrates, leaving group and the solvent polarity on the reactivity.

Aromatic Nucleophilic Substitution (6 Hrs)

The SNAr, SN1, benzyne an SRN1 mechanisms, Reactivity – effect of substrate structure, leaving group and attacking nucleophile. The von Richter, Sommelet-Hauser, and Smiles rearrangements.

PART D

Free Radical Reactions (6 Hrs)

Types of free radical reactions, free radical substitution mechanism, mechanism at an aromatic substrate, neighboring group assistance. Reactivity for aliphatic and aromatic substrates at a bridgehead. Reactivity in the attacking radicals. The effect of solvents on reactivity. Allylic halogenation (NBS), oxidation of aldehydes to carboxylic acids, auto-oxidation, coupling of alkynes and arylation of aromatic compounds by diazonium salts. Sandmeyer reaction. Free radical rearrangement. Hunsdiecker reaction.

Addition to Carbon-Carbon Multiple Bonds (6 Hrs)

Mechanistic and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, regio and chemoselectivity, orientation and reactivity. Addition to cyclopropane ring. Hydrogenation of double and triple bonds, hydrogenation of aromatic rings. Hydroboration. Michael reaction. Sharpless asymmetric epoxidation.

Suggested Books:

1. March,Jerry.*Advanced Organic Chemistry-Reactions, Mechanism and Structure*.John Wiley.

2. Carey, F.A. and sundberg,R.J. *Advanced Organic Chemistry*. Plenum.

3. AnslynEric V. and.Doughutes, D. A. *Modern Physical organic chemistry.* University Science Books, 2004.

4. Sykes, Peter.*A Guide Book to Mechanism in Organic Chemistry*. 1986, Longman.

5. Ingold, C.K. *Structure and Mechanism in Organic Chemistry*. Cornell University Press, 1954.

6.Morrison, R.N. and R.N. Boyd, *Organic Chemistry*. 7th edition, Pearson, 2011.

7. House,H.O. *Modern Synthetic Reactions*, Benjamin, 1965.

8. Norman, R.O.C. and Coxon, J.M. *Principles of Organic Synthesis.* Blackie Academic & Professional.

9. Mukherji, S.M. and Singh, S.P. *Reaction Mechanism in Organic Chemistry.* Macmillan, 1984.

This syllabus is as per national syllabus given by UGC and it covers 20% more syllabus than UGC model curriculum as per the requirement of honors course.

DAV UNIVERSITY JALANDHAR

Course Title: Inorganic Chemistry-IV

Course Code: CHE302

L	T	P	Credits	Marks	Pass marks
4	1	0	4	100	40

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Inorganic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Inorganic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Organometallics **(10 Hrs)**

Importance of organometallic chemistry in modern times: Definition and terminologies. Preparation of metal carbonyls, binary carbonyls, mixed metal polynuclear carbonyls, chemical reactions of metal carbonyls, structures of metal carbonyls (evidence from spectral and diffraction methods), bonding in linear M-C-O groups.

Metal carbonyls and related compounds

Fluxionality in metal carbonyls, Additional structural and bonding features, vibrational spectra of metal carbonyls, carbonylate anions and carbonyl hydrides, Chemical behavior of hydrido compounds.

DAV UNIVERSITY JALANDHAR

PART B

Bonding and Structure **(12 Hrs)**

Molecular hydrogen compounds, metal-hydrogen interactions with C-H groups, carbonyl halides, Metal nitrosyl compounds, nitrosyl carbonyls. Dinitrogen and dioxygen complexes, tertiary phosphines as ligand.

Aromatic complexes

Complexes with aromatic systems, cyclopentadiene complexes, Structure of cyclopentadiene-metal compounds. Metal-olefin complexes. Arene-metal compounds. Alkyne complexes.

Chemical reactivity

Coordinative unsaturation, Oxidative-addition reactions, Insertion reaction, Fluxional molecules and their Characterization.

PART C

General Properties and Magnetism **(10 Hrs)**

Definition, general characteristics and positions of transition elements in the periodic table, division into d and f block elements and electronic configurations of the atoms and ions, origin of parmagnetism, diamagnetism, magnetic susceptibility and magnetic moment from magnetic susceptibility, Guoy method to determine the magnetic susceptibility, ferromagnetism, antiferromagnetism.Electronic configuration of first transition series elements, comparative study of the first transition series elements with reference to atomic and ionic radii, ionization potential, redox potential, oxidation state diagram on the basis of redox potentials, Chemistry of scandium to copper with reference to relative stability of their oxidation states, magnetic and spectral properties.

PART D

Structures of Important Complexes **(12 Hrs)**

Structure of some important complexes of the first transition series (to be discussed in terms of coordination number, shape or oxidation states or nature of bonding), $Ti(NO_3)_4$, $TiCl_4(diars)_2$, $[Ti(Oet)_4]_4$, VF_5, $VO(acac)_2$ and nature of VO^{2+} bond, $[VOCl_3(NMe_3)_2]$, CrO_4^{2-}, $Cr_2O_7^{2-}$ $[CrO(O_2)_2Py]$, $[Cr(O_2)_2(bipy)]$, nature of metal, peroxo bond, $Cr_2(2\text{-acetate})_4$ and the nature of Cr-Cr bond in this complex, tetrameric $[Co(acac)_2]_4$, tetrahedral complexes being more common in case of cobalt, oxidation of Co(II), complexes by molecular O_2, $[Ni(acac)_2]_3$, $Ni(DMGH)_2$,

$[Ni(Me_6\text{-}acac)_2]$, $[Ni(MeSal)_2]$,$[Ni(CN)_5]^{3-}$, anomalous behavior of nickel(II)complexes, copper(II) acetate dihydrate, $[Cu(CN)_2]^{2-}$, cubane complexes $[CuXL]_4$ where X=halide and L=phosphine or arsine

Suggested Books:

1.Elschenbroich, C.*Organometallics.*Wiley VCH Verlag GmbH (2005).

2. Huheey,J.E. Keiter, E.A. and Keiter, R.L.*Inorganic Chemistry*.Singapore :Pearson Education, 1999.

3. Greenwood,N.N. and Earnshaw, A.*Chemistry of the Elements*. Pergamon Press.

4. Cotton,F.A. and Wilkinson, G.*Advanced Inorganic Chemistry*. John Wiley and Sons.

This syllabus has been designed as per national syllabus suggested by UGC and cover 20% extra syllabus as per requisite of honors degree.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass Marks
4	1	0	4	100	40

Course Title: Environmental Chemistry

Course Code: CH303

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Environmental Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of environmental chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

The Environment (2 Hrs)

Introduction, components, chemical and physical characteristics of the atmosphere, Environment pollution, classification of pollutants.

Air Pollution (8 Hrs)

Natural and anthropogenic air pollution, Sources and types of air pollutants, carbon oxides, sulfur compounds, nitrogen compounds, Hydrocarbons, and their derivatives particulate matter. Cause affect relationship between a pollutant and community Health problems, Health effect of criteria pollutants such as carbon monoxide, sulfur oxides, nitrogen oxides particulate matter, hydrocarbons, ozone, lead, Health effects of Hazardous air pollutants such as Be, Hg, Asbestos, vinyl chloride, Benzene. Analysis of air pollutant such as CO, SO_X, NO_X and particulate matters.

PART B

Water Pollution (15 Hrs)

Definition and types of water pollution, limits of various pollutants, water quality parameters. Physico-chemical analysis of water:- colour, Turbidity, total solids, total alkalinity and acidity as CaCO3, Dissolved oxygen (DO), BOD, COD, Analysis of anions and cations by recommended

technique. Waste-water treatment/sewage: Treatment and disposal. Primary, secondary and tertiary treatment of water.

PART C

Soil Pollution (15 Hrs)

Definition of soil, components, its function and formation, sources pollution: Chemical pesticides, disposal of industrial and domestic solid wastes on soils. Contamination with toxic inorganic compounds, Prevention and elimination of inorganic chemical contaminants, Advantages and disadvantages of organic wastes to soil.Soil Analysis, Sampling, site selection, method of collection and sample preparation. Determination of physical constants, determination of pH, electrical conductivity, calcium carbonate, water soluble salts, organic matter, N, P and K of the soil.

PART D

Toxicology (8Hrs)

Definition of toxicology, its history, scope and its literature, Dose-response relationship.Absorption, distribution and excretion of toxic materials. Toxicity of metal ions, (Pb, Hg, Al, Ni, As) organic toxicants such as Halogenated hydrocarbons, pesticides and solvents, Chemical Carcinogens.

Ecology (2 Hrs)

Introduction, scope, Ecosystem, bio-geochemical cycles, Homeostasis.

Suggested books:

1. Enger, E D. and Smith B.F. *Environmental Science- A study of interrelationships*. McGraw-Hill Higher Education.
2. Smith, R. L. *Ecology & Field Biology*.Harper-Collins Pub. 1996.
3. Peirce, J.J., Vesilind P.A. and Weiner R.F. *Environment Pollution & Control*. Elsevier Science.
4. Vanloon G.W. and Dufly S.J. *Environmental Chemistry-A Global Perspective*. Oxford University Press, 2000.
5. Odum, E.P. *Fundamental of Ecology*. Natraj Publishers, 1996.
6. Colin Baird, *Environmental Chemistry*.W.H. Freeman Co. New York, 2008.
7. Wayne, R.P. *Chemistry of Atmospheres.* Oxford University Press, 2000.

8. De, A.K. *Environment Chemistry*. Wiley Eastern, 2004.
9. Manahan, S.E. *Environmental Chemistry*. Lewis Publishers, 1994.
10. Hobbs, P.V. *Introduction to Atmospheric Chemistry.*Cambridge University Press, 2000.

This syllabus has been designed as per national syllabus suggested by UGC and covers 10% extra syllabus as per requisite of honors degree.

DAV UNIVERSITY JALANDHAR

Course Title: Mechanics and Waves

Course Code: PHY 353

L	T	P	Marks
4	0	0	100

Lectures 45

AIM

The aims and objectives of the course on the **Mechanics and Waves** of the students of B.Sc. (Hons) Chemistry and Mathematics is to acquaint them with the coordinate system, central force problem, simple harmonics motion as well furthering the idea of wave phenomena.

.

- The question paperforendsemesterexamination will have a weightage of 25%. It willconsistof100 objective questions of equal marks. Allquestionswill becompulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consistof 20 objective type, 5short questions/problemson the UGCNET(Objective type) pattern as well as one long answer type question. The student is expected toprovide reasoning/solution/workingfortheanswer. Thecandidateswill attemptall question. Choice will be given only in long answer type.Thequestionpaperis expected tocontainproblemstotheextent of40%of totalmarks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 2025 questions.
- Thebooksindicatedas textbook(s)aresuggestiveHowever, anyotherbookmaybefollowed

Unit I

LAWS OF MOTION (11):

Inertial reference frame, Newton's laws of motion, motion in uniform field, components of velocity and acceleration in different coordinate systems, uniformly rotating frame, fictitious force, Coriolis force and its applications.

Unit II

CENTRAL FORCES (11)

Conservative and Non-conservative forces, Two particle central force problem, reduced mass, equation of motion, conservation of linear and angular momenta, conservation of energy, Nature of motion under central force and differential equation of motion under central force, Kepler's laws.

Unit III

SIMPLE HARMONIC MOTION (11)

Simple harmonic motion, differential equation of S.H. M. and its solution, velocity and acceleration of S.H.M., Energy of a simple harmonic oscillator, examples of simple harmonic motion, similarities between electrical and mechanical oscillators.

Unit IV

WAVE MOTION (12)

Type of waves, the wave equation and its solution, Characteristic impedance of a string, Impedance matching, Reflection and transmission of energy, Reflected and transmitted energy coefficients, Standing waves on a string of fixed length, Energy of a vibrating string. Wave and group velocity their measurements.

Books:

1. Berkeley Physics Course (Vol. 1), Mechanics, E.M. Purcell (Ed), McGrawHill Publication.
2. The Feymman Lectures in Physics (Vol. 1), RP Feymman, RB Lighton and M Sands; BI Publications, Delhi
3. Fundamentals of Vibration and Waves, S.P. Puri, Tata McGraw Hill Company, New Delhi.
4. Physics for degree students, C.L. Arora and P.S. Hemne, S. Chand Company, New Delhi 2010.
5. Mechanics by D.C. Tayal, Himalayan Publishing House, Mumbai, 2013.
6. P.K. Srivastava: "Mechanics" (New Age International).

Course Title: Mathematics for Chemists-IV

DAV UNIVERSITY JALANDHAR

Paper Code: MTH 360

4	0	0	4	100

Course Objective: The aim of this course is to make the students acquire facility and confidence in the use of vectors and vector calculus so that they may employ the same in an effective manner to various applications.

UNIT-A **9HOURS**

Vectors Algebra:

Definition of vector and scalar. Scalar & Vector product of two vectors. Scalars triple product and vector triple product and their applications. Work done by a force, moment of a force about a point

UNIT-B **12HOURS**

Vectors Calculus:

Vector differentiation and integration of vectors. Vectors operators, Gradient, Divergence and Curl. Gauss, Stoke and Green's Theorem (Statement only) and their applications.

UNIT-C **12HOURS**

Laplace Transform:

Definition of elementary transforms, transforms of integrals and derivatives. Laplace transforms of periodic functions, inverse Laplace transforms of periodic functions. Solutions of ordinary differential equations and simultaneous differential equations using Laplace transforms.

UNIT-D **12HOURS**

Fourier Series:

Periodic Functions, Dirichlet Conditions, Fourier Series & Fourier coefficient, functions having arbitrary period, Sin and Cosine Series, half range expansions, Fourier integral (definitions), Harmonic Analysis.

Reference Books:

1. B.S. Grewal – Higher Engineering Mathematics.

2. Erwin Kreyszig-Higher Engineering Mathematics.

3. Joseph B, Dence-Mathematical Techniques in Chemistry.

4. B.L. Manocha and H.R. Choudhary – A text book of Engineering Mathematics.

5. Margenau Murphy – Mathematics for Physics and Chemists.

DAV UNIVERSITY JALANDHAR

Course Title: Physical Chemistry lab -II

Course Code: CHE304

L	T	P	Credits	Marks	Pass Marks
0	0	3	2	50	20

Time: 04 Hours

Course Objectives:

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (Hons.) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

Expected Prospective:

The students will be able to understand the basic objective of experiments in physical chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills.They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

1. Treatment of experimental data

Recording of experimental data. Significant number, accuracy and precision, error analysis.

2. Liquids and Solutions

(i) To determine surface tensions of solutions of amyl alcohol in water at different concentrations and to calculate surface excess.

(ii) To determine refractive index and molar refractivity of some organic liquids.

3. Thermochemistry

(i) To determine heat of neutralization of a strong acid by a strong base.

(ii) To determine heat of ionization of a weak acid from heat of neutralization.

4. Distribution Law

(i) To determine the equilibrium constant of the reaction I_2+KI =KI_3 by the partition method and the corresponding free energy change.

(ii) To determine distribution coefficient between water and a non-aqueous solvent of a solute which associates or dissociates in one of the solvents.

5. Phase Rule

(i) To construct a binary solid-liquid phase diagram by the cooling curve method.

(ii) Determine the eutectic temperature and eutectic composition.

6. Colorimetery

(i) To determine the composition of a complex by Job's method of continuous variations (Ferric-salicylate Complex)**/**

(ii) To titrate copper with EDTA photometrically.

7. pH metry

(i) To titrate a weak base against a strong acid and determine the ionization constant of the weak base.

8. Use of computational tools to plot and analyze data.

Suggested Books

1. Levitt, B.P., *Findlays Practical Physical Chemistry*. London & New York: LongmanGroup Ltd 1978.

2. Khosla, B.D., Garg, V.C. and Gulati, A., *Senior Practical Physical Chemistry*. New Delhi: R.Chand& Co., 2002.

3. Das, R.C. and Behra, B., *Experimental Physical Chemistry.* Tata McGraw Hill Publishing Co. Ltd. 1983.

4. SvehlaG.,*Vogel's Qualitative Inorganic Analysis (revised).* New Delhi: OrientLongman, (1987).

5**.** Christian G.D.*Analytical Chemistry*. John Wiley & Sons Inc

6. Bassett, J., Denney, R.C., Jeffery, G.H. and Mendham, J., *Vogel's Textbook of Quantitative Inorganic Analysis (revised).*Orient Longman, 1978.

7. Fifield, F.W. and Kealey D., *Principles and Practice of Analytical Chemistry.*Blackwell Science, 2000.

This syllabus has been designed as per national syllabus suggested by UGC and covers 10% extra syllabus as per requisite of honors degree.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks
0	0	3	2	50

Course Title: Organic Chemistry Lab -III

Course Code: CHE305

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of organic synthesis. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand synthesis in organic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

1. Synthesis of adipic acid starting from cyclohexanol.
2. Synthesis of p-nitroacetanilide from acetanilide.
3. Synthesis of p-bromoaniline by bromination of acetanilide and subsequent hydrolysis.
4. Isolation of caffeine from tea leaves.
5. Synthesis of aniline from nitrobenzene.
6. Synthesis of 2-phenylindole by Fischer indole synthesis approach.
7. Synthesis of diethylbarbituric acid from diethyl malonate.
8. Synthesis of Fluorescein.
9. Cannizzaro reaction of 4-chlorobenzoic acid.
10. Synthesis of ethyl benzoate from benzoic acid.
11. Reduction of 3-nitroacetophenone using i) $NaBH_4$ ii) using Sn and HCl
12. Preparation of oil of Wintergreen from commercial aspirin tablets

Suggested Books:

1. Vogel,A.I.*Vogels Text book of Practical Organic Chemistry*. Prentice Hall.

2. Adams,R. Johnson, J.R. and C.F. Wilcox, *Laboratory Experiments in Organic Chemistry*.the Macmilan Limited, London, 1978.

3. Vogel,A.I.*ElementaryPractical Organic Chemistry Part III.Quantitative Organic Analysis*. Pearson.

DAV UNIVERSITY JALANDHAR

Course Title: Mechanics and Waves Lab

L	T	P	Credits	Marks
0	0	4	2	50

Course Code: PHY 354

Max. Marks: 50

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note:

- Students are expected to perform at least eighteen experiments out of following list. Theexperimentsperformedin firstsemestercannotbe repeatedinsecond Semester.
- Theexaminationforboththecourseswill beof3hoursduration.
- Total marks of practical will include 20% weightage of Continuous Assessment and 80% end semester exam including Notebook / Viva / Performance/ written test**.**

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results

1. Use of Vernier callipers, Screw gauge, Spherometer, Barometer,Sphygmomanometer, Lightmeter, dry and wet thermometer, TDS/conductivity meterand other measuringinstruments based on applications of the experiments. Use ofPlumb line and Spirit level.
2. To analyse the given experimental Data by using the least squares curve fitting and the knowledge of straight line fitting of the experimental data. Also determine the standard deviation and their use in expressing the experimental results. (Note: To achieve these objectives on a sample data of some experiment to be decided by the teacher concerned.)
3. To study the variation of time period with distance between centre of suspension and centre of gravity for a bar pendulum and to determine:

(i) Radius of gyration of bar about an axis through its C.G. and perpendicular toits length.
(ii) The value of g in the laboratory.

4. Determination of acceleration due to gravity ‘g’ by Kater's pendulum method.
5. To study moment of inertia of a flywheel.
6. Determination of height (of inaccessible structure) using sextant.
7. To determine the Young's modulus by (i) bending of beam using travelingmicroscope/laser, (ii) Flexural vibrations of a bar.
8. To study one dimensional collision using two hanging spheres of differentmaterials.
9. To study the magnetic field produced by a current carrying solenoid using a pickupcoil/Hall sensor and to find the value of permeability of air.
10. To determine the frequency of A.C. mains using sonometer.
11. To study C.R.O. as display and measuring device by recording sines and squarewaves, output from a rectifier, verification (qualitative) of law of electromagneticinduction and frequency of A.C. mains.
12. To measure thermo e.m.f. of a thermocouple as a function of temperature and findinversion temperature.
13. Determination of given inductance by Anderson's bridge.
14. To determine the value of an air capacitance by deSauty Method and to findpermittivity of air. Also, determine the dielectric constant of a liquid.
15. Study of R.C. circuit with a low frequency a.c. source.
16. Studies based on LCR Board: Impedance of LCR circuit and the phase and between voltage and current.
17. To measure low resistance by Kelvin’s double bridge/ Carey Foster’s bridge.

18. To study the basic ideas of equal a priori probability, law of two independent events, and probability distribution of identical particles in two compartments for a two option system using coloured dice.

DAV UNIVERSITY JALANDHAR

Scheme of Courses B.Sc.
B.Sc. (Hons.) Chemistry

S No.	Paper Code	Course Title	L	T	P	C	% Weightage				E
							A	B	C	D	
1	CHE306	Organic Chemistry-VI	4	1	0	4	25	25	25	25	100
2	CHE307	Inorganic Chemistry-V	4	1	0	4	25	25	25	25	100
3	CHE308	Physical Chemistry-V	4	1	0	4	25	25	25	25	100

Semester 6

4	CHE309	Spectroscopy -II	4	1	0	4	25	25	25	25	100
5	CHE310	Analytical Chemistry	4	1	0	4	25	25	25	25	100
6	CHE311	Physical Chemistry Lab-III	0	0	3	2	0	0	0	0	50
7	CHE312	Inorganic Chemistry Lab-III	0	0	3	2	0	0	0	0	50
8		Seminar					0	0	0	0	#
			20	**5**	**6**	**24**					**600**

#Satisfactory/ Unsatisfactory

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass Marks
4	1	0	4	100	40

Course Title: Organic Chemistry-VI

Course Code: CHE306

Time: 04 Hours

Course Objectives:

This course is intended to learn the advance Organic Chemistry about heterocyclic compounds, photochemistry and Pericyclic reactions. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the heterocyclic chemistry, photochemistry and Pericyclic reactions. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Nomenclature of Heterocycles (5 Hrs)

Replacement and systematic nomenclature (Hantzsch-Widman system) for monocyclic, fused and bridged heterocycles.

Aromatic Heterocycles (6 Hrs)

Aromatic resonance energy, structure of six-membered heteroaromatic systems (pyridine, diazines, pyridones and pyrones), structure of five-membered heteroaromatic systems (pyrrole, thiophene, furan, azoles), bicyclic heteroaromatic compounds. Heteroaromatic reactivity and tautomerism in aromatic heterocycles

PART B

Non-aromatic Heterocycles (6 Hrs)

Strain – bond angle and torsional strains and their consequences in small ring heterocycles. Conformation of six-membered heterocycles with reference to molecular geometry, barrier to ring inversion, pyramidal inversion and 1, 3-diaxial interaction. Stereo-electronic effect –

anomeric and related effects. Attractive interactions – hydrogen bonding and intermolecular nucleophilic-electrophilic interactions.

Heterocyclic Synthesis (5 Hrs)

Principles of heterocyclic synthesis involving cyclization and cycloaddition reactions.

PART C

Photochemistry (11 Hrs)

General principles about light absorption, electronic transition, Jablonski diagram, inter-system crossing singlet and triplet states, Quantum yield. Brief introduction and description of photochemical reactions of simple carbonyl compounds, alkenes and aromatic compounds, Barton Reaction, Hofmann-Loffler-Freytag reaction.

PART D

Concerted reactions, unimolecular rearrangement and elimination (12 Hrs)

Electrocyclic sigmatropic and cycloaddition reactions, Correlation diagrams and FMO theory. Diels-Alder reactions, general feature, Dienophiles, Dienes (2+2) cycloadditions, Cope and Claisen rearrangement, Ene reaction.

Suggested Books:

1. Newkome, G.R. and Paudler, W.W. *Contemporary Heterocyclic Chemistry.* Wiley-Interscience.

2. Acheson, R.M. *An Introduction to Heterocyclic Compounds*. John Wiley, 1976.

3. Carey F.A. and Sundoerg R.J., *Advance Organic Chemistry.* Part A and PartBNew York:Plenum Press, 1984.

This syllabus is as per national syllabus given by UGC and it covers 20% more syllabus than UGC model curriculum as per the requirement of honors course.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass marks
4	1	0	4	100	40

Course Title: Inorganic Chemistry-V

Course Code: CHE307

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Inorganic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Inorganic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Symmetry and group theory (12 Hrs)

Symmetry elements and symmetry operations, point groups, definitions of group, subgroup relation between orders of a finite group and its subgroup; group multiplication tables, Schoenflies symbols, Representation of groups character of a representation.

Properties of irreducible representations, the great orthogonality theorem (without proof) and its importance. Character Tables, Symmetry criteria for optical activity, Symmetry restrictions on dipole moment, Hybridization schemes of orbitals.

PART B

Orbital Wave Functions (12 Hrs)

Wave function and shapes of imaginary and real s, p,d and f orbital (cubic and general set in case of f orbitals), Z – component of orbital angular momentum, vector, imaginary and real d orbitals.

Crystal field theory

the qualitative picture of the crystal field effects in tetrahedral, square planar, octahedral, tetragonal, square pyramidal cases, pairing energy, factors affecting the CFSE, the use of crystal

field theory in explaining magnetic properties of transition metal complexes, the thermodynamic effects of the crystal field splitting, the structural consequences of CFSE, the nephalauxetic effect of the spectrochemical series, the limitation of the crystal field theory, the ligand field theory, the jahn theorem and its uses in explaining the distortions in the structures of electrically degenerate system, the molecular orbital treatment of the octahedral, tetrahedral and square planar complexes (qualitative picture only), the comparison of the VBT, CFT and MOT picture of bonding in case of transition metal complexes, the angular overlap model.

PART C

Thermodynamic effects of crystal field splitting (10Hrs)

Enthalpies of hydration of M_2^+ ions, lattice energies of MCl_2 compounds, etc. Evidence of covalence and adjusted crystal field theory. Molecular orbital treatment of octahedral complexes and bonding; complexes with no bonding and complexes with bonding. Molecular orbital diagrams for tetrahedral and square planar complexes.

PART D

Interelectronic Repulsions (12Hrs)

Spin-spin, orbital-orbital and spin orbital coupling, LS and jj coupling schemes,determination of all the spectroscopic terms of p^n, d^n ions, determination of the ground state terms for p^n, d^n, f^n ions using L.S. scheme, determination of total degeneracy of terms, order of interelectronic repulsions and crystal field strength in various fields, two type of electron repulsion parameters, term wave functions, Bra and Ket notation, spin orbit coupling parameters, energy separation between different j states.

Suggested Books:

1. Figgis, B.N. *Introduction to Ligand Field*, Wiley Eastern.

2. Lever,A.B.P. *Inorganic Electronic Spectroscopy*, Elsevier.

3. Earnshaw,A.*Introduction to Magnetochemistry*, Academic Press.

4. Huheey, J.E. *Inorganic Chemistry Principles of Structure and Reactivity.* Harper Inter-Science.

5. Drago, R.S. *Physical Method in Chemistry.* W.B. Saunders Company.

6. Cotton, F.A. and Wilkinson,G. *Advanced Inorganic Chemistry.* Wiley Inter-science.

7. Cotton, F.A. *Chemical Application of Group Theory.* Wiley Eastern.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass Marks
4	1	0	4	100	40

Course Title: Physical Chemistry- V

Course Code: CHE308

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Physical Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of physical chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Nuclear Chemistry (6 Hrs)

Introduction to atomic nucleus, size and shape, magnetic effects due to orbiting and spinning of nucleus, nuclear stability; Liquid drop model and shell model, Introduction to Nuclear Reactions, Nuclear fission-fusion and Nuclear energy, isotopes.

Isotopes (5Hrs)

Their separation and applications, Nuclear forces, nuclear binding energy, stability of nucleus, energy changes in nuclear reactions, Bethe notation, nuclear fission and fusion. Uses of nuclear radiations (radiation, sterilization, radiation energy for chemical synthesis), Radio isotopes as a source of electricity

PART B

Surface and Colloids Chemistry (10 Hrs)

Adsorption- Langmuir and Freundlich isotherms, Multi-layer adsorption-BET equation (no derivation) and its application to surface area measurement. Sols (reversible and irreversible), emulsions and emulsifiers, association colloids (micelles), gels, Applications of colloids.

PART C

X-ray diffraction (12 Hrs)

Definition of space lattice, unit cell. Miller indices, Symmetry elements in crystals – X ray diffraction by crystals, Bragg equation, Dimension and contents of unit cell, Structural information from the physical properties of crystals.

Diffraction techniques

Scattering factors, Powder diffraction methods. Information from X-ray analysis. Neutron and electron diffraction and their applications.

PART D

Elementary Quantum Chemistry (20 Hrs)

Historical background, classical ideas of energy and particle trajectory. Black body radiation and Planck's hypothesis of quantization of energy, photoelectric effect. Line spectra of atoms, diffraction of electrons, wave particle duality. De Broglie's relation Heisenberg's uncertainty principle. Schrödinger-wave equation, concept of wave function (y) physical significance of y and y 2, normalization of y constraints on y. Free particle, particle in a one dimensional box, translational energy, energy levels, quantization of energy, wave functions for particle in a box, comparison with classical theory, concepts of orthogonality and orthonormality, Kronecker delta. Particle in a three dimensional box, cubical box and concept of degeneracy of energy levels, Operators, definitions, linear operators, Eigen value operators, operators for various observables, concept of Hermitian operators, orthogonality. Postulates of quantum mechanics, time dependent Schrödinger equation, expectation, values, and applications of particle in a box model.

Suggested Books:

1. Atkins P.W.*Physical Chemistry*. Oxford University Press, 2002.

2. Levine I. N.*Physical Chemistry*. Pearson Education1988.

3. Billmeyer, *Textbook of Polymer Science*.Wiley Interscience, 1977.

4. Friedlander G., Kennedy J.W., Macias E.S. and Miller J.M. *Nuclear and Radiochemistry*. John Wiley and Sons, 1981.

5. Arnikar H.J.*Essentials of Nuclear Chemistry*. Wiley Eastern Limited, 1987.

6. Adamson A.W.*Physical Chemistry of Surfaces.* John Wiley & Sons, 1982.

7. Castellan G.W.*Physical Chemistry*.Addison Wisley/Narosa, 1985.

8. Barrow G. M.*Physical Chemistry.*New York :McGraw Hill, 1996.

9. Sood D. D., Reddy A.V.R. and Ramamoorthy N.*Fundamentals of Radiochemistry*. Indian Association of Nuclear Chemists and Allied Scientists, 2004.

DAV UNIVERSITY JALANDHAR

Course Title: Spectroscopy-II

Course Code: CHE309

Time: 04 Hours

L	T	P	Credits	Marks	Pass marks
4	1	0	4	100	40

Course Objectives:

This course is intended to learn advance spectroscopy. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the advance spectroscopy and its applications. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

General Features of Spectroscopy (5 Hrs)

Units and conversion factors. Introduction to spectroscopy, Nature of radiation. Energies of corresponding to various kinds of radiation, Experimental techniques, intensities of spectral lines, Selection rules and transition moments, Line widths, Broadening.

PART B

Nuclear Magnetic Resonance Spectroscopy (25 Hrs)

The nuclear spin, precessional motion, Larmor frequency, the NMR isotopes, population of nuclear spin levels, spin – spin and spin – lattice relaxation, measurement techniques (CW and FT methods). Solvent used, Chemical Shift, shielding constant, range of typical chemical shifts simple applications of chemical shift, ring currents and aromaticity, inductive effect, ring current effect and anisotropy chemical bonds, intermolecular forces affecting the chemical shifts. Spin – spin interactions, low and high resolution NMR spectra, splitting due to vicinal and germinal protons, long range coupling, nuclear magnetic double resonance, nuclear overhauser Effect (NOE), and applications.

DAV UNIVERSITY JALANDHAR

PART C

Mass Spectra(15 Hrs)

Introduction, methods of ionization E1 & C1, Laser desorption, Fast Atom Bombardment (FAB). Secondary Ion Mass Spectrometry (SIMS), field desorption etc. Ion analysis methods (in brief), isotope abundance, Metastable ions, Electron Impact mass spectra, fragmentation patterns for aliphatic compounds, amines, aldehydes, ketones, esters, amides, nitriles, carboxylic acids ethers, aromatic compounds, general rules predicting the fragmentation patterns.

Suggested Books:

1. Drago,R.S. *Physical Methods in Chemistry.* Reinhold Publishing Corporation, 1965.
2. Silverstein, R.M. Bassler,G.C. and Morrill, T.C. *Spectrometric Identification of Organic Compounds*. Wiley 1991.
3. Kemp, W. *Organic Spectroscopy*. Macmillan, 1987.
4. Dyer,J. R.*Application of Absorption Spectroscopy of Organic Compounds*. Prentice Hall, 1965.
5. Williams,D. H. and Fleming, I.*Spectroscopic Problems in Organic Chemistry*. McGraw Hill, 1967.
6.Banks,R.C., Matjeka, E.R. and Mercer, G.*Introductory Problems in Spectroscopy*. Benjamin/Cummings, 1980.
7. Barrow, G.M. *Introduction to Molecular Spectroscopy.* McGraw Hill.
8. Banwell, C.N.*Fundamentals of Molecular Spectroscopy*. McGraw Hill, 1966.
9. Pavia, D.L., Lampan and Kriz, G. S.*Introduction to Spectroscopy*. Hartcourt College Publishers, 2001.

This syllabus is as per national syllabus given by UGC and it covers 20% more syllabus than UGC model curriculum as per the requirement of honors course.

DAV UNIVERSITY JALANDHAR

Course Title: Analytical Chemistry

Course Code: CHE310

Time: 04 Hours

L	T	P	Credits	Marks	Pass marks
4	1	0	4	100	40

Course Objectives:

This course is intended to learn the basic concepts of Analytical Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the postgraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of analytical chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following post-graduation in the course.

PART A

Elementary concepts (10Hrs)

Qualitative and quantitative analysis, concepts important to quantitative analysis, classification of methods for quantitative analysis, choice of method for analysis, sampling and theories of sampling. Preparation of samples for analysis, calibration standards, solution concentration in terms of various conventions, simple equilibrium calculations, calibration of analytical weights and glass wares, significance of calibration.

Acid-Base Equilibria

Preparation of standard solutions of acids and bases, mono and poly functional
acids and bases and their pH titration curves, typical applications of neutralization titrations in elemental analysis and determination of inorganic salts in mixtures like mixtures of carbonates with hydroxides and bicarbonates.

PART B

Precipitation Equilibria (10Hrs)

Solubility of precipitates, effect of competing equilibria on solubility ofprecipitates, separation of ions by control of concentration of precipitatingreagents, effect of electrolyte concentration on

solubility, solubility product andanalytical calculations based on it. The Volhard and the Mohr's methods ofanalysis, adsorption indicators

Complexation Equilibrium

Complexation, Formation constants, EDTA equilibria, effect of pH on EDTAequilibria, complexometric titration curves. Use of indicators, Applications ofcomplexometric equilibria.

PART C

Chromatographic Methods (12Hrs)

Principles, classification of chromatographic techniques, Column chromatography techniques, Band shapes and band broadening, Optimization of column performance, size exclusion chromatography, applications of ion-exchange chromatography. Paper and thin layer chromatography.

PART D

Solvent Extraction and Ion-Exchange Separation (11Hrs)

Basic principles of solvent extraction, solvent extraction of metals, extractionprocess, separation efficiency of metal chelates, ion-exchange processes, ion exchange resins, techniques and applications of ion-exchange separation.

Atomic Spectrometric Methods

Emission spectroscopy, Flame emission spectrometry, Plasma emissionspectrometry, Distribution between ground and excited states, Atomic absorption spectrophotometry.

Suggested Books:

1. Christian G.D. *Analytical Chemistry*. John Wiley, 1994.

2. Skoog, D.A., West, D.M., Holler,F.J.and Crouch, S.R.*Fundamentals of AnalyticalChemistry*. Brooks/Cole, 2004.

3. Skoog, D.A. *Principles of Instrumental Analysis.* Holt-Saunders International edition, 1985.

4. Bassett, J., Denney, R.C., Jeffery, G.H., Mendham, J.*Vogel's Textbook ofQuantitative Inorganic Analysis (revised)*. Orient Longman, 1978.

5. Willard H.H., Merritt L.L. Jr, Dean J.A., and Settle F.A. Jr*., Instrumental Methods of Analysis*.California:Wadsworth Publishing Company, 1988.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks	Pass Marks
0	0	3	2	50	20

Course Title: PHYSICAL CHEMISTRY LAB -III

Course Code: CHE311

Time: 04 Hours

Course Objectives:

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (Hons.) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

Expected Prospective:

The students will be able to understand the basic objective of experiments in physical chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

I Conductometry

1. To study the effect of concentration of electrolyte on specific and molar conductance of a strong and weak electrolyte.

2. Determination of degree of dissociation and dissociation constant of weak acid.

3. Conductometeric titration of a strong acid, a weak acid, mixture of a strong and weak acid and a dibasic acid with alkali.

4. To compare the relative strengths of weak acids like acetic acid and monochloroacetic acid by conductivity measurements.

5. To verify Debye-Huckel Onsager equation.

II. Potentiometry

1. Potentiometric titration of monobasic acids (HC & CH3 COOH) with NaOH.

2. Determination of mean ionic activity coefficients of hydrochloric acid at different concentrations.

3. To study the effect of ionic strength on mean ionic activity coefficient of hydrochloric acid in a given solution and verify Debye-Huckel limiting law.

III. Polarimetry

1. To determine the specific and molecular rotations of an optically active substance.

2. To determine the composition of an unknown solution with a polarimeter.

IV. Chemical Kinetics

1. To study the kinetics of hydrolysis of methyl acetate in the presence of hydrochloric acid.

2. To study the effect of ionic strength (primary salt effect) on the kinetics of a reduction of toluidine blue with sodium sulfite.

V. Determination of Molecular Masses by Cryoscopy

1. To determine the molecular weight of a non-volatile substances by a cryoscopic method.

VI. Dipole-Metery

1. To determine the dielectric constant of an unknown liquid.

2. To determine the dipole moment of a polar substance in solution.

Suggested Books

1. Levitt, B.P., *Findlays Practical Physical Chemistry*. London & New York: LongmanGroup Ltd 1978.
2. Khosla, B.D., Garg, V.C. and Gulati, A., *Senior Practical Physical Chemistry*. New Delhi: R.Chand& Co., 2002.
3. Das, R.C. and Behra, B., *Experimental Physical Chemistry.* Tata McGraw Hill Publishing Co. Ltd. 1983.

4. SvehlaG.,*Vogel's Qualitative Inorganic Analysis (revised)*. New Delhi: OrientLongman, (1987).

5.Christian G.D.*Analytical Chemistry*. John Wiley & Sons Inc

This syllabus has been designed as per national syllabus suggested by UGC and covers 10% extra syllabus as per requisite of honors degree

DAV UNIVERSITY JALANDHAR

Course Title: Inorganic Chemistry Lab -III

Course Code: CHE312

Time: 04 Hrs

L	T	P	Credits	Marks	Pass marks
0	0	3	2	50	20

Course Objectives:

This course is intended to learn the basic concepts of Inorganic Chemistry Laboratory. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand the basic objective of experiments in inorganic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

Quantitative Gravimetric Analysis

1. Determine nickel (II) in a given sample gravimetrically using dimethylglyoxime.
2. Determine copper (II) in a given sample gravimetrically using ammonium/sodium thiocyanate.
3. Estimate the iron as its ferric oxide from a given solution of ferrous ammonium sulphate gravimetrically.
4. Estimate chromium (III) as its lead chromate.
5. Estimate lead as its lead molybdate gravimetrically.
6. Estimate cobalt as mercury tetraisothiocyanatocobalt (II) $[HgCo(NCS)_4]_n$.
7. Determine silver (I) as its chloride gravimetrically.
8. Determine barium (II) as its chromate gravimetrically.
9. Determine cadmium (II) as $[Cd(C_5H_5N)_2(SCN)_2]$ gravimetrically.

Book: 1. Svehla,G. and Sivasankar, B.*Vogel's Qualitative Inorganic Analysis*. Pearson, 1996.