DAV UNIVERSITY JALANDHAR

DAV University, Jalandhar

Department of Chemistry

Proposed Syllabus for

M.Sc. (Hons.) Chemistry

(Semester I – IV)

Batch 2013

DAV UNIVERSITY JALANDHAR

Scheme of Courses M.Sc. (Program ID-39)

M.Sc. (Hons.) Chemistry

Semester 1

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	CHE501	Organic Chemistry-I	4	1	0	4	25	25	25	25	100
2	CHE502	Inorganic Chemistry-I	4	1	0	4	25	25	25	25	100
3	CHE503	Physical Chemistry-I	4	1	0	4	25	25	25	25	100
4	CHE504	Analytical Chemistry	4	1	0	4	25	25	25	25	100
5	CSA551	Computer Fundamental & Office Automation	4	0	0	3	25	25	25	25	75
6	CHE505	Organic Chemistry Lab-I	0	0	4	2	0	0	0	0	50
7	CHE506	Inorganic Chemistry Lab-I	0	0	4	2	0	0	0	0	50
8	CSA553	Office automation Lab	0	0	2	1	0	0	0	0	25
			20	**4**	**10**	**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

Course Title: Organic Chemistry-I

Course Code: CHE501

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 postgraduate 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 post-graduation in the course.

PART A

Nature of Bonding in Organic molecules (6Hrs)

Delocalized chemical bonding, conjugation, cross conjugation, resonance, hyperconjugation, tautomerism. Aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons, Huckel's rule, energy level of p-molecular orbitals, annulenes, antiaromaticity, homo-aromaticity, PMO approach.

Reaction Mechanism: Structure and Reactivity (6Hrs)

Types of mechanisms, types of reactions, thermodynamic and kinetic requirements, kinetic and thermodynamic control, Hammond's postulate, Curtin-Hammett principle. Potential energy diagrams, transition states and intermediates, methods of determining mechanisms, isotope effects. Hard and soft acids and bases. Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes and nitrenes. Effect of structure on reactivity. The Hammett equation and linear free energy relationship, substituent and reaction constants. Taft equation.

PART B

Aliphatic Nucleophilic Substitution (6Hrs)

The SN2, SN1, mixed SN1 and SN2 and SET mechanism. The neighboring group mechanism, The Neighboring group participation by π & σ bonds, anchimeric assistance, classical and non-classical carbocations, phenonium ions, norbornyl system, carbocation rearrangements in neighboring group participation. SNi mechanism, Nucleophilic Substitution at an allylic, aliphatic trigonal and vinylic carbon. Reactivity effects of structure, attacking Nucleophile, leaving group and reaction medium, Phase transfer catalyst, ambident nucleophile and regioselectivity.

Aromatic Nucleophilic Substitution (4Hrs)

The SNAr, SN1 Benzyne and SNR1, Mechanisms, Reactivity effect of substrate structure, leaving group and attacking nucleophile.

Elimination reactions (4Hrs)

E2, E1, E1cb Mechanisms, Orientation, stereochemistry in elimination, reactivity effect of structure attacking and leaving groups, competition between substitution & elimination , syn eliminations.

PART C

Aliphatic Electrophilic Substitution (4Hrs)

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

Aromatic Electrophilic Substitution (6Hrs)

The arenium ion mechanism, orientation and reactivity, energy profile diagram, The ortho/ para ratio ipso attack, orientation in other ring systems, Naphthalene, Anthracene, Six and five membered heterocycles, Diazonium coupling Vilsmeier reaction, Gattermann – Koch reaction, etc.

PART D

Stereochemistry (12Hrs)

Chirality, elements of symmetry, molecules with more than one chiral centre, diastereomerism. Determination of relative and absolute configuration (octant rule excluded) with special reference to lactic acid, alanine & mandelic acid. Methods of resolution, optical purity, prochirality, enantiotopic and diastereotopic atoms, groups and faces, R / S, E / Z nomenclature, asymmetric synthesis, cram's rule and its modifications, prelog's rule, conformational analysis of cycloalkanes (up to six membered rings), decalins, conformations of sugars, optical activity in absence of chiral carbon (biphenyls, allenes and spiranes), chirality due to helical shape, geometrical isomerism in alkenes and oximes, methods of determining the configuration.

Suggested Books:

1. March, Jerry.*Advanced Organic Chemistry: Reactions, Mechanism and Structure*, John Wiley, 6th edition, 2007.
2. Carry, F. A. and Sundberg, R.J. *Advanced Organic Chemistry*, Plenum,3rd edition, 1990.
3. Sykes, Peter.*A Guide Book to mechanism in Organic Chemistry*, Longman,6th edition, 1989.
4. Morrison, R. T. and Boyd, R. N. *Organic Chemistry*, Prentice Hall, 6th edition, 1992.
5. Kalsi, P. S. *Organic Reactions and their Mechanisms*, New Age International Publishers,2nd edition, 2000.
6. Mukherji, S.M. and Singh, S.P. *Reactions Mechanism in Chemistry*, Vol. I, II, III, Macmillan, 1985.
7. Nasipuri, D. *Stereochemistry of Organic Compounds*, New Age International Publishers,2nd edition, 1994.
8. Kalsi, P.S. *Stereochemistry of Organic Compounds*, New Age International, 2nd edition, 1993. Kalsi, P.S. *Stereochemistry: Conformation and Mechanism,*Wiley Eastern Limited, 2nd edition, 1993.

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 Hons course.

DAV UNIVERSITY JALANDHAR

Course Title: Inorganic Chemistry –I (Transition Metal Chemistry)

Course Code: CHE502

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 postgraduate 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 post-graduation in the course.

PART A

Symmetry **(13 Hrs)**

Symmetry elements, symmetry operations and their matrix representation, group postulates and types, multiplication tables, point group determination, determination of reducible and irreducible representations, character tables, construction of character tables for C_{2v}, C_{3v}, use of symmetry in obtaining symmetry of orbitals in molecules, qualitative splitting of s, p, d, f orbitals in octahedral, tetrahedral and square planar fields using character tables and without the use of character tables.

Molecular Orbital Theory for Metal Complexes

Ligands symmetry orbitals and metal orbitals involved in molecular orbitals formation in octahedral complexes, MOEL diagrams for octahedral tetrahedral and square planar complexes showing σ and π bonding in transition metal complexes.

PART B

Interelectronic Repulsions **(10 Hrs)**

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, spin orbit coupling parameters (λ) energy separation between different j states, The effect of octahedral and tetrahedral fields on S, P, D and F terms (with help of the character table). Splitting patterns of and G, H and I terms

PART C

Free Ions in Medium and Strong Crystal Fields (12 Hrs)

Strong field configurations, transition from weak to strong crystal fields, evaluation of strong crystal field terms of d^2 configuration in octahedral and tetrahedral crystal fields (using group theory), construction of the correlation energy level diagrams of d^2 configuration in octahedral field, study of energy level diagrams for higher configurations, selection rules of electronic transitions in transition metal complexes, their proof using group theory, relaxation of the selection rule in Centro symmetric and non-centro symmetric molecules, Orgel diagrams, Tanabe Sugano diagrams, calculation of 10Dq and B with use of Orgel and Tanabe Sugano diagrams, quenching of orbitals angular momentum by ligand field.

PART D

Electronic Spectra of Transition Metal Complexes (12 Hrs)

Variation of the Racah parameter, nephlauxetic effect -central field covalency, symmetry restricted covalency, differential radial expansion, spectrochemical series, band intensities, factors influencing band widths, Magnetic properties of transition metal ions and free ions presentive, Effects of L-S coupling on magnetic properties, Temperature independent paramagnetism (TIP) in terms of crystal field theory CFT and molecular orbital theory (MOT), Quenching of orbital angular momentum by crystal fields in complexes in terms of term-splitting. Effect of spin-orbit coupling and A, E & T statesmixing, first order and second order Zeeman effects, Spin paired and spin-free equilibria in complexes magnetic properties of polynuclear complexes involving OH, NH_2 and CN bridges.

Suggested Books:

1.Cotton, F.A. *Chemical Application of Group Theory*,Wiley Eastern,3rd edition.

2. Miessler,G. L.and Tarr, D. A. *Inorganic Chemistry,*Pearson Education,3rd edition.

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

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

5. Huheey,J.E. *Inorganic Chemistry Principles of Structure and Reactivity,* Harper Interscience.

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

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

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

Course Title: Physical Chemistry I

Course Code: CHE503

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

Time: 04 Hrs.

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 post-graduate 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 post-graduation in the course.

PART A

Classical Thermodynamics (15 Hrs)

Brief resume of concepts of thermodynamics, free energy, chemical potential and entropy. Partial molar properties, partial molar free energy, partial molar volume and partial molar heat content and their significances. Determination of these quantities. Concept of fugacity and determination of fugacity.

Non-ideal systems: Excess functions for non-ideal solutions. Activity, activity coefficients, Debye-Huckel theory for activity coefficient of electrolytic solutions, determination of activity and activity coefficients, ionic strength. Application of phase rule to three component system

PART B

Statistical Thermodynamics (12 Hrs)

Corresponding distribution laws (using Lagrange's method of undetermined multipliers)

Partition functions: Translational, Rotational, Vibrational, Electronic partitions functions. Calculation of Thermodynamic properties in terms of partition functions, Heat capacity, behavior of solids chemical equilibria and equilibrium constant in terms of partition function, F.D. statistics, distribution law and application to metals, Bose Einstein's statistics, Distribution law & application to Helium**.**

PART C

Macromolecules (10 Hrs)

Polymers-definition, types of polymers, liquid crystal polymers, Molecular mass-number and mass average molecular mass, determination of molecular mass (osmometry, viscosity, diffusion, light scattering, and sedimentation methods), Mechanism and kinetics of step-growth and chain growth polymerization-radical, ionic, coordination and ring opening polymerization, Copolymerization, reactivity ratios, Polymerization techniques and polymer reactions.

PART D

Surface Chemistry (13 Hrs)

Adsorption: Surface tension, capillary action, pressure difference across curved surface (Laplace equation), Vapour pressure of droplets, (Kelvin equation), Gibb's adsorption isotherm, estimation of surface area (BET equation), surface films on liquids (electro kinetic phenomenon), catalytic activity at surfaces.

Micelles: Surface active agents, classification of surface active agents, micellization hydrophobic interactions, critical micellar concentration, factors affecting CMC of surfactants, counter ions binding to micelles, thermodynamics of micellization-phase separation & mass action models, solubilization, microemulsion, reverse micelles.

Suggested Books:

1.Atkins, P.W. *Physical Chemistry,*ELBS,3rd edition, 1987.

2. Young, R-J and Lovell, P.A. *Introduction to Polymers,*ReplikaPress Pvt. Ltd., 2nd edition, 1991.

3. Flory, P.J. *Principles of Polymer Chemistry,*Asian Book Private Ltd., 1st edition, 2006.

4. Thomas, E. and Philip, R. *Thermodynamics: Statistical Thermodynamics and Kinetics,*Pearson Education,1st edition, 2007.

5. Moore, J.W. and Pearson, R.G. *Kinetics and Mechanism,*John Wiley and Sons, 2nd edition, 1981.

6. Moroi, Y. *Micelles: Theoretical and Applied Aspects,*Plenum Press, 1st edition, 1992.

7. Adamson, Arthur W. *Physical Chemistry of Surfaces,*Wiley-Interscience Publication, 4th edition, 1982.

8. Silbey, R.J., Alberty, R.A. and Bawendi, M.G. *Physical Chemistry*,Wiley-Interscience Publication, 4th edition, 2013.

9. Peter, A. and Paula, J. de. *Physical Chemistry*, Oxford University Press,9th edition, 2011.

10. Castellan, G. W. *Physical Chemistry,*Narosa,4th edition,2004.

11. Engel, T. and Reid, P. *Physical Chemistry,*Prentice-Hall,3rd edition, 2012.

12.McQuarrie, D. A. and Simon, J. D. *Molecular Thermodynamics,*New Delhi:Viva Books Pvt. Ltd., 2004.

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
4	1	0	4	100

Course Title: Analytical Chemistry

Course Code: CHE504

Time: 04 Hours

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 (5 Hrs)

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.

Gravimetric Methods of Analysis (5 Hrs)

Precipitation gravimetry, Properties of precipitates and precipitating agents, particle size, Colloidal and crystalline precipitates, Precipitation from homogeneous solutions, Washing and filtration of precipitates, Drying and ignition of precipitates, Inorganic and organic precipitating agents, Applications of gravimetric methods.

PART B

Volumetric (Titrimetric) Methods of Analysis (10 Hrs)

Terms used in volumetric analysis, Precipitation titrimetry, Neutralization titrations, Titration curves for complex acid/base systems, Applications of neutralization titrations, Complexation titrations, Redox titrations and redox indicators, standard reducing and oxidizing agents.

PART C

Thermo analytical or Thermometric Methods (5 Hrs)

Thermogravimetric analysis (TGA): Principle and method, automatic analysis, factors affecting results. Derivative Thermogravimetric analysis (DTG), applications. Differential thermal analysis (DTA): Principle and working, theory, simultaneous DTA-TGA curves, applications.

Analytical Separations (5 Hrs)

Separation by precipitation, separation by distillation, Distribution law, thermodynamic derivation, association and dissociation in one of the solvents, applications, separation by solvent extraction, separation by ion exchange.

X-ray diffraction methods of analysis (9 hrs)

Production of X-rays, solid state symmetry, reciprocal lattice, Bragg's law in reciprocal space, the powder method, interpretation of powder pattern of a cubic system, particle size, determination by powder method, qualitative and quantitative analysis using powder method. X-ray fluorescence spectroscopy, X-rays emission method, applications (qualitative and quantitative).

PART D

Chromatography (15 Hrs)

Introduction, terminology and basic principle, Gas chromatography (GC): Instrumentation for Gas-Liquid chromatography, columns, stationary phases, applications, Gas-Solid chromatography. High-Performance Liquid Chromatography (HPLC), instrumentation, partition chromatography, Adsorption chromatography, Ion-Exchange chromatography, Size-Exclusion chromatography, Affinity chromatography, Chiral chromatography, Comparison of HPLC and GC. Supercritical-Fluid chromatography, planar chromatography, Capillary Electrophoresis, Capillary Electro chromatography, Fluid-Flow Fractionation.

Suggested Books

1. Christian G.D.*Analytical Chemistry,*John Wiley, 6th edition, 1994.

2. Skoog D.A., West, D.M.,Holler,F.J. andCrouch,S.R. *Fundamentals of Analytical chemistry,* Brooks/Cole, 2004.

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

4. Bassett, J., Denney, R.C., Jeffery, G.H. and Mendham, J.*Vogel's Textbook of Quantitative Inorganic Analysis (revised),* Orient Longman, 4th edition,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, 7th edition, 1988.

DAV UNIVERSITY JALANDHAR

Course Title: Computer Fundamentals and Office Automation
Course Code: CSA551

L	T	P	Credits	Marks
4	0	0	3	75

Course Duration: 60 Hours

Course Objective: The objective of this course is to develop understanding of different software and hardware systems available in industry among the participants and to build up the experience of computer usage in business organizations with specific reference to commercial data processing systems.

UNIT – A **11 Hours**

Computer Fundamentals and Number System

- Block Structure of a Computer
- Characteristics of Computers
- Generations of Computers, Uses of Computers
- Classification of Computers
- Input-Output Devices, Memory and Mass Storage Devices
- Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversion from One System to the other

UNIT – B **11 Hours**

Computer Software , Network & Communication

- Application and system software
- Programming languages and their classification
- Assemblers, compilers and interpreters, Process of software development
- Operating systems: functions of operating systems
- Network topologies
- Network communication devices, Physical communication media
- Network protocol (TCP/ IP)
- Internet and its applications: e-mail, TELNET, FTP, World Wide Web, Internet chatting

UNIT – C **12 Hours**

Word Processing and Spreadsheets

- Editing and Formatting a Document, Text Formatting, Paragraph Formatting, Headers and Footers
- FIND command & REPLACE command, Checking Spelling and Grammar; On-line Spelling and Grammar correction using Auto correct, Auto Text, Using Thesaurus, Using Clip Gallery
- Inserting Graphics From files, Working with Tables - Entering Text in the Table, Creating Table, Changing Format of Text of cells, Changing Column width and Row height, Formatting Table Border
- Using Mail Merge - Mail Merge Procedure, Printing a document

- Basic Operations - Arithmetic operators, Comparison operators, Text operator & (ampersand) Reference operator
- Modifying the worksheet layout - Changing Width of Column, Changing Height of Row, Deleting Rows/Columns/Cells, Moving and copying contents of cell, Alignment of text in the cell
- Working with functions - Date and time function, Statistical function, Financial function, Mathematical and Trigonometric functions, Lookup and Reference Functions, Data Base functions, Text function, Logical functions
- Printing the workbook - Setting up Print Area, Setting up Margins, Defining Header and Footer, Controlling Gridlines
- Introduction to CHARTS - Formatting Charts

UNIT – D **11 Hours**

Presentations and DBMS

- Creating a presentation slide, Design Templates and Blank presentations, Power Point standard toolbar buttons
- Changing Font, Font Size and Bold; Moving the frame and inserting clip art; Different slide layouts; Formatting the Slide Design; Work with the Slide Master; Saving the presentation
- The Auto Content Wizard; Using Existing Slides; Using the different views of a slide, Adding Transitions and Animation, Running Slide Show
- Adding and Deleting Records
- Creating, Saving , Editing, Joining Tables in Queries
- Creating and Using Forms
- Creating and Printing Reports

Reference Books:

1. Kumar,K. and RajKumar,R. *Computer Applications in Business,* Tata McGraw Hill.
2. *Kogent Learning Solutions Inc, Office 2010 in Simple Steps,* DreamTech Press.
3. Goel,A. *Computer Fundamentals,* Pearson.
4. Silberschatz andKorth, A. *Database System Concepts,* New York: McGraw-Hill.
5. Simpson,A. andRobinson, C. *Mastering Access 2000,* New Delhi: BPB.
6. Taxali,R. K. *P C Software Made Simple,* New Delhi: Tata McGraw-Hill.

DAV UNIVERSITY JALANDHAR

Course Title: ORGANIC CHEMISTRY LAB I

Course Code: CHE505

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

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic experimental 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 postgraduate 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 post-graduation in the course.

1. Organic Lab- (i) Safety: Eye, Fire and Chemicals (ii) Glassware (iii) Non-glass equipment (iv) Heating devices (v) Cleaning Glassware
2. To determine corrected melting points of an unknown organic compound (Calibration of thermometer).
3. Synthesis of Adipic acid from cyclohexanol (oxidation).
4. Synthesis of Aspirin from Salicylic acid.
5. Synthesis of Preparation of benzyl alcohol and benzoic acid (Cannizzaro's reaction).
6. Synthesis of Dibenzal acetone from benzaldehyde (Claisen-Schmidt reaction).
7. Synthesis of Cinnamic acid from benzaldehyde (Knoevenaegal reaction).
8. Synthesis of Acetanilide, bromoacetanilide.
9. Synthesis of p-chlorotoluene from p-toludine
10. Synthesis of Benzanilide (Schotten-Baumann reaction).
11. Synthesis of o-Benzoylbenzoic acid (Friedel Craft's reaction).

Suggested Books:

1. Harwood, L.M. and Moody, C.J. *Experimental Organic Chemistry,*Blackwell Scientific Publishers,1st edition, 1989.

2. Vogel, A.I. *Text Book of Practical Organic Chemistry*, ELBS,Longman Group Ltd.,5thedition,1978.

3. Mann, F.G. and Saunders, B.C. *Practical Organic Chemistry*,New Impression, Orient Longman Pvt. Ltd., 4th edition, 1975.

4. Leonard, J. and Lygo, B. *Advanced Practical Organic Chemistry,* Chapman and Hall, 1995.

DAV UNIVERSITY JALANDHAR

Course Title: Inorganic Chemistry Lab -I

Course Code: CHE506

Time: 04 Hrs

L	T	P	Credits	Marks	Pass marks
0	0	4	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 postgraduate 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. Theywill know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

I. Oxidation-Reduction Titrations

1. Standardization of $KMnO_4$with sodium oxalate and determination of Ca^{2+} ion.
2. Standardization of ceric sulphate with Mohr's salt and determination of Cu^{2+}, NO_2^- and $C_2O_4^{-2}$ ions.
3. Standardization of $K_2Cr_2O_7$ with Fe^{2+} and determination of Fe^{3+} (Ferric alum)
4. Standardization of hypo solution with potassium iodate / $K_2Cr_2O_7$ and determination of available Cl_2 in bleaching powder, Sb^{3+} and Cu^{2+}.
5. Determination of hydrazine with KIO_3 titration.

II. Precipitation Titrations

1. $AgNO_3$ standardization by Mohr's method.
2. Volhard's method for Cl^- determination.
3. Determination of ammonium / potassium thiocyanate.

III. Complexometric Titrations

1. Determination of Cu^{2+} and Ni^{2+} by using masking reagent by EDTA titration.
2. Determination of Ni^{2+} (back titration).

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

IV. Gravimetric Analysis

1. Determination of Ba^{2+} as its chromate.
2. Estimation of lead as its lead sulfate.
3. Estimation of Nickel (II) as its nickel dimethyl glyoximate.
4. Estimation of Cu^{2+}as cuprousthiocyanate.

Suggested Books:

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

DAV UNIVERSITY JALANDHAR

Course Title: Computer Fundamentals and Office Automation Laboratory
Course Code: CSA553

L	T	P	Credits	Marks
0	0	2	1	25

- The laboratory will comprise of using commands and tools available in MS Word, PowerPoint, and Excel.
- Assignments based on the applications of above mentioned software packages.

DAV UNIVERSITY JALANDHAR

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

Semester 2

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	CHE507	Organic Chemistry - II	4	1	0	4	25	25	25	25	**100**
2	CHE508	Inorganic Chemistry-II	4	1	0	4	25	25	25	25	100
3	CHE509	Physical Chemistry-II	4	1	0	4	25	25	25	25	100
4	CHE510	Spectroscopy-I	4	1	0	4	25	25	25	25	100
5	MTH560	Mathematics for Chemists	4	0	0	4	25	25	25	25	100
6	CHE511	Organic Chemistry Lab-II	0	0	4	2	0	0	0	0	50
7	CHE512	Physical Chemistry Lab-I	0	0	4	2	0	0	0	0	50
			20	**4**	**8**	**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-II

Course Code: CHE507

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 postgraduate 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 post-graduation in the course.

PART A

Addition to Carbon-Carbon Multiple Bonds (6 Hrs)

Mechanistic and stereochemical aspects of addition reaction 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 ring. Hydroboration. Michael reaction, Sharpless asymmetric epoxidation.

Addition to Carbon-Heteroatom Multiple Bonds (8 Hrs)

Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds acids, esters and nitriles. Addition of Grignard reagents, organozinc and organolithium reagents to carbonyl and unsaturated carbonyl compounds. Wittig reaction. Mechanism of condensation reactions involving enolates-Aldol, Knoevenagel, Claisen, Mannich, Benzoin, Perkin and Stobbe reactions. Hydrolysis of esters and amides, ammonolysis of esters.

PART B

Oxidation Reactions (7 Hrs)

Introduction. Different oxidative processes. Hydrocarbons- alkenes, aromatic rings, saturated C-H groups) activated and inactivated). Alcohols, diols, aldehydes, ketones, ketals and carboxyalic acids. Amines, hydrazines, and sulphides. Oxidations with ruthenium tetraoxide, iodobenzene diacetate and thallium (III) nitrate, DDQ, PCC, CAN, selenium dioxide, peroxyacids, DCC. Baeyer-Villeger reaction, Cannizarro oxidation-reduction reaction.

Reduction Reactions (7 Hrs)

Introduction. Different reductive processes, Hydrocarbons- alkanes, alkenes, alkynes and aromatic rings, Carbonyl compounds – aldehydes, ketones, acids, ester and nitriles. Epoxides, Nitro, nitroso, azo and oxime groups, Hydrogenolysis. Sodium borohydride, sodium cyanoborohydride, LAH, disobutylaluminium hydride, tin hydride, trialkyltinhydride, trialkylsilanes, alkoxy substituted LAH, DIBAL, diborane, diisoamylborane, hexyl borane, 9-BBN, isopinocamphenyl and disiopinocamphenylborane. Wolf-Kishner reduction, Clemensen reduction.

PART C

Free Radical Reactions (8 Hrs)

Types of free radical reactions, free radical substitution mechanism at an aromatic substrate, neighbouring 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.

PART D

Rearrangements (12 Hrs)

General mechanistic considerations-nature of migration, migratory aptitude, memory effects A detailed Study of the following rearrangements Pinacol-pinacolone, Wagner-Meerwein, Demjanov, Benzil- Benzilic Acid, Favorskii, Arndt Eistert synthesis, Neber, Beckmann, Hofman, Curtius, Schmidt, Baeyer- Villiger, Shapiro reaction.

Suggested Books:

1. March, Jerry.*Advanced Organic Chemistry: Reactions, Mechanism and Structure,*John Wiley, 6th edition, 2007.
2. Carry, F. A. and Sundberg, R.J. *Advanced Organic Chemistry,*Plenum,3rd edition, 1990.
3. Sykes, Peter.*A Guide Book to mechanism in Organic Chemistry,* 6th edition, Longman, 1989.
4. Morrison, R. T. and Boyd, R. N. *Organic Chemistry,*Prentice Hall, 6th edition, 1992.
5. Kalsi, P. S. *Organic Reactions and their Mechanisms,* New Age International Publishers,2nd edition, 2000.
6. Mukherji, S.M. and Singh, S.P. *Reactions Mechanism in Chemistry,* Vol. I, II, III, Macmillan, 1985.
7. Aggarwal, O.P. *Organic Chemistry Reactions and Reagents,*Krishna Prakashan Media,47th edition, 2011.

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 Hons course.

DAV UNIVERSITY JALANDHAR

Course Title: Inorganic Chemistry - II

Course Code: CHE508

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 postgraduate 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 post-graduation in the course.

PART A (13 Hrs)

Inorganic chains, rings and cages

a) **Chains:** Catenation, heterocatenation, isopolyanions and heteropolyanions.

b) **Rings:** Borazines, phosphazenes, other heterocyclic inorganic ring systems, homocyclic inorganic systems.

c) **Cages:** Cage compounds having phosphours, oxygen, nitrogen and sulphur: boron cage compounds, Boranes, carboranes and metallocenecarboranes.

PART B (10 Hrs)

2. Transition metal cluster compounds

Introduction, metal carbonyl clusters; Low Nuclearity (M_3 M_4) clusters: isoelectronic and isolobalrelaltionships high nuclearity carbonyl clusters; hetero atoms in metal atom clusters, electron counting schemes for HNCC: HNCC of Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt.

PART C (10 Hrs)

a) Lower halide and chalcogenide clusters, octahedral metal halide, chalocogenide clusters, triangular clusters, and solid state extended arrays.

b) Compounds with M-M multiple bonds; I) Major structural types; quadrupole bonds, other bond orders in the tetragonal context, relation of clusters to multiple bonds, one dimensional solids.

PART D (14 Hrs)

Reaction Mechanisms of Transition Metal Complexes

Introduction, ligand replacement reactions, classification of mechanisms, Water exchange rates, formation of complexes from aqueous ions, catanation, reaction, aquation and base hydrolysis attack on ligands, reactions, of square planar complexes, mechanism of ligand displacement reactions; metal carbonyl reactions, reactions of binuclear carbonyls, associative reactions, species with 17 electron, electron transfer processes outer and inner sphere. The Marcus theory, doubly bridged inner-sphere transfer, other electron transfer reactions; two electron transfers, Non-complementary reaction, Ligand exchange via electron exchange, reductions by hydrated electrons, stereochemical non-rigidity, stereochemically non-rigid coordination compounds, Trigonal bipyramidal molecules, systems with coordination number six or more, isomerization and recombination's, tris chelate complexes, metal carbonyl scrambling cluster, rotation within Co shells.

Suggested Books:

1. Huheey, J.E.Inorganic Chemistry, Pearson,3rd Edition, 1983.

2.Cotton, F.A. andWilkinson,G. *Advanced Inorganic Chemistry*, Wiley eastern,6th edition.

3. Shriver,D.F.,Atkins,P.W. and Langford,C.H. *Inorganic Chemistry,* ELMS, Oxford, 1990

4. William W. Porterfield, Inorganic Chemistry, 1stEdition.

5. K.F. Purcell and J.C. Kotz.An Introduction to Inorganic Chemistry.

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 II

Course Code: CHE509

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

Time: 04 Hrs

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 post-graduate 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 post-graduation in the course.

PART A

Chemical Dynamics (15 Hrs)

Methods of determining rate laws, collision theory of reaction rates, steric factor, activated complex theory, Arrhenius equation, concept of energy of activation, potential energy surfaces; ionic reactions, kinetic salt effects, steady state kinetics, kinetic and thermodynamic control of reactions, Lindemann-Christiansen hypothesis, Hinshelwood treatment and Rice Ramsperger-Kassel-Marcus (RRKM) theories of unimolecular reactions. General features of fast reactions, study of fast reactions by flow method, relaxation method, flash photolysis and nuclear magnetic resonance method, Dynamic chain (hydrogen-bromine reaction, pyrolysis of acetaldehyde, decomposition of ethane), photochemical (hydrogen bromine and hydrogen-chlorine reactions).

PART B

Non Equilibrium Thermodynamics (7 Hrs)

Thermodynamic criteria for non-equilibrium states, entropy production and entropy flow, entropy balance equations for different irreversible processes (for example heat flow, chemical reaction, etc.), generalized forces and fluxes, non-equilibrium stationary states, phenomenological equations, microscopic reversibility and Onsager's reciprocity relations, electrokinetic phenomena, diffusion, electric conduction, irreversible thermodynamics for biological systems, coupled reactions.

PART C

Solution & Phase Equilibrium (10 Hrs)

Solubility and factors affecting solubility, types of solutions, ideal solution, vapour pressure of ideal solutions, boiling point diagrams of binary miscible mixtures and their Distillation diagrams, azeotropes, critical solution temperatures, solubility of gases in liquids, Henry's law, Nernst distribution law, number of extractions, solutions of solids in liquids & chemical equilibrium. Derivation of Gibb's phase rule, phase equilibria of two component systems showing eutectic congruent and incongruent melting points. Triangular method for graphical representation of three component systems; partially miscible three liquid systems, Applications of ternary liquid diagrams; systems composed of two solids and a liquid.

PART D

Colloidal State (10 Hrs)

Classification of colloids, charge and stability of colloidal dispersions, Hardy-Schulze Law, gold number, electrical properties of colloids, electrical double layer and its structure, Stern's theory of double layer, zeta-potential, electrophoresis and electro osmosis, emulsions and their classification, emulsifiers, gels and their classification, thixotropy. Association colloids; miceller formation, cmc, soap action. Application of colloids.

Corrosion and its Control (5 Hrs)

Corrosion in Metal and alloys, causes of corrosion, Effects of Corrosion, Corrosion cell, Types of corrosion, Electrochemical corrosion, Corrosion control, Protective Coatings, Metal Finishing, Electroplating, Effect of plating variables on the Nature of Electro deposit, Surface preparation, Electroplating of Chromium, silver, Electroless plating.

Suggested books:

1. Maron, S.HandPrutton, C.F. *Principles of Physical Chemistry,*Oxford and IBH publishing, 1st edition, 1958.

2. Laidler, Keith J. *Chemical Kinetics,*New York: Harper & Row Publishers, 3rd edition, 1987.

3. Atkins, P.W. *Physical Chemistry,*ELBS,3rd edition, 1987.

4. Thomson, S.J. and Webb, G.*Heterogeneous Catalysis,*Edinburgh; London: Oliver & Boyd, 1968.

5. Moore, J.W. and Pearson, R.G. *Kinetics and Mechanism,* John Wileyand Sons,2nd edition, 1981.

6. Moroi, Y.*Micelles: Theoretical and Applied Aspects,*Plenum Press, 1st edition, 1992.

7. Bockris, John. Reddy, M., Amulya, K.N. *Modern Electro-Chemistry,*New York:Plenum Press,2nd edition, 1998.

8. Adamson, Arthur W. *Physical Chemistry of Surfaces,*Wiley-Interscience Publication,4th edition, 1982.

9. Silbey, R.J., Alberty, R.A. and Bawendi, M.G. *Physical Chemistry,*Wiley-Interscience Publication,4th edition, 1982.

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
4	1	0	4	100

CourseTitle: Spectroscopy-I

Course Code: CHE510

Time: 04 Hours

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 corresponding to various kinds of radiation, Experimental techniques, intensities of spectral lines, Selection rules and transition moments, Line widths, broadening.

Nuclear Magnetic Resonance Spectroscopy (20 Hrs)

PMR: Natural abundance of ^{13}C, ^{19}F and ^{31}P nuclei; The spinning nucleus, effect of external magnetic field, processional motion and frequency, Energy transitions, Chemical shift and its measurements. Factors influencing chemical shift, anisotropic effect; Integrals of protons, proton exchange, spin-spin coupling- splitting theory, one, two and three bond coupling, virtual, long range and allylic coupling, magnitude of coupling constant; factors affecting the coupling constant, Chemical and magnetic equivalence, First and second order spectra, A_2, AB, AX, AB_2, AX_2, A_2B_2 and A_2X_2 spin systems, Simplification of complex spectra (solvent effect, field effect, double resonance and lanthanide shift reagents), CW and FT NMR, Relaxation processes, T1 and

T2 measurements, Applications of PMR in structural elucidation of simple and complex compounds.

PART B

^{13}C-NMR (5 Hrs)

Resolution and multiplicity of ^{13}C NMR, ^{1}H-decoupling, noise decoupling, broad band decoupling; Deuterium, fluorine and phosphorus coupling; NOE and origin of nuclear overhauser effect. off-resonance, proton decoupling, Structural applications of 13C-NMR., pulse sequences, pulse widths, spins and magnetization vectors, DEPT, INEPT, Introduction to 2D-NMR, COSY, NOESY, HSQC spectra.

PART C

Mass Spectra (10 Hrs)

Introduction, methods of ionization EI & CI, Brief description of LD, FAB, SIMS, FD etc., Ion analysis methods (in brief), isotope abundance, Metastable ions, general rules predicting the fragmentation patterns. Nitrogen rule, determination of molecular ion peak, index of H deficiency, fragmentation patterns for aliphatic compounds, amines, aldehydes, Ketones, esters, amides, nitriles, carboxylic acids ethers, aromatic compounds etc.

PARTD

UV and Visible Spectroscopy of organic molecules (10 Hrs)

Measurement techniques, 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, blue shift, red shift, hypo and hyperchromic effect, transitions in organic molecules, Woodward rules for conjugated dienes, unsaturated carbonyl groups, extended conjugation and aromatic sterically hindered systems, Quantitative applications.

Suggested Books:

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

2. Silverstein,R.M. Bassler,G.C. andMorrill,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. andFleming,I. *Spectroscopic Problems in Organic Chemistry,* McGraw Hill, 1967.

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

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

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

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

Course Title: Mathematics for Chemists

Paper Code: MTH-560

L	T	P	Credits	Marks
4	0	0	4	100

Objective: To provide the understanding and use of mathematical techniques for various chemistry concepts.

UNIT-A **15 hours**

Matrices, Operations on Matrices, Determinants, Properties of determinants, Singular and non-singular matrices, Adjoint and Inverse of a matrix, Rank of Matrix, The solution of linear equations Basic idea of linear transformation, orthogonal matrices and orthogonal transformations, Symmetry operations, The Eigen value problem, Properties of the Eigen vectors, Matrix Diagonalization

UNIT-B **14 hours**

Limit and continuity, Differentiation from first principle, Differentiation by rule, Implicit functions, Logarithmic differentiation, successive differentiation Stationary points, Linear and angular motion. Integral as anti-derivative. Integration by substitution, by partial fractions and by parts. The method of partial fractions, parametric differentiation of integrals Definite integral and its properties. Areas of bounded regions Reduction formulas, rational integrands. Static properties of matter.

UNIT-C **13 hours**

Basic concepts, Scalar product, Vector product, Vector differentiation, Arc length. Line, Surface and Volume integrals. The gradient, divergence and curl. The Del operator. Green's, Gauss' and Stokes' theorems (statements only)

UNIT-D **14 hours**

Permutation and Combination: Idea of Factorial notation for natural numbers, Fundamental principle of counting, basic concept of Permutation, Basic concept of Combination

Probability and probability theorems**:** introduction to probability, addition theorem of probability, multiplication theorem of probability.

References:

1. Grewal,B. S. *Higher Engineering Mathematics,* Khanna Publishers, 40th edition.
2. Kreyszig,Erwin.*Advanced Engineering Mathematics,*New Delhi: Wiley Eastern Ltd. Revised edition, 2003.
3. Dence,Joseph B.*Mathematical Techniques in Chemistry,* Wiley, 1975.
4. Narayan,Shanti andMittal,P. K. *A Text Book of Matrices,* S. Chand & Co. Ltd., Reprint 2002.

DAV UNIVERSITY JALANDHAR

L	T	P	Credits	Marks
0	0	4	2	50

Course Title: Organic Chemistry Lab II

Course Code: CHE511

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic experimental 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 postgraduate 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 post-graduation in the course.

Preparation of the following organic compounds:

1. Hydroxynaphthaldehyde (Reimer tiemann Reaction)
2. Benzoin. Benzil. Benzilic acid.
3. Benzophenone, Benzophenone oxime, Benzanilide (Beckmann Rearrangement).
4. Alkylation of diethyl malonate with benzyl chloride

Qualitative Analysis of mixtures of organic solids:

Separation of the compounds and their identification through various steps, derivative Preparation, checking the purity of components by melting point.

Suggested Books:

1. Harwood, L.M. and Moody, C.J. *Experimental Organic Chemistry*, Blackwell Scientific Publishers, 1st edition, 1989.

2. Vogel, A.I. *Text Book of Practical Organic Chemistry*, ELBS, Longman Group Ltd.,4th edition, 1978.

3. Mann, F.G. and Saunders, B.C. *Practical Organic Chemistry*, 4th edition, New Impression, Orient Longman Pvt. Ltd., 1975.

4. Leonard, J. and Lygo, B. *Advanced Practical Organic Chemistry,* Chapman and Hall,1995.

DAV UNIVERSITY JALANDHAR

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

Course Title: Physical Chemistry Lab -I

Course Code: CHE512

Time: 04 Hours

Course Objectives:

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to M.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 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. Viscosity:

(i) Determination of percentage composition of a liquid mixture by viscosity measurement.

(ii) Determination of molecular weight of a high polymer (say polystyrene) by viscosity measurement.

2. Surface Tension:

(i) Determination of Parachor value of $>CH_2$ group.

(ii) To measure interfacial tension and to test the validity of Antonoff's rule.

(iii) To compare cleansing power of two detergents.

(iv) To determine the critical micelle concentration of a soap by surface tension method.

3. Solubility:

(i) Determination of solubility of an inorganic salt in water at different temperatures and hence to draw the solubility curve.

(ii) To study the effect of addition of an electrolyte on the solubility of an organic acid.

(iii) To study the variation of solubility of $Ca(OH)_2$ in NaOH solution and hence determine the solubility product.

4. Colloidal State:

(i) To compare the precipitation power of Na^{+}, Ba^{2+}& $A1^{+3}$ ions for As_2S_3 sol.

(ii) To study interaction between arsenious sulphide and ferric hydroxide sol.

5. Density:

Determine the partial molar volume of ethanol in dil. aqueous solution at room temperature.

Suggested Books:

1. Levitt, B.P. *Findlay's Practical Physical Chemistry,*Longman Group Ltd., 9th edition, 1973.

2. Matthews, G. Peter.*Experimental Physical Chemistry,*Oxford University Press, 1st edition, 1985.

3. Shoemaker, D.P., Garland, C.W. and Nibler, J.W. *Experiments in Physical Chemistry,*McGraw Hill Inc., 6th edition (International Edition), 1996.

4. Khosla, B.D., Garg, V.C., and Gulati, A. *Senior Practical Physical Chemistry,*R. Chand and Co., 11th edition, 2002.

5. Yadav, J. B. *Advanced Practical Physical Chemistry,*Krishna Prakashan Media, 32th edition, 2013.

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

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

Semester 3

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	CHE601	Organic Chemistry-III	4	1	0	4	25	25	25	25	100
2	CHE602	Inorganic Chemistry-III	4	1	0	4	25	25	25	25	100
3	CHE603	Physical Chemistry-III	4	1	0	4	25	25	25	25	100
4	CHE604	Spectroscopy-II	4	1	0	4	25	25	25	25	100
5	CHE605	Quantum Chemistry	4	1	0	4	25	25	25	25	100
6	CHE606	Inorganic Chemistry Lab-II	0	0	4	2	0	0	0	0	50
7	CHE607	Physical Chemistry Lab-II	0	0	4	2	0	0	0	0	50
8	CHE608	Seminar and Literature Survey	0	0	0	2	0	0	0	0	50
			20	5	8	26					650

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-III (Pericyclic Reactions and Photochemistry)

Course Code: CHE601

Time: 04 Hrs

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

Course Objectives:

This course is intended to teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to M.Sc. (2nd Year) in the subject of Chemistry has been framed 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:

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 post-graduation in the course.

PART A

Pericyclic Reactions (15Hrs)

Molecular orbital symmetry, frontier orbitals of ethylene, 1,3-butadiene, 1, 3, 5-hexatriene and allyl system. Classification of pericyclic reactions. Woodward-Hoffmann correlation diagrams. FMO and PMO approach. Electrocyclic reactions conrotatory and disrotatory motions 4n, 4n +2 and allyl system. Cycloadditions-antarafacialsuprafacial additions, 4n and 4n+2 systems, 2+2 additiion of ketenes, 1, 3-dipolar cycloadditions and cheleotropic reactions.

PART B

Sigmatropic rearrangements (5 Hrs)

Suprafacial and antarafacial shifts of H. Sigmatropic shifts involving carbon moieties, [3, 3]-and [5, 5]- sigmatropic rearrangements. Claisen, Cope and aza-Cope rearrangement. Fluxional tautomerism. Ene reaction.

Photochemical Reactions (4 Hrs)

Interaction of electromagnetic radiation with matter, types of excitations, fate of excited molecule, quantum yield, transfer of excitation energy, actinometry.

Determination of Reaction Mechanism (4 Hrs)

Classification, rate constants and life times of reactive energy states – determination of rate constants of reactions. Effect of light intensity on the rate of photochemical reactions. Types of photochemical reactions – photo-dissociation, gas-phase photolysis.

PART C

Photochemistry of Alkenes (6 Hrs)

Intramolecular reactions of the olefinic bond- geometrical isomerism, cyclisation reactions, rearrangement of 1, 4-dienes,

Photochemistry of Aromatic Compounds (4 Hrs)

Isomerisations, additions and substitutions.

PART D

Photochemistry of Carbonyl Compounds (6 Hrs)

Intramolecular reactions of carbonyl compounds – saturated, cyclic and acyclic, β, γ-unsaturated and α,β -unsaturated compounds, Cyclohexadienones.

Intermolecular cyloaddition reactions – dimerisations and oxetane formation.

Miscellaneous Photochemical Reactions (4 Hrs)

Photo-Fries reactions of anilides. Photo-Fries rearrangement. Barton reaction. Singlet molecular oxygen reactions. Photochemical formation of smog. Photo degradation of polymers. Photochemistry of vision.

Suggested Books:

1. Mukherji, S. M. *Pericyclic reactions,* Macmillan, 1979.
2. Turro, N.J. and Benjamin, W.A. *Molecular Photochemistry,* University Science Books, U.S.,1991.
3. Cox, A. and Camp, T. *Introductory Photochemistry,* McGraw Hill, 1972.
4. Horsepool, W. M. *Organic Photochemistry,* Ellis Horwood, 1992.
5. Kalsi, P.S. *Organic Reactions and their Mechanisms,* New Age International,2nd edition, 2000.

6. Mukherji, S.M. and Singh, S.P. *Reactions Mechanism in Chemistry,* Vol. I, II, III, Macmillan, 1985.

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 Hons.Course.

DAV UNIVERSITY JALANDHAR

Course Title: Inorganic Chemistry –III (Organometallics)
Course Code: CHE602

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 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 Inorganic 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 (14 Hrs)

The 18 Valence Electron Rule: Introduction, The 18 electron rule, counting of electrons and finding metal-metal bonds and related problems.

Alkyl, Aryl and Ligands with Higher Hapticity

Sigma bonded alkyl groups as ligands: Synthesis of metal-alkyl compounds, β-hydride elimination, σ-bonded η1-aryl ligands.

Cyclic and acyclic polyenyl π-bonded ligands: Cyclopentdienyl (Cp-), Synthesis of Cp based sandwich compounds, Structure and properties of MCp2 complexes, The first metal-sandwich compound Ferrocene, Reactions of metal-sandwich compounds, Bent sandwich compounds, Schwartz reagent and hydrozirconation, Chemistry of Cp*, Chemistry of arene sandwich compounds, Allyl groups as ligands, 1,3-Butadiene complexes, Cyclobutadiene complexes, Cycloheptatriene and Cyclooctatetraene as ligands. Davies-Green-Mingos (DGM) rules.

PART B (9 Hrs)

Ferrocene: Structure and bonding of ferrocenes, Basic chemical reactions of Ferrocene, Reactions of Acetyl Ferrocene and formylFerrocene, lithiatedferrocenes and their reactions, (Dimethylaminomethyl)Ferrocene and its methiodide salt, Ferroceneboronic acid and

haloferrocenes, Chirality in Ferrocene derivatives, Synthesis of chiral Ferrocene based compounds, Ferrocene based condensation polymers.Recaptulation of Metal carbonyls.

PART C (13 Hrs)

Applications of Organometallic Complexes to Catalysis

Catalysis, Terminology in catalysis, sequences involved in a catalysed reaction, asymmetric synthesis using a catalyst, Hydrogenation catalysts, classification of hydrogenation catalysts, catalytic cycle of Wilkinson's catalyst, catalytic cycles of iridium and ruthenium based catalysts, hydrogenation by lanthanide organometallic compounds, catalytic asymmetric synthesis, Hydroformylation: Cobalt catalysts and phosphine modified cobalt catalysts, Rhodium-phosphine catalysts, factors affecting the n/iso ratio of hydroformylation products; Methanol Carbonylation and Olefin Oxidation: Monsanto, Cativa and Wacker Processes,; Polymerisation and oligomerisation of olefins and dienes, carboxylation of olefins, carbonylation of methanol, Synthetic gas.

PART D (9 Hrs)

Bioorganometallic Chemistry

Role of organometallics in heavy metal poisoning: Mercury and Arsenic poisoning,organometallic compounds as drugs: ruthenium and ferrocene based drugs; Organometallics as radiopharmaceutical, tracers, ionophores and sensors.

Suggested Books:

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

2. Cotton,F.A. and Wilkinson, G. *Advanced Inorganic Chemistry,* 6^{th} edition, Wiley Inter-Science.

3. Gupta,B.D. and Elias,A.J. *Basic Organometallic Chemistry,* Universities Press.

4. Salzer,C.E.and Elchinbroich, A. E. *Organometallics, A Concise Introduction Chemistry,* VCH.

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

Course Title: Physical Chemistry III

Course Code: CHE603

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 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 post-graduate 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 post-graduation in the course.

PART A

Electrochemistry of Solutions I (10 Hrs)

Ion-solvent interactions, the Born model, electrostatic potential at the surface of a charged sphere, Born expression far the free energy of ion-solvent interactions, structural treatment of ion-solvent interactions, ion-dipole moment, evaluation in the ion-dipole approach to heat of solvation, solvation number, static and dynamic pictures of ion-solvent interactions, hydration number, dielectric constant of water and ionic solutions, dielectric constant of liquids containing associated dipoles, ion – solvent nonelectrolyte interactions, change in solubility of non-electrolyte due to primary and secondary solvations.

PART B

Electrochemistry of SolutionsII (15 Hrs)

Debye-Huckel treatment, and its extension, ion solvent interaction, Debye-Huckel-Jerrum model, Thermodynamics of electrified interface equations, derivation of electro capillarity, Lippmann equations (surface excess), Methods of determining structures of electrified interfaces, Guoy-

Chapman, Stern. Over potentials, exchange current density, derivation of Butler-Volmer equation. Tafel plots. Quantum aspects of charge transfer at electrode solution interfaces, quantization of charge transfer, tunnelling Semiconductor interfaces- theory of double layer interfaces, effects of light at semiconductor solution interface.

Electrocatalysis (5 Hrs)

Influence of various parameters, Hodges-Huxley equation, Nernst-Plank equation, H-electrode, polarography, theory of Ilkovic eqn, (excluding derivation), half wave potential & its significance, electrocardiography

PART C

Photochemistry (10 Hrs)

Difference between thermal photochemical reactions, laws of photochemistry, Jablonski diagram, qualitative description of fluorescence, phosphorescence, non- radiative processes (IC, ISC), quantum yield, photosensitized reactions, nuclear geometries of electronically excited states, energy surface description of molecular photochemistry, Excimers and Exciplexes, kinetics of photochemical reactions, chemiluminescence, solar energy conversion and storage.

PART D

Nanochemistry (10 Hrs)

Properties of nanomaterials, General Method of synthesis, Characterization of nanomaterials, Material Self-assembly, Quantum dot, Nanoscale Materials, Nanocrystalline Materials, Fullerenes, Carbon nanotubes, nanowires, Nanorods, Dendrimers, Nanocomposite, Biological Nanomaterials, General Applications of Nanochemistry.

Suggested Books:

1. Bockris, John,Reddy, O.M. and Amulya K.N. *Modern Electro-Chemistry,* Plenum Press, New York,2nd edition, 1998.
2. Silbey, R. J., Alberty, R. A. and Bawendi, M. G. *Physical Chemistry,* John Wiley & Sons, Inc.4thedition, 2005.
3. Atkins, P.W and Paula, J.D. *Physical Chemistry,* Oxford University Press,9thedition, 2011.
4. Barrow, G. M.*Physical Chemistry,*New Delhi:Tata McGraw Hill, 5thedition, 2006.
5. Metz, C. R. *Physical Chemistry*,Tata McGraw-Hill, 2nd edition, 2009.

DAV UNIVERSITY JALANDHAR

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

Course Title: Spectroscopy -II
Course Code: CHE604

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 postgraduate 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 post-graduation in the course.

PART A (12 Hrs)

Nuclear Quadruple Resonance Spectroscopy

Introduction, experimental considerations, fundamentals of NQR spectroscopy, origin of EFG, measurement of energy differences between two nuclear spin states, the asymmetry parameter, effects of the magnetic field, interpretation of the spectra, application of the technique to halogen compounds, group, elements, transition metals, complications in the spectra.

Electroanalytical Techniques (12 Hrs)

Electrogravimetry: Without potential control and controlled potential, applications. Coulometric methods and applications. Voltammetry and polarography: linear sweep Voltammetry, voltammetric electrodes, voltammograms, voltammograms for mixtures. Polarography: currents, dropping mercury electrodes, pulse polarography, cyclic Voltammetry, stripping methods, amperometric titrations, conductometric titrations.

PART B (12 Hrs)

Mossbauer Spectroscopy

Experimental considerations, the spectrum and its parameters, simple spin states (1/2, 3/2), higher spin states (I > 3/2), magnetic splitting significance of parameters obtained from spectra,

quadruplesplitting, additive model, interpretation of Mossbauer spectra of ion-57, tin-119, complications like unusual intensities, non-zeroasymmetry parameter recoil fraction, magnetic ordering and relaxation.

PART C (12 Hrs)

Electron Paramagnetic Resonance Spectroscopy

Introduction, principle, Presentation of spectrum, hyperfine splitting in isotropic systems involving more than one nucleus, ESR spectrum of benzene radical anion, methyl radical. CH_2OH cyclopentadienyl cycloheptatrienyl radical, pyrazine anion, pyrazine anion with ^{23}Na and ^{39}K counter ion, Nitrosyl nitroxide factors affecting magnitude of g values, zero field splitting and Krammer's degeneracy. Qualitative survey of EPR spectra of first row transition metal ion complexes (d1, d2, d3, low spin d5, d5, high spin d6, d7, d9 system).

PART D (12 Hrs)

Nuclear Magnetic Resonance

Recapitulations, NMR of inorganic compounds, $_1H$ NMR of organometallics- chemical shift, coupling effects, phosphorous and arsine ligands, hydrides, coupling to metals, Main group hydrides, transition metal hydrides, coupling to phosphine ligands, more than one hydride, coupling to metal, effect of trans ligand, dihydrogen complexes, Isotopes other than ^1H e.g. ^{31}P, ^{13}C, ^{14}N, ^{15}N, ^{19}F, ^{27}Al, ^{29}Si, transition metals.

Suggested Books:

1.Drago, R.S. *Physical Methods in Chemistry,* W.B. Saunders Company.

2. Parish,R.V. *NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic Chemistry,* Eds Elis Horwood.

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

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

Course Title: Quantum Chemistry

Course Code: CHE605

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 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 post-graduate 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 post-graduation in the course.

PARTA

Mathematical Preparation (5 Hrs)

Operators and observables, normality and orthogonality of functions, Hermitianoperators. Introduction to differentiation and Integration.

Quantum Theory: Introduction and principles and applications (20 Hrs)

Black Body radiation, planck's radiation law, photoelectric effect, Compton effect, De-Broglie hypothesis, the Heisenberg's uncertainty principle, Rydberg's relation forexplaining atomic spectrum of hydrogen. Bohr theory and its limitations. Solution ofclassical wave equation by separation of variable method, eigen value equation,Hamiltonian operator. Interpretation of Ψ, Solution of particle in one, two and threedimensional box, degeneracy. Postulates of quantum mechanics, the linear harmonicoscillator, and the rigid rotator, quantization of vibrational and rotational energies.

PART B

Angular Momentum (10 Hrs)

Commutative laws, need of polar coordinates, transformation of Cartesian coordinates into polar coordinates. Angular momentum of one particle system, orbital angular momentum, the ladder operator method for angular momentum.

DAV UNIVERSITY JALANDHAR

PARTC

The Hydrogen Atom (5 Hrs)

Outline of various steps in the solution of the electronic Schrödinger equation forhydrogen atom, Radial and angular parts of the hydrogenic wave functions (atomicorbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals. Significance of Quantum numbers, orbital angular momentum and quantum numbers ml and ms.

PART D

The Approximation Methods (5 Hrs.)

Need for approximation methods, Perturbation and Variation methods and their application to Helium atom.

Chemical Bonding (5 Hrs)

Chemical bonding, linear combination of atomic orbitals, overlap integral, coulomb integral, molecular orbital treatment of H_2^+, Bonding and antibonding orbital of H_2^+

Suggested Books:

1. Levine, Ira N. *Quantum Chemistry,* Prentice-Hall International, Inc.5th edition, 2000.
2. Chandra, A. K. *Introductory Quantum Chemistry,* Tata McGraw-Hill, 2001.
3. House, J. E. *Fundamentals of Quantum Chemistry* USA:Elsevier, 2nd edition, 2004.
4. Lowe, J. P. and Peterson, K. *Quantum Chemistry,* Academic Press, 2005.

DAV UNIVERSITY JALANDHAR

Course Title: Inorganic Chemistry Lab -II
Course Code: CHE606

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

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 postgraduate 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.

EXPERIMENT

1 Preparation of mercury tetraisothiocyanatocobaltate(II). Determination of its magnetic moment and interpretation of its IR spectrum.

2 Preparation of nitro-and nitrito-pentaamminecobalt(II) chlorides from chloropentaamine cobalt(III) chloride. Recording and interpreting their electronic and IR spectra.

3 Heating the nitro and nitrito isomers at serial 2 to 15^{o}C in an oven for 3 h and recording the infrared spectra again and compare those with the spectra recorded before the isomers were heated.

4 Preparation and resolution of tris(ethylenediamine)cobalt(II) ion. Measurement of optical rotation of these resolved complexes.

5 Preparation of diaquotetraacetatedicopper(II). Determination of its magnetic susceptibility and interpretation of E.P.R., electronic absorption and IR spectra.

6 Preparation of bis(2,4-pentanedione)vanadium(IV) acetate and its piperidine or pyridine complex. Study of both the complexes with the help of infrared, UV-vis spectroscopy and magnetic susceptibility.

7 Preparation of hexaamminenickel(II) chloride and tris(ethylenediamine)nickel(II)chloride. Interpretation of their electronic absorption spectral data and calculation of β and 10Dq values. Measurement of magnetic susceptibility, calculation and interpretation of the values.

8 Preparation of lead tetraacetate.

9 Preparation of potassium trioxalatoaluminate(III) trihydrate. Its TGA and DTA studies and its interpretation of its i.r. data.

10 Preparation of disulphur dichloride.

11 Preparation of sodium tetrathionate, potassium dithionate, and interpretation of their IR spectra.

12 Preparation of cis-and trans-potassium dioxalatodiaquochromate(III). Interpretation of their i.r., and selectronic absorption spectral data. Calculation of β and 10 Dq values.

13 Preparation of iron(II) oxalate and potassium trioxalateferrate(III). Interpretation of their magnetic data, E.p.r. and Mossbauer spectra.

14 Preparation of nitrosylbis(diethyldithiocarbamato)iron(II) and interpretation of its IR and EPR spectra.

15 Preparation of chromium (II) acetate hydrate.

16 Preparation of Manganese (II) phthalocyanine. Interpretation of its IR, and electronic absorption spectra.

Suggested Books:

1 Marr,G. and Rockett, B.W. *Practical Inorganic Chemistry,* Van Nostrand Reinhold Company.

2 Jolly,W.L. *The Synthesis and Characterization of Inorganic Compounds.* Prentice Hall.

DAV UNIVERSITY JALANDHAR

Course Title: Physical Chemistry Lab -II
Course Code: CHE607

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

Time: 04 Hours

Course Objectives:

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to M.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 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.

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to M.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.

1.Polarimetry:

To study the inversion of cane sugar by optical rotation measurement.

2. **Potentiometry:**

(i) Determination of valence of mercurous ion.

(ii) Determination of pH value using quinhydrone electrode.

(iii) Determination of heat of reaction, equilibrium constant and other thermodynamic functions for:

(a) $Zn + Cu^{+2}$ $Zn^{+2} + Cu$

(b) $Zn + Pb^{+2}$ $Zn^{+2} + Pb$

(iv) Determination of hydrolysis constant of aniline hydrochloride electrometrically.

3. **Flame Photometry:**

(i) Determination of Na^{+} & K^{+} when present together.

(ii) Determination of Lithium/Calcium/Barium/Strontium.

4. Transition Temperature Determination:

Determination of transition temperature of $MnCl_2$ by Dielatometric method.

Suggested books:

1. Levitt, B.P. *Findlay's Practical Physical Chemistry,* Longman Group Ltd.,9th edition, 1973.

2. Matthews, G. Peter.*Experimental Physical Chemistry,*Oxford University Press, 1st edition, 1985.

3.Shoemaker, D.P.; Garland, C.W.; Nibler, J.W. Experiments in Physical Chemistry, (International Edition) McGraw Hill Inc., 6th edition 1996.

4. Khosla, B.D., Garg, V.C. and Gulati, A. Senior Practical Physical Chemistry,R. Chand and Co., 11th edition, 2002.

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

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

Semester 4

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	CHE609	Organic Chemistry-IV	4	1	0	4	25	25	25	25	100
2	CHE610	Bio-Inorganic Chemistry	4	1	0	4	25	25	25	25	100
3	CHE611	Bio-Physical Chemistry	4	1	0	4	25	25	25	25	100
4		*Elective	4	1	0	4	25	25	25	25	100
5	CHE612	Project				8	0	0	0	0	150
			16	**4**	**0**	**24**					**550**

***Electives – 1. Supramolecular Chemistry (CHE613)**

2. Molecules of Life (CHE614)

3. Chemistry of Materials (CHE615)

4. Medicinal Chemistry (CHE616)

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-IV (Chemistry of Natural Products)

Course Code: CHE609

Time: 04 Hours

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

Course Objectives:

This course is intended to teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to M.Sc (2nd Year) in the subject of Chemistry has been framed 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: 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 post-graduation in the course.

PART A

Terpenoids and Carotenoids (12 Hrs)

Classification, nomenclature occurrence isolation general methods of structure Determination, isoprene rule. Structure determination stereochemistry, Biosynthesis and synthesis of the following representative molecules: citral, Terpeneol, Farnesol, santonin, phytol, Abietic Acid and Beta-Carotene, vitamin A.

PART B

Alkaloids (12 Hrs)

Definition, nomenclature and physiological action occurrence isolation general method of structure elucidation degradation classification based on nitrogen heterocyclic ring role of alkaloids in plants. Structure stereochemistry synthesis and biosynthesis of the following: Ephedrine, (+)-Conine, Nicotine, Atropine, Quinine and Morphine.

Biosynthesis of shikimic acid, aromatic amino acids, cinnamic and benzoic acid, coumarines.

Amino acids, Peptides and Proteins (5Hrs)

Introduction, amino acid classification and structure, chemical and enzymatic hydrolysisof proteins to peptides, amino acid sequencing. Secondary structure of proteins, forcesresponsible

for holding secondary structures. - helix and -sheet. Tertiary structure ofprotein folding. Quaternary structure. Biosynthesis of amino acids.

PART C

Steroids (12 Hrs)

Occurrence nomenclature basic skeleton. Diel's hydrocarbon and Stereochemistry Isolation structure determination and synthesis of cholesterol Bile acids Androsterone Testosterone, EstroneProgestrone Aldosterone Biosynthesis of Steroids

PART D

Plant Pigments (4 Hrs)

Occurrence nomenclature and general methods of structure determinations, isolation and synthesis ,Quercetin , Quercetin-3-Glucoside Vitexin, Diadzein, Cyanidin-7-arabinoside cyanidine, Hirsutidin Biosynthesis of Flavonoids: Acetate path way and shikimic acid path way.

Porphyrins (2 Hrs)

Structure and synthesis of Haemoglobin and chlorophyll

Prostaglandins (4 Hrs)

Occurrence, nomenclature, classification, biogenesis and physiological effects Synthesisof PGE2 and PGF 2

Pyrethroids and rotenones (2Hrs)

Synthesis and reaction of Pyrethroids and rotenones

Suggested Books:

1. Finar, I.L. *Organic Chemistry,*ELBS,Vol. 2, 5th edition, 1975.
2. Nogradi, M. *Stereoselective Synthesis: A Practical Approach,* VCH, 1995.
3. Coffey, S. *Rodd's Chemistry of Carbon Compounds,*Elsevier, 2nd Edition.
4. Hostettmann, Kurt, Gupta, M.P. and Marston, A. *Chemistry, Biological and Pharmacological Properties of Medicinal Plants*, Americas, Harwood Academic Publishers.
5. Aggarwal, O.P. *Chemistry of Organic Natural Products,* Vol. 1 & 2, Goel Publishing House, 2009.
6. Rohm, B.A. *Introduction to Flavonoids,* Harwood Academic Publishers, 1998.
7. Rahman, A. and Choudhary, M.I. *New Trends in Natural Product Chemistry,* Harwood Academic Publishers, 1998.

8. Dev, Sukh.*Insecticides of Natural Origin,* Harwood Academic Publishers, 1997.
9. Mann, J. Davidson, R.S., Hobbs, J.B., Banthrope, D.V. and Harborne, J.B. *Natural Products: Chemistry and Biological Significance,* Longman, Essex, 1994.

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 Hons course.

DAV UNIVERSITY JALANDHAR

Course Title: Bio-Inorganic Chemistry

Course Code: CHE 610

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 postgraduate 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 post-graduation in the course.

PART A

Inorganic Chemistry of Enzymes - I (12 Hrs)

Introduction, energy sources for life, non-photosynthetic processes, metallopoophyrings, cytochromes, biochemistry of iron, iron storage and transport, ferritin transferring, bacterial iron transport, hemoglobin and myoglobin, nature of heme-dioxygen binding, model systems, cooperativity in hemoglobin, physiology of myoglobin and hemoglobin, structure and function of hemoglobin. Other iron-prophyrin biomolecules, structure and function of hemoglobin. Other iron-porphyrin biomolecules, peroxidases and catalases, cytochrome P450 enzymes, other natural oxygen carriers, hemerythrins, electron transfer.

PART B

Inorganic Chemistry of Enzymes - II (12 Hrs)

Respiration and photosynthesis; ferridoxins, and subredonim carboxypeptidase, carbonic anhydrase, metallothioneins. Blue copper proteins, superoxide dismutase hemocyanines photosynthesis, chlorophyll and photosynthetic reaction center.

Enzymes: Structure and function, inhibition and poisoning Vitamin B12 and B12 coenzymes metallothioneins, nitrogen fixation, in-vitro and in-vivo nitrogen fixation, bio-inorganic chemistry of Mo and W, nitrogenases: other elements V, Cr, Ni (essential and trace elements in biological systems).

PART C

Metal Ions in Biological Systems (12 Hrs)

Metal complexes of polynucleotides, nucleosides and nucleic acids (DNA & RNA). Template temperature, stability of DNA. Role of metal ions in replication and transcription process of nucleic acids. Biochemistry of dioxygen, bioinorganic chips and biosensors. Biochemistry of calcium as hormonal messenger, muscle contraction blood clotting, neurotransmitter, calcification reclaiming of barren land. Metals in the regulation of biochemical events. Transport and storage of metal ions *in vivo*. Metal complexes as probes of structure and reactivity with metal substitution.

PART D

Inorganic Medicinal Chemistry (10 Hrs)

Fundamentals of Toxicity and Detoxification. Nuclear medicines.

Suggested Books:

1. Huheey,J. E.,Keiter,E. A. andKeiter, R.L. *Inorganic Chemistry Principles of Structure and Reactivity,* 4th edition, Haper Collins.

2. Douglas,B.,McDaniel,D. andAlexander, J. *Concepts and Models of Inorganic Chemistry,* John Wiley and Sons,3rd edition.

3.Cotton, F.A. andWilkinson, G. *Advanced Inorganic Chemistry: A Comprehensive Text,* John Wiley, 5th edition.

4. Elschenbroich,Ch. and Salzer,A. *Organometallics. A Concise Introduction,* VCH, 2nd edition.

5.Shriver, D.F. and Atkins,P.W. *Inorganic Chemistry,* Oxford University Press,3rd edition.

6.Cowan, J.A. *Inorganic Biochemistry,* Wiley – VCH,2nd edition.

7. Lippard,S. J. *Progress in Inorganic Chemistry,*Vols. 18 and 38, Wiley-Interscience, 1991.

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: Bio-Physical Chemistry

Course Code: CHE611

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 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 post-graduate 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 post-graduation in the course.

PART A

Fundamentals of Biological Macromolecules (15 Hrs)

Biological Cell and its Constituents: Biological Cell, structure and functions of proteins, enzymes, DNA and RNA in living systems. Helix coil transition.

Bioenergetics: Standard free energy change in biochemical reactions, exergonic, endergonic, Hydrolysis of ATP, synthesis of ATP from ADP, coupled reactions, degree of coupling.

Statistical Mechanics in Biopolymers: Chain configuration of macromolecules, statistical distribution end to end dimensions, calculation of average dimensions for various chain structures. Polypeptide and protein structures, introduction to protein folding problem.

Biopolymer Interactions: Forces involved in biopolymer interactions, Electrostatic charges and molecular expansion, hydrophobic forces, dispersion force interactions, Multiple equilibria and various types of binding processes in biological systems, Hydrogen ion titration curves.

PART B

Thermodynamics of Biopolymer Solutions (10 Hrs.)

Biopolymer Solutions Thermodynamics of biopolymer solutions, osmotic pressure, membrane equilibrium, muscular contraction and energy generation in mechanochemical system.

Cell Membrane and Transport of Ions Structure and functions of cell membrane, Active transport across cell membrane, and irreversible thermodynamics treatment of membrane transport.

PART C

Structural Determination of Biological Macromolecules (10Hrs)

Bio-polymers and their Molecular Weights

Evaluation of size, shape, molecular weight and extent of hydration of biopolymers by various experimental techniques.

Viscosity

Measurement, relation to geometry and correlation with hydrodynamic properties.

Diffusion

Fick's Law of diffusion, diffusion coefficient and its interpretation, frictional coefficient.

Ultracentrifugation: Svedberg equation, sedimentation equilibrium, density gradient sedimentation.

Electrophoresis: General principles, Double layer techniques, moving boundary electrophoresis, zonal electrophoresis, isoelectric focusing.

Osmotic Pressure

Second virial coefficient, Donnan effect, molecular mass and geometry from O.P. data.

Optical Properties of Biomacromolecules

Light Scattering, fundamental concepts, Rayleigh Scattering, Scattering by Larger particles.

PART D

Methods for the Separation of Biomolecules (10 Hrs)

General principles, including Chromatography; Sedimentation, Moving Boundary Sedimentation, Zonal Sedimentation, Electrophoresis, Isoelectric focusing, Capillary electrophoresis, MALDI-TOF.

Suggested Books:

1. Lehninger, A.L. *Principles of Biochemistry,* Worth Publishers.

2. Stryer, L. *Biochemistry,*W.H. Freeman.

3. Voet and Voet, *Biochemistry,* John Wiley.

4. Wold, F. *Macromolecules: Structure and Function,* Prentice Hall.

5. Billmeyer, F.W. *Text Book of Polymer Science*.

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	Pass Marks
4	1	0	4	100	40

Course Title: Supramolecular Chemistry

Course Code: CHE613

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of supramolecular 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 supramolecular chemistry 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

Concepts **(5 Hrs)**

Definition and Development of Supramolecular Chemistry, classification of Supramolecular Host-Guest compounds, Pre- organization and Complementarily, Receptors, Nature of Supramolecular interactions.

PART B

Cation Binding Host **(10 Hrs)**

Crown ethers, Lariat ether and Podands, Cryptands, spherands, selectivity, Macro cyclic, Macrobicyclic and Template effects, soft ligands, calixarenes, carbon donor and π- acid ligands, siderophores.

Binding of anions **(10 Hrs)**

Biological anion receptors, concepts on anion host design, from cation to anion hosts- a simple change in pH, Guanidinium- based receptors, Neutral receptors, organometallic receptors, coordination interactions.

PART C

Binding of neutral molecules **(10 Hrs)**

Inorganic solid state clathrate compounds, solid state clathrates of organic hosts, intracavity complexes of neutral molecules, supramolecular chemistry of fullerenes.

DAV UNIVERSITY JALANDHAR

PART D

Crystal Engineering **(5 Hrs)**

Concepts, crystal structure prediction, Crystal Engineering with hydrogen bonds, weak hydrogen bonds, hydrogen bonds to metals and metal hydrides, π- π stacking, coordination polymers.

Molecular Devices **(5 Hrs)**

Introduction, Supramolecular photochemistry, molecular electronic devices: Switches, wires and rectifiers, machines based on catenanes and rotaxanes.

Suggested Books:

1. Steed, J.W and Atwood,J.L.*Supramolecular chemistry,* John Wiley & Sons, Ltd. New York.

This syllabus is as per national syllabus given by UGC.

DAV UNIVERSITY JALANDHAR

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

Course Tittle: Molecules of Life

Course Code: CHE614

Time: 04 Hours

Objective of the Course: It is the harmonious and synchronous progress of chemical reactions in body which leads to life. These chemical reactions involve certain molecules called biomolecules or molecules of life. These molecules constitute the source of energy in body, build the body, act as catalyst in many processes and also responsible for the transfer of characters to off springs. In this paper one would get the information about the structures of these molecules and their role in life related processes. The basic types of molecules included are carbohydrates, proteins, enzymes, lipids and nucleic acids.

Expected Prospective: This course will equip students of interdisciplinary subjects with the necessary chemical knowledge concerning the fundamentals in the basic areas of natural science. 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

Carbohydrates.

Classification of carbohydrates, reducing and non-reducing sugars, General Properties of Glucose and Fructose, their open chain structure. Epimers, mutarotation and anomers. Determination of configuration of Glucose (Fischer proof). Cyclic structure of glucose. Haworth projections. Cyclic structure of fructose. Linkage between monosaccharides, structure of disaccharides (sucrose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation.

PART B

Amino Acids, Peptides and Proteins

Classification *of* Amino Acids*,* Zwitter ion structure and Isoelectric point. Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins. Determination of Primary structure of Peptides , determination of N-terminal amino acid (by DNFB and Edman method) and C–terminal amino acid(by thiohydantoin and with carboxypeptidase enzyme). Synthesis of simple

peptides (upto dipeptides) by N-protection (tbutyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solid phase synthesis.

Enzymes and correlation with drug action

Mechanism of enzyme action, factors affecting enzyme action, Coenzymes and cofactors and their role in biological reactions, Specificity of enzyme action(Including stereo specificity), Enzyme inhibitors and their importance, phenomenon of inhibition(Competitive and Noncompetitive inhibition including allosteric inhibition). Drug action-receptor theory. Structure – activity relationships of drug molecules, binding role of –OH group,-NH2 group, double bond and aromatic ring,

PART C

Nucleic Acids

Components of Nucleic acids: Adenine, guanine ,thymine and Cytosine(Structure only), other components of nucleic acids, Nucleosides and nucleotides(**nomenclature**), Structure of polynucleotides; Structure of DNA (Watson-Crick model) and RNA(**types of RNA**), Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation.

LipidsIntroduction to lipids, classification. Oils and fats: Common fatty acids present in oils and fats, Omega fatty acids, Trans fats, Hydrogenation, Saponification value, Iodine number. Biological importance of triglycerides, phospholipids, glycolipids, and steroids (cholesterol).

PART D

Concept of Energy in Bio systems

Calorific value of food. Standard caloric content of carbohydrates, proteins and fats. Oxidation of foodstuff (organic molecules) as a source of energy for cells. Introduction to Metabolism (catabolism, anabolism), ATP: the universal currency of cellular energy, ATP hydrolysis and free energy change. Conversion of food into energy. Outline of catabolic pathways of Carbohydrate- Glycolysis, Fermentation, Krebs cycle. Overview of catabolic pathways of Fats and Proteins. Interrelationships in the metabolic pathways of Proteins, Fats and Carbohydrates.

Suggested Books:

1. Morrison, R. T. and Boyd, R. N. *Organic Chemistry,* Pearson Education, 6th edition, 1992.

2. Finar, I. L. *Organic Chemistry*(Volume 1), Pearson Education, 6th edition, 1973.

3. Finar, I. L. Organic Chemistry (Volume 2), Pearson Education, 6th edition, 1973.

4. Nelson, D. L. and Cox, M. M. *Menninger's Principles of Biochemistry,*W. H. Freeman 7th edition, 2004.

5. Berg, J. M., Tymoczko, J. L. and Stryer, L. *Biochemistry,*W. H. Freeman, 6th edition.

DAV UNIVERSITY JALANDHAR

Course Title: Chemistry of Materials

Course Code: CHE 615

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 material science. 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 students.

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

PART A

Solid State Chemistry

Types of solids, band and bond theories, crystal lattice energy, point defects in metals and ionic compounds, energy and entropy of defects, their concentration, diffusion and electrical conduction via defects, non-stoichiometry types, colour centres and electrical properties of alkali halides, electron theories for metal conduction in metals , in insulators, impurity semi-conductors, reactions in organic solids, photochemical reactions, solid-solid reactions, decomposition and dehydration reaction.

PART B

Macromolecules

Types of polymers, regular and irregular polymers, synthesis of polymers by chain and step reactions, physical properties of solid polymers(crystallinity, plasticity and elasticity), vulcanization of rubbers, molecular mass determination by osmometry, viscometer, light scattering and ultracentrifuge methods, number and mass average molecular masses, polymer solutions, factors affecting the solubility of polymers , conducting polymers, doping of polymers, mechanism of conduction, polarones and bipolarons.

PART C

Glasses and Ceramics

Factors affecting glass formation, oxide glasses, electronegativity and bond type, viscosity, structural effects (zachariasen's rule (1932), criteria of SUN and Rawson, thermodynamics of glass formation, behavior of liquids on cooling, kinetics of crystallization and glass formation, structure of glasses: vitreous silica, silicate glasses, vitreous B_2O_3 and borate glasses, viscosity, electrical conductivity of glasses and the mixed alkali effect, commercial silicate and borate glasses, metallic glasses , glass ceramics, refractories, important glass-ceramics compositions, properties of glass ceramics, applications.

PART D

Smart Materials

Methods of preparation- conventional ceramic methods, hot pressing and hot static pressing techniques, precursor method, gel method, co-precipitation method, glass crystallization methods, vacuum techniques- chemical vapor deposition method. , organic superconductors, magnetism in organic materials, magnetic nano materials, energy storage materials, nanomaterials for targeted drug delivery, fullerenes as superconductors. High temperature ceramic superconductors, electrical and magnetic properties of superconductors, critical temperature Tc, thermodynamics of superconductors, London equation, BCS theory, applications.

Suggested Books:

1. Cornell,P. J. Flory.*Principles of polymer chemistry,* University Press.
2. Tager,A. J.*Physical chemistry of polymers,* Mir Publishers.
3. Dekker,A. J.*Solid state physics,* MacMillan Publishers.
4. West,A. R.*Solid state chemistry and its applications,* Wiley Publishers.
5. Byrn,S. R.*Solid state chemistry of drugs,* Academic Press.
6. Puri, Sharma and Pathania, *Principles of physical chemistry,* Vishal Publishers.
7. Gray,G. W.*Thermotropic Liquid crystals,* John Wiley.
8. Malcolm, P and Stevens, *Polymer Chemistry,* Oxford University Press.
9. Keer, H. V. *Principles of Solid States,* Wiley Eastern.

DAV UNIVERSITY JALANDHAR

Course Title: Medicinal Chemistry

Course Code: CHE616

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 Medicinal 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 interest.

Expected Prospective: This course will equip students with the necessary medicinal chemistry knowledge concerning the fundamentals in the basic areas of pharmaceutical sciences The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers.

PART A

Enzymes (8 Hrs)

Basic considerations. Proximity effects and molecular adaptation. Introduction and historical prospective, chemical and biological catalysis, remarkable properties of enzymes like catalytic power, specificity and regulation. Nomenclature and classification, extraction and purification. Fischer's lock and key and koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors, affinity labelling and enzyme modification by site-directed mutagenesis. Enzyme kinetics, Michaelis-menten and lineweaver-Burk plots, reversible and irreversible inhibition.

Mechanism of Enzyme Action (5Hrs)

Transition-state theory, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Examples of some typical enzyme mechanisms for chymotrypsin, ribonucleases, lysozyme and carboxypeptidase A.

PART B

Kinds of Reaction Catalysed by Enzymes (8Hrs)

Nucleophilic displacement on a phosphorus atom, multiple displacement reaction and the coupling of ATP cleavage to endergonic processes. Transfer of sulphates, addition and

elimination reactions, enolic intermediates in isomerization reactions, β-cleavage and condensation, some isomerisation and rearrangement reactions. Enzyme catalyzed carboxylation and decarboxylation.

PART C

Co-Enzyme Chemistry (6Hrs)

Cofactors as derived from vitamins, coenzymes, prosthetic groups, apoenzymes. Structure and biological function of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD+, NADP+, FMN, FAD, LIPOIC ACID, vitamin B12. Mechanisms of reactions catalysed by the above cofactors.

PART D

Drug Design (18Hrs)

Development of new drugs, procedures followed in drug design, concepts of lead compound and lead modification, concepts of prodrugs and soft drugs, structure-activity relationship (SAP), factors affecting bioactivity, resonance, inductive effect, isosterism, bio-isosterism, spatial considerations. Theories of drug activity: occupancy theory, rate theory, induced fit theory. Quantitative structure activity relationship. History and development of QSAR. Concepts of drug receptors. Elementary treatment of drug receptors interactions. Physico-chemical parameters: lipophilicity, partition coefficient, electronic ionization constants, steric, Shelton and surface activity parameters and redox potentials. LD-50, ED-50 (Mathematical equations excluded)

Suggested Books:

1. Lehninger, *Principles of Biochemistry,*WH-Freeman,5th edition.

2.Silverman, R. B. *The organic chemistry of drug design and drug action,* Academic press 2nd edition, 2004.

3. PandeyaS. S. and Dimmock,J.R. *An introduction to drug design,* New Age International.

DAV UNIVERSITY JALANDHAR

M.Sc. Bio-Chemistry (Semester III)

Course Title: Organic and Biophysical Chemistry

Paper Code: CHE 651

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

Course Objective: This course is intended to learn the basic concepts of organic and biophysical 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.

Learning Outcomes: This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of organic and bio-physical 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

Organic Chemistry (11 Hrs)

Electronic theory of valency, dipole moments. Electronic displacements in a molecule: inductive effect, electronic effect, resonance. The hydrogen bond, hydrophobic interactions. Atomic and molecular orbitals. Shapes of biomolecules, hybridization and tetracovalency of carbon.**Isomerism:** Structural isomerism, stereoisomerism, geometrical isomerism (E & Z nomenclature)

Types of organic chemical reactions: Substitution, addition, elimination, rearrangement, condensation and polymerization.

PART B

Free radicals in biological systems (10 Hrs)

Oxygen as a free radical in the auto oxidation of fats. Antioxidants – Vitamin A, Vitamin E, Vitamin C

Mechanism of substitution in the benzene ring: o-, p- and m-directing groups. The concept of resonance with reference to benzene derivatives. Direct influence of substituents – electronic interpretation.

PART C (13 Hrs)

Stereochemistry: Optical Isomerism, optical activity, meso-compounds, specific rotation, chirality, chiral center, enantiomers, diastereoisomers, D-L, R-S, threo-erythro notations, conformation and configuration, dihedral angles, conformational analysis of ethane, n-butane, cyclohexane, mono- and di-substituted cyclohexane, monosaccharides - boat and chair forms, eclipsed, gauche and staggered conformations, axial and equatorial bonds, Anomers and mutarotation, glycoside, epimers, glucopyranose, fructopyranose, periodic acid oxidation of sugars.

Heterocyclic systems occurring in living systems: Numbering of the ring and properties of pyran, furan, thiozole, indole, pyridine, pyrimidine, quinone, purine and pteridine.

PART D (13 Hrs

Thermodynamics studies in chemistry and biochemistry: Open, closed and isolated system. First law of thermodynamics, heat of formation and heat of reaction, second law of thermodynamics, molecular basis of entropy, Helmholtz and Gibbs free energy, third law of thermodynamics and calculation of entropy, application of the first and second law of thermodynamics in understanding energies in living cells, chemical potential, equilibrium constant.

Types of electrodes, standard electrode potential and its determination, its relationship with emf, electron transfer measures. Phosphate group transfer potentials, coupled reactions.

Water: Physical properties and structure of water, hydrogen bonding, ionization of water, pH scale, acids-bases, Handerson-Hasselbalch equation, buffers, ionization behaviour of amino acids and proteins, titration curve, buffer solutions and their action.

Suggested Books:

1. Lehninger,A.L. *Principles of Biochemistry,* Worth Publishers.

2. Stryer,L. andFreeman, W.H. *Biochemistry.*

3. Voet and Voet, *Biochemistry,* John Wiley.

4.Wold,F. *Macromolecules: Structure and Function,* Prentice Hall.

5. Billmeyer, F.W. *Text Book of Polymer Science.*

6.Tager, A. *Physical Chemistry of Polymers.*