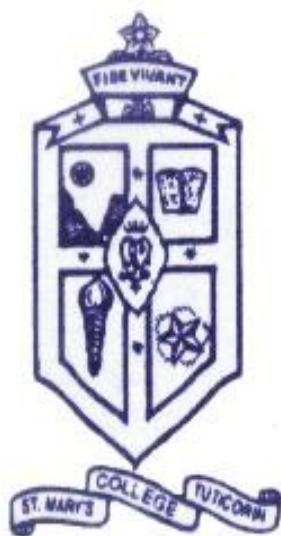


ST. MARY'S COLLEGE (Autonomous)

(Re-accredited with 'A⁺' Grade by NAAC)

Thoothukudi-628001, Tamil Nadu

(Affiliated to Manonmaniam Sundaranar University)



Syllabus

B.Sc. Chemistry

School of Physical Sciences

Outcome Based Curriculum

(W.e.f.2018)

Preamble

Chemistry is a branch of Physical Science that deals with the composition, structure, behaviour and properties of matter. Chemistry is at the center of our knowledge of the physical world around us. Each of us feels the impact of Chemistry in everyday of our lives.

Vision : To produce knowledgeable Chemists and Educate future scientists to enhance services to the community

Mission: To equip the students with the conceptual and experimental tools for the holistic development of professional graduates in academia, industry and government to meet the global environmental issues through chemical education

Programme Outcome

PO.No	Upon completion of B.Sc Degree programme , the graduates will be able to
PO-1	apply the acquired knowledge of fundamental concepts in the field of science and to find solutions to various problems.
PO-2	inculcate innovative skills and team – work among students to meet societal expectations.
PO-3	perform analysis to assess, interpret, and create innovative ideas through practical experiments.
PO-4	facilitate to enter multidisciplinary path to solve day-to-day scientific problems.
PO-5	carry out fieldworks and projects, both independently and in collaboration with others, and to report in a constructive way.
PO-6	improve communication ability and knowledge transfer through ict aided learning integrated with library resources.
PO-7	transfer the knowledge to the other stakeholders through extensive community development programme.
PO-8	attain competency in job market / entrepreneurship.

Course Structure (w.e.f. 2018)

Semester –I

Part	Components	Sub. Code	Title of the Paper	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil	18ULTA11	இக்கால இலக்கியம்: செய்யுள், இலக்கணம், உரைநடை, சிறுகதை, இலக்கிய வரலாறு Preliminary French Course	6	4	40	60	100
	French	18ULFA11						
II	General English	18UGEN11	Prose, Poetry, Extensive reading & language study I	6	4	40	60	100
III	Core I	18UCHC11	General Chemistry-I	4	4	40	60	100
	Core II	18UCHC12	General Chemistry-II	4	4	40	60	100
	Core Practical I	18UCHCR1	Quantitative Analysis	2				
	Allied I	18UMAA11/12 18UBCA11	Allied Mathematics I&II / Allied Biochemistry I	6/4	4/3	40	60	100
	Allied Practical	18UBCAR1	Allied Biochemistry Practical	2				
IV	Ability Enhancement Course	18UFVE11	Value Education	2	2			
Total				30	22/21			

Semester II

Part	Components	Sub. Code	Title of the Paper	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil	18ULTA21	சமய இலக்கியங்களும்,நீதி இலக்கியங்களும்: செய்யுள், இலக்கணம், உரைநடை, வாழ்க்கை வரலாறு, இலக்கிய வரலாறு	6	4	40	60	100
	French	18ULFA21	Basic French Course					
II	General English	18UGEN21 (Stream A/B/C)	Prose, Poetry, Extensive reading & language study II	6	4	40	60	100
III	Core III	18UCHC21	Inorganic Chemistry- I	4	4	40	60	100
	Core IV	18UCHC22	Organic Chemistry- I	4	4	40	60	100
	Core Practical II	18UCHCR1	Quantitative Analysis	2	2			
	Allied I	18UMAA21/22 18UBCA21	Mathematics III&IV / Allied Biochemistry II	6/4	4/3	40	60	100
	Allied Practical I	18UBCAR1	Allied Biochemistry Practical	2	2			
IV	Ability Enhancement Course	18UFEV21	Environmental Studies	2	2			
Total				30	24/25			

Semester III

Part	Components	Sub. Code	Title of the Paper	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil	18ULTA31	காப்பிய இலக்கியம்: செய்யுள்,இலக்கணம், உரைநடை, சிறுகதை, இலக்கிய வரலாறு Advanced French Course	6	4	40	60	100
	French	18ULFA31						
II	General English	18UGEN31	Prose, Poetry, Extensive reading & Language study III	6	4	40	60	100
III	Core V	18UCHC31	Physical Chemistry –I	4	4	40	60	100
	Core Practical II	18UCHCR2	Semi micro Inorganic Qualitative Analysis					
	Allied II	18UPHA31	Allied Physics –I	4	3	40	60	100
	Allied Practical II	18UPHAR1	Allied Physics Practical	2				
	Core Skill Based	18UCHS31	Agricultural Chemistry and water management	4	4	40	60	100
	NME I	18UCHN31	Industrial Chemistry	2	2	20	30	50
IV	Ability Enhancement Course	18UAWS31	Women's Synergy		2			
	Self Study / On-line Course / Internship (Optional)	18UCHSS1	Applied Chemistry		+2			
Total				30	23+2			

Semester IV

Part	Components	Sub. Code	Title of the Paper	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
I	Tamil	18ULTA41	சங்க இலக்கியம்: செய்யுள், இலக்கணம், உரைநடை, வாழ்க்கை வரலாறு, இலக்கிய வரலாறு	6	4	40	60	100
	French	18ULFA41	Language through literature					
II	General English	18UGEN41	Prose, Poetry, Extensive reading & language study IV	6	4	40	60	100
III	Core VI	18UCHC41	Organic Chemistry II	4	4	40	60	100
	Core Practical II	18UCHCR2	Semi micro Inorganic Qualitative Analysis	2	2			
	Allied II	18UPHA41	Allied Physics –II	4	3	40	60	100
	Allied Practical	18UPHAR1	Allied Physics Practical	2	2			
	Core Skill Based	18UCHS41	Pharmaceutical Chemistry	4	4	40	60	100
	NME II	18UCHN41	Every Day Chemistry	2	2	20	30	50
IV	Ability Enhancement Course	18UAYM41	Yoga & Meditation		2			
	Self Study / Online Course / Internship (Optional)	18UCHSS2	Informative Chemistry		+2			
	NCC, NSS & Sports				1			
	Extension Activities CDP				+1			
Total				30	28+3			

Semester V

Part	Components	Sub. Code	Title of the Paper	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
III	Core VII (Common Core)	18UPCC51	Solid State and Material Science	6	4	40	60	100
	Core VIII	18UCHC52	Organic Chemistry III	5	4	40	60	100
	Core IX	18UCHC53	Physical Chemistry II	5	4	40	60	100
	Core Integral I	18UCHI51	Essentials of Inorganic Chemistry	4	4	40	60	100
	Core Practical III	18UCHCR3	Physical Chemistry Practical	5	3	40	60	100
	Core Practical IV	18UCHCR4	Organic analysis and organic preparation	3				
IV	Common Skill Based	18UCSB51	Computer for digital era and Soft Skills	2	2	40	60	100
	Self Study / On-line Course (Compulsory)	18UCHSS3	Chemistry for competitive Examination	-	2			
Total				30	23			

Semester VI

Part	Components	Sub. Code	Title of the Paper	Hrs/ Week	Credits	Max.Marks		
						CIA	ESE	Total
III	Core X	18UCHC61	Inorganic Chemistry - II	4	4	40	60	100
	Core XI	18UCHC62	Organic Chemistry - IV	4	4	40	60	100
	Core XII	18UCHC63	Physical Chemistry - III	5	4	40	60	100
	Core Integral II	18UCHI61	Spectroscopy	4	4	40	60	100
	Core Practical IV	18UCHCR4	Organic Preparation and analysis	3	3	40	60	100
	Core Practical V	18UCHCR5	Gravimetry and Inorganic Preparation	5	2			
IV	Core Integral III/ Project	18UCHI62/ 18UCHP61	Selected topics in Chemistry/ Project	5	4			
Total				30	25			
Total				180	145+5			

Semester	Hours	Credits	Extra Credits
I	30	22/21	---
II	30	24/25	---
III	30	23	2
IV	30	28	3
V	30	23	--
VI	30	25	--
Total	180	145	5

Courses	Number of courses	Total Hours/ Course	Credits	Extra Credits
Tamil	4	24	16	-
English	4	24	16	-
Core	12T+ 5P	53T+24P	48T+12P	-
Core Skill based	2	8	8	-
Core Integral	2	8	8	-
Group project	1	5	4	-
Allied	6T +1P /4T+2P	20T+4P/16T+8P	14T+2P/12T+4P	-
NME	2	4	4	-
Ability Enhancement Course	4	4(4 Extra hours)	8	-
Common skill based	1	2	2	-
NCC, NSS, &Sports	-	-	1	-
Extension activities		-		1
Self study paper(optional)	2	-		4
Self study paper(Compulsory)	1	-	2	-
Total		180	145	5

Programme Specific Outcome

PSO No.	Students of B.Sc. Chemistry will be able to
PSO-1	have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in analytical, inorganic, organic and physical chemistry.
PSO-2	students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments
PSO-3	excel in problem solving, critical thinking and analytical reasoning as applied to scientific problems
PSO-4	explore new areas of research in both chemistry and allied fields of science and technology
PSO-5	appraise the central role of chemistry in our society and use this as a basis for ethical behaviour in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine
PSO-6	synthesize , characterize and elucidate the structure of chemical compounds
PSO-7	cater to the need of industries in context of the developing needs of the society
PSO-8	develop a rigorous scientific attitude and provide excellence in teaching and research

SEMESTER- I			
Part III	Core I	General Chemistry I	
Code :18UCHC11	Hrs/Week:4	Hrs/ Sem: 60	Credits:4

Vision:

Inculcating the students the basic principles and concepts in chemistry.

Mission:

- Understand the development of atomic structure and general aspects of inorganic and physical Chemistry.
- Recall the importance of periodic table
- Be familiar with balancing the ionic equations using electron transfer concept.
- Explain the various concepts of acids and bases.

Course Outcome :

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	compare Rutherford and Bohr's model of the atom	1, 2	An
CO-2	predict electronic arrangement in orbits	1, 2, 3	Ev
CO-3	understand quantum numbers and to Know the rules for filling up of orbitals	1, 2, 3, 4	Un
CO-4	explain the periodic properties of the different groups of compounds focusing on production methods	1	Un
CO-5	apply methods of balancing redox reactions	1, 2, 3	Ap
CO-6	know the different concepts of acids and bases	1, 3	Re
CO-7	identify different types of bonding in molecules	3, 4	An
CO-8	sketch Molecular orbital diagram and to apply the VSEPR theory to predict the shape of a molecule or polyatomic ion.	3, 4	Ap

SEMESTER- I			
Part III	Core I	General Chemistry I	
Code :18UCHC11	Hrs/Week:4	Hrs/ Sem: 60	Credits:4

Unit I Atomic Structure I (Classical Approach)

Introduction-Discharge tube experiment-properties of cathode ray and anode rays-measurement of e/m for electrons- Milikan's oil-drop experiment-sub atomic particles-Rutherford nuclear structure of atom-weakness of Rutherford's model-Mosley's experiment- composition of the nucleus- Bohr's model of the atom – derivation of Bohr's radius and energy of the electron-significance of negative value of energy- drawbacks of Bohr atom-origin of hydrogen spectrum-Ritz combination principle-Sommerfeld extension of Bohr's theory-electronic arrangement in orbits-Langmuir scheme-Bohr-Bury scheme.

Unit II Atomic Structure II (Wave mechanical Approach)

de Broglie equation- Heisenberg's uncertainty principle- Postulates of quantum mechanics – derivation of Schrodinger equation – eigen value – eigen function – significance of ψ and ψ^2 – charge cloud concept –radial and angular function - shapes of orbitals-nodal planes- g and u character. Quantum numbers –rules for filling up of orbitals – Aufbau principle – Hund's rule – Pauli's exclusion principle.

Unit III Periodic Table and Atomic Properties

Modern periodic law- long form of periodic table – its merits and demerits– Abundance of elements- cosmic, terrestrial and relative abundance – classification of elements based on their electronic configuration- Major trends in periodic table – Slater's rule- calculation of effective nuclear charge - periodic properties – trends in ionic and covalent radii , ionization energy, electron affinity and electro negativity –factors affecting ionization energy, electron affinity and electro negativity- scales of electro negativity – Alfred-Rochow's scale – Pauling scale – Mulliken approach – applications of electro negativity

Unit IV Concept of Electron Transfer and Acids and Bases

Oxidation and reduction – electronic Concept – Oxidation number – Calculations of Oxidation number of elements in compounds and ions – Redox reaction – Important Oxidants and their reduction half reaction Fe (II) and Potassium permanganate – important reductants and their oxidation half reaction Fe (II) and Oxalic acid. Methods of balancing redox reactions.

Arrhenius concept – limitations – Bronsted - Lowry concept – proticity (Basicity) of an acid – hydroxity (Acidity) of a base –levelling concept, Lewis concept – relative acidity of H_y molecules. Pearson's principle of hard and soft acids and bases (HSAB). Theories of hardness and softness – applications of HSAB theory(relative stabilities of compounds-occurrence of minerals-course of reactions-poisoning of metal catalysts-rate of chemical reactions).

Unit V Chemical Bonding

Ionic bond, factors influencing the formation of ionic bond- covalent bond – overlapping of atomic orbital – σ bond and π bond – coordinate covalent bond – Fajan's rule –

valence bond theory – limitations – molecular orbital theory – bonding and anti bonding
molecular orbital – energy level – bond order – molecular orbital diagram of homo nuclear
diatomic molecules H_2 , H_2^+ , N_2 , O_2 , F_2 – molecular orbital diagram of hetero nuclear molecules
CO and HF – comparison of VB and MO theory.

Hybridization of sp , sp^2 , sp^3 , sp^3d , sp^3d^2 , and sp^3d^3 , with example – salient features of
concept of hybridization – VSEPR Theory – postulates – VSEPR theory as applied to molecules
of regular geometry ($BeCl_2$, BF_3 , CH_4 , CCl_4 , PCl_5 , SF_6 and IF_7) and irregular geometry (NH_3 ,
 H_2O , and SF_4) – geometry of ions (CO_3^{2-} and ClO_4^-) – Hydrogen bonding – nature, type

Text Books

1. ArunBahl, B.S.Bahl, G.D.Tuli, *Essentials of Physical Chemistry*, S.Chand and Company Ltd., New Delhi-Revised edition-2008
2. B.R.Puri, L.R.Sharma, K.C.Kalia, *Principles of Physical Chemistry*, Milestone publishers and distributors, Delhi, 2010.
3. R.D.Madan, *Modern Inorganic Chemistry*, S.Chand and Company Ltd., New Delhi, 2005.

Books for Reference

1. B.R. Puri. L.R. Sharma, Madan S. Pathania, *Principles of Physical Chemistry*, Vishal Publishing Co., 2008.
2. Gurdeep Raja, *Advanced inorganic Chemistry*, Goel Publishing house 1986.
3. Sathyaprakash and R.D.Madan, *Advanced Inorganic Chemistry Volume I*, S.Chand and Company, New Delhi. 2005

SEMESTER- I			
Part III	Core I	General Chemistry II	
Code :18UCHC12	Hrs/Week:4	Hrs/ Sem: 60	Credits:4

Vision:

Educate the basic characteristics of organic compounds and organic reaction mechanism

Provide students with a sound education in the fundamental concepts of physical chemistry.

Mission:

- Understand the basic mechanism involved in organic reaction,
- Have an idea about the properties of alkenes, alkynes and aromatic substitution
- Know the importance of halogen compounds
- Have a firm foundation in chemical principles as well as higher level of understanding in organic and Physical Chemistry

Course Outcome :

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO 1	know the nomenclature of different class of organic compounds	1	Re
CO 2	associate polarization of a bond with electronegativity	1, 3	Un
CO 3	discuss nucleophilic and electrophilic groups and their properties, Identify Aromatic, antiaromatic & non- aromatic compounds by Huckel's rule	1,3	Re,Un
CO 4	discriminate terminal & non-terminal alkynes, the acidic nature of acetylenic hydrogen	1,3	An,Un
CO 5	predict the mechanism of aromatic substitution reactions and effect of o,m& p directing group	1,6	Cr
CO 6	interpret the reactions and properties of halogen compounds, Distinguish the nuclear and side chain halogen compounds in aromatic ring, Describe the preparation and properties of halogen derivatives such as vinyl chloride, chloroprene	1,2,5,6,7	Un,An,Ap
CO7	classify and compare the types of colloids, Discuss the preparation methods and properties of colloids	1 , 2 , 5	Un
CO 8	enumerate the importance of colloids in day to day life, Know the experimental methods of determining the colligative properties	1, 3,4	Re

SEMESTER- I			
Part III	Core I	General Chemistry II	
Code :18UCHC12	Hrs/Week:4	Hrs/ Sem: 60	Credits:4

Unit I Basic Concepts of Organic Chemistry

Classification and nomenclature of organic compounds – Open chain and closed chain compounds- systems of naming organic compounds- rules of IUPAC system of nomenclature branched alkanes, cyclo alkanes – alkenes, alkynes and substituents-compounds having functional groups, poly functional groups

Polar effects – Inductive (+I, –I), Electromeric effect-Resonance/Mesomeric effect (+R, –R, +M, –M) – examples- Hyper conjugation (Baker Nathan effect) and steric effect.

Bond fission – homolytic and heterolytic fission. Reaction intermediates – carbocation, carbanion, free radicals and carbenes – their generation, shapes and stability. Types of reaction- substitution- elimination-addition-definition and examples.

Unit – II Hydrocarbons

Alkenes – Mechanism of addition reaction to alkenes – Markownikoff's rule- Peroxide effect epoxidation – ozonolysis. Dienes Classification –Conjugated dienes – (1,2&1,4 – addition)- Diels Alder reaction. Alkynes – terminal & non-terminal alkynes – acidic nature of acetylenic hydrogen atom. Aromatic hydrocarbon- Concept & Condition – Huckel's Rule- Aromatic, antiaromatic& non- aromatic compounds – Mechanism of aromatic electrophilic &Nucleophilic substitution reactions- Orientation (Electronic concept) – direct influence of substitution o,m& p directing – Benzyne mechanism.

Unit – III Halogen Compounds

Aliphatic halogen compounds – General methods of preparation, reaction of monohalogen compound- Mechanism of S_N1 , S_N2 , $E1$, $E2$, $E1CB$ reaction – Halogen derivatives- Preparation and properties of Vinyl chloride – Allyl chloride – Preparation & uses of Chloroprene- Aromatic halogen compounds – Preparation and reaction of benzyl chloride – Nuclear & Side chain halogen compounds distinction- relative reactivities of alkyl,aryl, vinyl and allyl halides.

Unit –IV Colloids

Definition- Classification of Colloids –comparison of lyophilic and lyophobic colloids- Preparation of sols-Dispersion method(Bredig's Arc method, peptization) –Aggregation method-(double decomposition, reduction, oxidation, Hydrolysis,Change of solvent)- purification of Sols-Dialysis-Properties – Optical(Tyndall effect) – kinetic(Brownian movement) Electrical (electrical double layer) – Coagulation of colloids – Hardy Schulze law-

Hoffmeister series – protective colloids – gold number - Emulsion – types and their distinction. Emulsifiers – surfactants– Gels – classification, preparation ,properties(imbibition,syneresis and thixotropy). Applications of colloids-food, medicine, thixotropic paints, clarification of municipal water, formation of delta.

Unit –V Colligative Properties

Definition- lowering of Vapour Pressure-- Raoult's Law - measurement of vapour pressure lowering— Ostwald and Walker's Dynamic method – Elevation of boiling point and its determination- Landsberger –walker method. Depression of freezing point and its determination –Rast's Camphor method – Osmotic pressure- isotonic solution- determination of osmotic pressure-Berkely and Hartley's method. Abnormal molecular masses of electrolytes – Relation between Van't Hoff factor and degree of association and dissociation

Text Books

1. K.S.Tewari,N.K.Vishnoi,S.N.Mehrotra, *A Text Book of Organic Chemistry*, 2nd Revised Edition, 1998.
2. ArunBahl and B.S.Bahl,*Advanced Organic Chemistry*,S.Chand and Company Ltd., Reprint 2005.
3. ArunBahl,B.S.Bahl,G.D.Tuli, *Essentials of Physical Chemistry*,S.Chand&Company Ltd.,New Delhi,2008.

Books for Reference

1. M.K.Jain and S.C.Sharma ,*Modern Organic Chemistry*, Vishal Publishing Co., 2017-2018.
2. Jerry March, *Advanced Organic Chemistry*, Reactions Mechanisms and Structure, 4th Edition. 2013
3. B.R. Puri. L.R. Sharma, Madan S. Pathania, *Principles of Physical Chemistry*, Vishal Publishing Co., 2008.

SEMESTER - I			
Part III Allied Mathematics – I			
Code:18UMAA11	Hrs / Week: 3	Hrs / Semester: 45	Credits: 2

Vision:

Aims to help physical science students to achieve their goals and to develop their mathematical skills

Mission:

To help students to appreciate the uses of derivatives and integrals in day to day life and solve real life problems

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	form the equations from the given roots.	6, 7	C
CO-2	Approximate solutions of equations by applying Horner's method and Newton's method	2	U,E
CO-3	transform equations by increasing, decreasing and multiplying the roots of the equation.	4	A
CO-4	develop and apply concepts of expressions and equations to investigate and describe relationships	5	A
CO-5	demonstrate problem solving skills	2, 8	C
CO-6	evaluate eigen values and eigen vectors of square matrices and make use of the properties of determinants in their calculation.	4	U,E
CO-7	calculate the radius of curvature by differentiation	4, 6, 7	U,E
CO-8	calculate centre and circle of curvature.	4, 6, 7	E

SEMESTER –I			
Part III		Allied Mathematics I	
Code : 18UMAA11	Hrs/week :3	Hrs/Semester :45	Credits :2

Unit I

Theory of equations - Formation of equations

Unit II

Approximate solutions of equations - Horner's method and Newton's method

Unit III

Matrices - Cayley - Hamilton theorem - Eigen values and Eigen vectors

Unit IV

Curvature and Radius of Curvature –Cartesian and polar co - ordination

Unit V

Centre of Curvature - Evolutes

Text Book

S.Arumugam and A.Thangapandi Isaac, Allied Mathematics, New Gamma Publishing House, Palayamkottai

Books for Reference

1. Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., Ancillary Mathematics Volume I, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010
2. Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., Ancillary Mathematics Volume II, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010

SEMESTER – I			
Part III		Allied Mathematics II	
Code:18UMAA12	Hrs / Week: 3	Hrs / Semester: 45	Credits: 2

Vision:

Aims to help physical science students to achieve their goals and to develop their mathematical skills

Mission:

To help students to appreciate the uses of derivatives and integrals in day to day life and solve real life problems

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	compute the curl and the divergence of vector fields	4	C
CO-2	compute the gradient of a scalar valued function	1, 4	C
CO-3	solve Differential Equations	5	E
CO-4	interpret basic definitions and terminology associated with differential equations and their solutions	6,7,8	U
CO-5	classify the differential equations with respect to their order and linearity	6, 7,8	An
CO-6	Solve linear differential equations	1	Ev
CO-7	find complementary functions	4	R
CO-8	evaluate particular integrals of the form e^{ax} , $\sin ax$, $\cos ax$, x^m and $e^{ax}f(x)$	2, 4	A,E

SEMESTER –I			
Part III		Allied Mathematics II	
Code : 18UMAA12	Hrs/week :3	Hrs/Semester :45	Credits :2

Unit I

Vector Differentiation - Gradient-unit normal

Unit II

Divergence and Curl

Unit III

First order differential equations of higher degree - Equations solvable for p,x,y and Clairauts form

Unit IV

Linear equations of second and higher order with constant coefficients- Complementary function - particular integrals of the form e^{ax}

Unit V

Linear equations of second and higher order with constant coefficients- Complementary function - particular integrals of the form $\sin ax, \cos ax, x^m$ and $e^{ax}f(x)$

Text Book

S.Arumugam and A.Thangapandi Isaac, Allied Mathematics, New Gamma Publishing House, Palayamkottai

Books for Reference

1. Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., Ancillary Mathematics Volume I, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010
2. Narayanan S., Kandaswamy P., Hanumantha Rao R., Manicavachagom Pillay T.K., Ancillary Mathematics Volume II, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010

SEMESTER I			
Part III ALLIED BIOCHEMISTRY -I			
Code: 18UBCA11	Hrs/Week : 4	Hrs/ Sem : 60	Credits : 3

VISION:

Acquire knowledge about the chemical composition of life.

MISSION:

- Understand fundamental biochemical processes.
- Knowledge about vitamins and their deficiency
- Study the functions of hormones.

Course Outcomes

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO 1	Explain about the chemical composition and the elements of life. Differentiate direct and indirect method for the determination of energy requirement of man	1,2	Un
CO 2	Express the importance of bioenergetics	7	Un
CO 3	Compare the biological reaction such as exergonic reaction and endergonic reaction	3	An
CO 4	Demonstrate about the various energy rich compounds such as adenosine triphosphate, guanosine triphosphate, uridinetriphosphate, Cytidinetriphosphate and acyl phosphate.	5	Ap
CO 5	Distinguish water soluble and fat soluble vitamins and analyze their composition, functions and deficiency symptoms.	3	An
CO 6	Interpret the hormones producing organs and their functions, Know about the plant as well as animal hormones.	3,5	Cr,Re
CO 7	Identify the antibiotics which are all responsible for affecting cell wall synthesis, cytoplasmic membrane and enzyme systems.	7	Re
CO 8	Develop knowledge about the antibiotics interfering with nucleic acid function and inhibiting protein synthesis.	5	Ev

SEMESTER I			
Part III ALLIED BIOCHEMISTRY -I			
Code: 18UBCA11	Hrs/Week : 4	Hrs/ Sem : 60	Credits : 3

UNIT-I Introduction To Biochemistry

Introduction to biochemistry - scope – chemical composition of life – elements of life – water – biological importance – Energy requirements of the body – Measurement of energy value of foods – Determination of energy requirement of man – Direct method, Indirect method, Respiratory quotients (RQ) of food stuffs – Total heat production – Significance of RQ - Basal metabolism – Definition – Conditions for measurement – Factors influencing, Measurement, Significance, Specific dynamic action.

UNIT – II Bioenergetics

Introduction – Importance of bioenergetics - Energy and work – thermodynamic principles - Biological reactions – Exergonic reaction – Endergonic reaction – Energy and its forms - Energy rich compounds – Adenosine triphosphate – Guanosine triphosphate – Uridine triphosphate – Cytidine triphosphate – Acyl phosphate - Energy coupling.

UNIT – II Vitamins

Introduction – definition - Sources of vitamin – Deficiency diseases – provitamins – biological functions - Properties of Vitamins – Classification of vitamins - water soluble (Vitamin B₁, B₂, B₃, B₅, B₆, B₇, B₉ and B₁₂) and fat soluble vitamins (Vitamin – A, D, E and K) and their composition, functions and deficiency symptoms.

UNIT – IV Hormones

Introduction –Definition – Properties – Biological Functions – Chemical Nature – Hormones secreting glands – Hormones producing organs and their functions - Classification of hormones: based on chemical nature – Functions of Hormones – Plant hormones – Animal hormones.

UNIT – V Antibiotics

Introduction – Definition – Antibiotics affecting cell wall synthesis (pencillin, cephalosporin) – Antibiotics affecting the cytoplasmic membrane – Antibiotics interfering with Nucleic acid function – Antibiotics inhibiting protein synthesis (streptomycin, erythromycin, neomycin)– Antibiotics affecting enzyme systems – Drug resistance.

Text Books:

1. Dulsy Fatima, L.M. Narayanan, R.P. Meyyan Pillai, K. Nallasingam, S. Prasanna Kumar and N. Arumugam, *Biochemistry*, Saras Publication, 1996
2. Patricia truelman, *Nutritional Biochemistry*, MJP publisher 2011
3. L.Veerakumari, *Biochemistry* MJP publisher 2010

Book for Reference :

1. Dr. A.C. Deb, *Concepts of Biochemistry*, Books & Allied (P) Ltd., 1999
2. C.B. Powar, G.R.Chatwal, *Biochemistry*, Himalaya Publishing House 2002

SEMESTER II			
Part III	Core III	Inorganic Chemistry- I	
Code :18UCHC21	Hrs./Week:4	Hrs/ Sem:60	Credits:4

Vision

Transforming knowledge into skill through novel metallurgical techniques and periodic properties

Mission

- Recall the basic methods of purification of ores.
- Explain the general characteristics about s and p block elements.
- Have an insight into the theory of practicals.

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO 1	Recall the methods of purification of ores	1	R
CO 2	Identify the electronic configurations of the zero, s, p d-and f-block elements	1, 5	An
CO 3	Explain the general characteristics and diagonal relationship of alkali and alkali earth metals and discuss the preparation and uses of their compounds	1	Un
CO 4	Describe the extraction and uses of various lanthanide and actinide compounds.	1, 5, 7	Un
CO 5	Derive equations for reactions of compounds of the zero group elements	1, 3	Ap
CO 6	Compare the different shapes of compounds of noble gases	3, 4	Ap
CO 7	Apply the knowledge about interfering radicals, common ion effect and solubility product	1, 4, 7, 8	Ap
CO 8	Communicate the concepts and results of their laboratory experiments clearly and concisely to both chemists and non-chemists through effective writing and oral communication skills	1, 2 7, 8	Ev

SEMESTER II			
Part III	Core III	Inorganic Chemistry- I	
Code :18UCHC21	Hrs./Week:4	Hrs/ Sem:60	Credits:4

Unit I General Principles of Extraction of Metals

Minerals, ores and gangue -different steps of metallurgy – crushing and grinding of the ore – concentration of the ore – hand picking - gravity separation (Hydraulic Washing) - electromagnetic separation – electrostatic separation – froth flotation process - leaching process – calcination – roasting –difference between calcination and roasting – reduction to free metals – reduction by displacement, thermal decomposition, carbon (smelting), heating in air, an electro positive metal (Gold Schmidt's aluminothermic process) – Kroll's process – flux and slag. Refining of impure metals – thermal refining - distillation, liquation – vapour phase refining- Van Arkel process, carbonyl process- electrolytic process- zone refining process- Ellingham diagram- Types of furnaces – Fuel fired – blast, reverberatory and blast furnace – Electric furnace – Arc furnaces and resistance furnace.

Unit II s-block elements

General characteristics of IA and IIA group elements – diagonal relationship of lithium with magnesium – anomalous behaviour of lithium and beryllium – extraction of lithium beryllium. Sodium carbonate and sodium bicarbonate – manufacture – properties and uses – principle of fire extinguisher. Preparation and uses of basic beryllium acetate, epsom salt, gypsum, plaster of Paris and lithopone.

Unit III p-block elements (boron and carbon)

Boron – classification and nomenclature of boron hydrides – preparation, structures and uses of diborane – boron trihalides as Lewis acid – relative strength of boron trihalides. Lewis acids – oxo compounds of boron – ortho boric acid – preparation, properties and uses Borax bead test.

Carbides – Classification with examples – Preparation, Properties, uses and Structure of Calcium Carbide, Boron Carbide, Aluminium Carbide and Silicon Carbide – Per carbonates – Preparation, Properties and Structure of Permonocarbonate , perdicarbonates - Preparation, Properties and uses of Carbonyl Chloride and Carbon disulphide -Fullerenes

Unit IV p-block elements (nitrogen and halogens)

Liquid ammonia as a non-aqueous solvent – Preparation, Properties, Uses and Structures of

hydrazine, hydrazoic acid and hydroxylamine – Structure of oxides of Nitrogen(NO , N_2O , NO_2 , N_2O_4 , N_2O_5)

Peculiarities of fluorine, the first element of the group – manufacture of fluorine – etching on glass. hydrides of halogens (hydrogen halides) - formation – physical state - stability – reducing character - nature of bonds – relative strengths of oxide – Born – Haber cycle. Interhalogen compounds – preparation and structure of interhalogen compounds. Pseudohalogen-polyhalides and basic nature of iodine.

Unit V Theory of practicals II

Inorganic quantitative analysis – Primary and secondary standard. Preparation of a primary standard solution. Methods of expressing the strength of the solution – percentage, normality, molarity, molality and formality, volumetric principle – calculation of strength of solution.

Types of titrations –definition - principle and examples. Acid-base titrations - Redox titrations involving self, internal and external indicators. Complexometric titrations.

Inorganic qualitative analysis - basic idea Types of radicals - simple and interfering radicals Common ion effect and solubility product -definition -applications in inorganic qualitative analysis.

Analysis of anions: Test for sulphide, sulphate, nitrate (brown ring test), bromide and iodide (silver nitrate test), chloride and chromate (chromyl chloride test), oxalate and fluoride (calcium chloride test), borate (ethyl borate test), phosphate (ammonium molybdate test).

Need for eliminating interfering radicals –methods of elimination of various radicals.

Analysis of Cations : Test for – lead, copper, cadmium, antimony, bismuth, cobalt, nickel, manganese, zinc, barium, strontium, calcium, magnesium and ammonium.

Principles of gravimetric analysis – precipitation methods – conditions of precipitation – co-precipitation and post precipitation

Text books

1. B.R.Puri, L.R.Sharma, K.C.Kalia, *Principles of Inorganic Chemistry*, Milestone publishers and distributors, Delhi.
2. R.D.Madan, *Modern Inorganic Chemistry*, S.Chand & Co., Ltd. New Delhi, 2005

Books for Reference

1. Gurdeep Raj, *Advanced inorganic Chemistry*, Goel Publishing house 1986.
2. Sathyaprakash and R.D.Madan, *Advanced Inorganic Chemistry* Volume I, S.Chand and Company, New Delhi. 2005,
3. S. Giri, D.N. Bajpai and O.P. Pandey, *Practical chemistry*, S. Chand and Company Ltd., New Delhi. 6th Edition.

SEMESTER- II			
Part III	Core IV	Organic Chemistry-I	
Code :18UHC22	Hrs/Week:4	Hrs/ Sem: 60	Credits:4

Vision

Acquire excellence in Organic Chemistry for educating and graduating students

Mission

- Gain knowledge about the importance of ethers, epoxides, hydroxy, nitro and amino compounds
- Appreciate the applications of organometallic compounds in synthesis
- Understand the concepts of tautomerism & molecular rearrangements

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO 1	Prepare alcohols and summarize their properties, Distinguish between 1°, 2° & 3° alcohols, Recognise the differences between the acidities of alcohols and phenols	1,3,6	Ev,An,Re
CO 2	Reframe the alcohol series, Justify the effect of substituent on the acidity of phenols, Know the preparation and uses of thioalcohols	1,2,3,6	Cr,Re
CO 3	Estimate alkoxy group by ziesel's method	1,2	Cr
CO 4	Compare ethers and alcohols, nitroalkanes and alkyl nitrites, Differentiate 1°, 2° & 3° amines by reactions	1,3	An
CO 5	Justify the effect of substituent on the basicity of aromatic amines	1,3	Cr
CO 6	Recall the synthetic importance of organometallic compounds, Recognise Frankland reagent and its significance	1,6,7	Re
CO 7	Illustrate the theory of resonance and tautomerism	1,3	Un
CO 8	Identify the product of rearrangement reactions such as pinacol-pinacolone, Benzil-Benzilic acid, Curtius, Lossen, Favorskii and Fries rearrangement.	1,3	An

SEMESTER- II			
Core IV		Organic Chemistry-I	
Code :18UCHC22	Hrs/Week:4	Hrs/ Sem: 60	Credits:4

UNIT – I Hydroxy Compounds

Alcohols – General methods of preparation and properties of mono hydric alcohols – distinction between primary, secondary and tertiary alcohols – (Lucas test, catalytic dehydrogenation, oxidation, Victor - Meyer's test)-Interconversion of primary, secondary and tertiary alcohols. Ascent and descent in the series of alcohols-trihydric alcohol-Glycerol-Preparation, properties – derivatives of glycerol- nitroglycerine-blasting gelatin- Cordite and dynamite-Phenols – classification with example – effect of substituent on the acidity of phenols – Mechanism of Kolbe's reaction, Riemer- Tiemann- test for phenol – Preparation & uses of Nitrophenol (picric acid only)- Dihydric phenol – Catechol, Resorcinol & Quinol – Thioalcohols-ethyl mercaptan.

UNIT-II Ethers and Epoxides

Classification- Preparation by Williamson's synthesis and alkoxymercuration-demercuration methods.- Ziesel's method for the estimation of alkoxy groups-comparison of ethers and alcohols- Phenolic ethers- preparation and properties of anisole, guaicol-

Ethers- ethers of industrial importance – Preparation properties and uses of oxirane, and dioxane

UNIT – III Nitro Compounds and Amino Compounds

Preparation and reaction of nitrile and isonitrile – distinction between nitroalkane and alkyl nitrites – reduction reaction of nitroalkane – NEF reaction.

Preparation of o, p,m-dinitrobenzene- trinitrobenzene.

Aliphatic amine – separation of mixture of amine –(Hoffmann, Heisenberg method)- Comparison of 1°, 2°&3° amines- Mustard oil reaction- Mannich reaction – ascending and descending of amines.

Aromatic amines – effect of substituents on the basicity of aromatic amines-preparation and properties of phenylenediamine

Diazonium compounds- Preparation of diazonium chloride and its synthetic applications.

UNIT -IV Organometallic Compounds

Definition – examples- Organomagnesium compound (Alkyl magnesium halides) – preparation, general characteristics and synthetic applications (Nucleophilic substitution reactions , addition reaction and miscellaneous reactions.) Organo zinc compounds(Diethyl

Zinc-Frankland reagent)- preparation, properties and synthetic applications (Nucleophilic substitution and addition reactions). Organo Lithium compounds (alkyl lithium) –preparation and synthetic applications- Organo Silicon compounds- Preparations and reactions- Preparation and uses of TEL.

UNIT – V Tautomerism and Molecular Rearrangements

Resonance – definition – resonance energy – resonance theory.

Tautomerism – Definition – Types of tautomerism – Keto-enol, Nitro -acinitro, Lactam - lactim, p-Nitrosophenol- Quinone monoxime and amido-imidotautomerism.

Molecular Rearrangement

- a) Rearrangement involving migration to electron deficient carbon- Pinacol-pinacolone rearrangement, Benzil-benzilic acid rearrangement
- b) Rearrangement involving migration to electro deficient nitrogen-Curtius rearrangement, Lossen rearrangement
- c) Rearrangement involving carbanion intermediate – Favorskii rearrangement
- d) Rearrangement involving migration from oxygen to aromatic ring-Fries rearrangement

Text Books

1. K.S.Tewari, N.K. Vishnoi, S.N. Mehrotra, *A Text Book of Organic Chemistry*, 2nd Revised Edition, 1998.
2. Arun Bahl and B.S. Bahl, *Advanced Organic Chemistry*, S.Chand and Company Ltd., Reprint 2005.
3. M.K. Jain and S.C. Sharma, *Modern Organic chemistry*, Vishal Publishing Co., 2017-2018

Books for Reference:

1. Jerry March, *Advanced Organic Chemistry, Reactions Mechanisms and Structure*, 4th Edition. 2013
2. I.L. Finar, *Organic Chemistry*, Volume 1, The Fundamental Principles, 6th Edition, 1973.

SEMESTER I & II			
Major Practical I			
Code : 18UCHCR1	Hrs/Week : 2	Hrs/ Sem : 30	Credits : 2

Quantitative Analysis (Volumetric Methods)

A double titration involving the preparation of a primary standard, standardization of the link solution, making up of the given solution and its estimation. Concepts of acids, bases, oxidants, complex formation — Theory of Indicators. (Use of digital balance is permitted).

Titrimetric Quantitative Analysis:

	Substance to be estimated	Primary Standard
I Acidimetry and alkalimetry.	1. NaOH/ Na ₂ CO ₃	Na ₂ CO ₃
	2. HCl/H ₂ SO ₄ /oxalic acid	Oxalic acid
II Permanganometry	3. Oxalic acid	Oxalic acid
	4. Mohr's salt	Mohr's Salt
	5. Fe ²⁺ Mohr's Salt	
III Dichrometry - External indicator method	6. Fe ²⁺ Mohr's Salt	
IV Iodometry	7. CuSO ₄ /K ₂ Cr ₂ O ₇	K ₂ Cr ₂ O ₇
	8. KMnO ₄	CuSO ₄
V Complexometry	9. Zn ²⁺	ZnSO ₄ .7H ₂ O
	10. Pb ²⁺ Pb(NO ₃) ₂	
	11. Mn ²⁺	MnSO ₄ .H ₂ O
	12. Ni ²⁺	ZnSO ₄ .7H ₂ O

VI Estimation of Phenol /Aniline

VII Course work (Not for external examination)

1. Estimation of acetic acid in vinegar samples.
2. Estimation of oxalate content in vegetables and fruits such as tomato, guava, grapes, etc.
3. Estimation of sodium carbonate and sodium Bicarbonate in a mixture.
4. Estimation of Total Hardness of water.

Books for Reference:

1. Vogel's Textbook of Quantitative Chemical Analysis, 2004 sixth Edition
2. Advanced Practical Chemistry - RaghupatiMukhopadhyay, Pratul Chatterjee Books and Allied (P) Ltd. Third Edition-2007

SEMESTER - II			
Allied	Allied Mathematics –III		
18UMAA21	Hrs / Week: 3	Hrs / Semester: 45	Credits: 2

Vision:

Aims to help physical science students to achieve their goals and to develop their mathematical skills

Mission:

To help students to appreciate the uses of derivatives and integrals in day today life and solve real life problems

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Identify the difference between partial differential equation and ordinary differential equation	1	An
CO-2	Form the partial differential equation	6	Cr
CO-3	Classify various types of partial differential equations	3	Un
CO-4	Apply Laplace transform on functions	8	Ap
CO-5	Understand inverse Laplace transform	4	Un
CO-6	Solve differential equation using Laplace transform	5	An
CO-7	Identify Beta integrals and Gamma integrals	2	Ap
CO-8	Understand the concept of Beta and Gamma functions.	7	Un

Semester –II			
Part III		Allied Mathematics – III	
Code : 18UMAA21	Hrs/week : 3	Hrs/Sem : 45	Credits : 2

Unit I

Partial differential equation –first order -formation - types of solutions -Lagrange’s form

Unit II

Laplace transforms - inverse Laplace transform

Unit III

Application to solution of differential equations (except simultaneous equations)

Unit IV

Beta and Gamma functions – Definitions, Properties and results

Unit V

Beta and Gamma functions - Problems

Text Book

1. S.Arumugam&A.ThangapandiIsaac, Allied Mathematics, New Gamma Publishing House, Palayamkottai

Books for Reference

1. Narayanan S., Kandaswamy P., Hanumantha Rao R., ManicavachagomPillay T.K., *Ancillary Mathematics Volume – I*, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010
2. Narayanan S., Kandaswamy P., Hanumantha Rao R., ManicavachagomPillay T.K., *Ancillary Mathematics Volume – II*, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010

SEMESTER – II			
Part III Allied	Mathematics – IV		
18UMAA22	Hrs / Week: 3	Hrs / Semester: 45	Credits: 2

Vision:

Aims to help physical science students to achieve their goals and to develop their mathematical skills

Mission:

To help students to appreciate the uses of derivatives and integrals in day today life and solve real life problems

Course Outcome:

CO.No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Use the Jacobian to change variables to ease integration	1, 3	Un
CO-2	Evaluate line integrals	3	Ev
CO-3	Set up the regions and integrate double integrals in rectangular and polar coordinates	2	Re, Ev
CO-4	Set up and evaluate triple integrals	3	Re, Ev
CO-5	Use Green's theorem to evaluate line integrals along simple closed contours on the plane.	10	Cr
CO-6	Apply Stokes' theorem to compute line integrals along the boundary of a surface.	7,9	Ap
CO-7	Use Stokes' theorem to give a physical interpretation of the curl of a vector field.	8,9	An
CO-8	Use the divergence theorem to give a physical interpretation of the divergence of a vector field.	8, 9	Ap

Semester –II			
Part III		Allied Mathematics – IV	
Code : 18UMAA22	Hrs/week : 3	Hrs/Sem : 45	Credits : 2

Unit I

Jacobian –Results and Problems

Unit II

Vector Integration –Line Integral

Unit III

Vector Integration –Surface Integral-Stoke's theorems

Unit IV

Vector integration - Volume integrals-Verification of Green's, and Divergent theorems (simple problems only).

Unit V

Introduction of Forward Difference operator and Backward Difference operator(only)

-Newton's Interpolation formulae

Text Book

S.Arumugam&A.ThangapandiIsaac, Allied Mathematics, New Gamma Publishing House, Palayamkottai

Books for Reference

1. Narayanan S., Kandaswamy P., Hanumantha Rao R., ManicavachagomPillay T.K., *Ancillary Mathematics Volume – I*, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010
2. Narayanan S., Kandaswamy P., Hanumantha Rao R., ManicavachagomPillay T.K., *Ancillary Mathematics Volume – II*, S.Viswanathan (Printers & Publishers), PVT., LTD., 2010

SEMESTER II			
Part III		Allied Biochemistry -II	
Code: 18UBCA21	Hrs/Week : 4	Hrs/ Sem : 60	Credits : 3

Vision:

Achieve broad based knowledge in concepts and principles of biochemistry.

Mission:

- Provide an opportunity in acquiring knowledge about nutritional biochemistry.
- Understand the various pathways involved in cell respiration.
- Grasp in-depth knowledge about the biochemistry of blood and respiration.
- Familiarize the learners with the techniques involved in biochemistry.

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO 1	Discuss in detail about the nutritional values of milk, egg, meat, fish, vegetable foods, fruits, tea, coffee, cocoa and alcohol. Analyse the physio-chemical interactions between diet ingredients.	1,3	Un,An
CO 2	Categorize energy yielding foods, body building foods and protective foods. Assess effect of drugs on food intake, body weight, nutrient requirements and growth, vitamins and minerals.	1,5	An,Cr
CO 3	Demonstrate the theories of biological oxidation decarboxylation, electron transport system and oxidative phosphorylation.	6	Ap
CO 4	Describe the functions of blood. Discuss in brief about red blood cells, white blood cells, blood platelets, plasma and plasma protein.	1	Un
CO 5	Identify the variation in structure of hemoglobin with reduced solubility and altered oxygen affinity.	2	Re
CO 6	Formulate how the transport of oxygen by blood and carbon-di-oxide in blood taking place.	1	Ev
CO 7	Interpret the role of kidneys in acid-base balance, Relate the physical and chemical transport of blood,	2,6	Cr,Ap
CO 8	Compare the relation between optical and electron microscope, Identify the separated components using paper as well as gel electrophoresis.	1,2	An,Re

SEMESTER II			
Part III		Allied Biochemistry -II	
Code: 18UBCA21	Hrs/Week : 4	Hrs/ Sem : 60	Credits : 3

UNIT – I Nutritional Biochemistry

Nutritive value of Milk – Egg – Meat - Fish – Vegetable food (Cereals, Pulses, Nuts, Roots and Tubers, Green leafy vegetables) – Fruits – Tea – Coffee – Cocoa – Alcohol – Principles in balancing a diet - Bioavailability – absorption – Physico-chemical interactions between diet ingredients and drug ingredients – gastric emptying and drug absorption – transport across membrane – dietary effects on drug function – drug excretion – low protein diets – dehydration and starvation – effect of drugs on food intake, body weight, nutrient requirements and growth, vitamins and minerals – Energy yielding, Body building and Protective foods..

UNIT – II Cell Respiration and Biological Oxidations

Introduction – Importance of Biological oxidation – Theories of biological oxidation : oxygen activation theory, hydrogen activation theory – Hydrogen acceptors – Nicotinamide nucleotide – Flavin nucleotide – Cytochrome – Sites – Pathways – Oxidative decarboxylation – Electron transport system – Oxidative Phosphorylation – Energetics of Biological oxidation.

UNIT – III Biochemistry of Blood

Introduction – Functions of Blood – (Homeostatic functions, Blood as transport system) – Types of Blood group, Rh⁺ and Rh⁻ Red Blood Cells – White Blood Cells– Blood Platelets – Plasma – Plasma proteins – Albumin, Globulin (alpha, beta and gama), Fibrinogen – Functions of plasma proteins - Blood groups – Hemoglobin – Variation in structure - Hemoglobin with reduced solubility, altered oxygen affinity.

UNIT – IV Biochemistry of Respiration

Introduction – Transport of Oxygen by Blood– Oxygen dissociation curve – Factors affecting the dissociation of oxyhemoglobin –Temperature, Electrolytes and Effect of CO₂ – Carboxyhemoglobin – Oxygen toxicity – Transport of Carbon dioxide in blood – Mode of transport of CO₂– Physical and Chemical transport – Chloride shift – Significance of N₂ in respiration – Buffer Systems of the Blood – The hemoglobin buffers – Acid Base balance – Causes of disturbances – Role of kidneys in acid base balance - Hypoxia.

UNIT – V Biochemical Techniques

Introduction – Centrifuge – Principle, types – Hand Centrifuge, High Speed Centrifuge – pH meter – Principle, Electrodes used, Applications – Microscopy: Optical and electron

Microscope – comparison – Ion probe analysis – Electrophoresis – Paper electrophoresis, Gel electrophoresis – Identification of separated components – Applications.

Text Books:

1. Dulsy Fatima, L.M. Narayanan, R.P. Meyyan Pillai, K. Nallasingam, S. Prasanna Kumar and N. Arumugam, *Biochemistry*, Saras Publication, 1996
2. Patricia trueman, *Nutritional Biochemistry* , MJP publisher 2011
3. L.Veerakumari, *Biochemistry* MJP publisher 2010

Book for Reference :

1. Dr. A.C. Deb, *Concepts of Biochemistry*, Books & Allied (P) Ltd., 1999
2. C.B. Powar, G.R.Chatwal, *Biochemistry*, Himalaya Publishing House 2002

SEMESTER I & II			
Part III		Allied Biochemistry Practicals	
Code:18UBCAR1	Hrs/Week : 2	Hrs/ Sem : 30	Credits : 2

Qualitative And Quantitative Analysis

Analysis of Simple Biomolecule

- I. Qualitative analysis of carbohydrates.
- II. Qualitative analysis of amino acids.
- III. Colour reactions of Proteins.

Volumetric Analysis

- I. Estimation of Glycine by formal titration.
- II. Estimation of Ascorbic acid.
- III. Estimation of Protein by Biuret method.
- IV. Determination of Saponification number of oil.
- V. Determination of Iodine number of oil.
- VI. Preparation of Buffer and Determination of its pH using pH meter.

Books for Reference:

1. *Vogel's Textbook of Quantitative Chemical Analysis*, 2004 sixth Edition
2. Raghupati Mukhopadhyay, Pratul Chatterjee , *Advanced Practical Chemistry*
Books and Allied (P) Ltd. Third Edition-2007

SEMESTER- III			
Core V		Physical Chemistry-I	
Code : 18UCHC31	Hrs/Week : 4	Hrs/ Sem : 60	Credits : 4

Vision:

Explore and enhance new chemical frontiers in physical chemistry.

Mission:

Mould the students to acquire knowledge in the field of nuclear chemistry, Surface Chemistry, phase rule and gaseous states of matter

Course Outcome :

CO No.	Upon completion of this course, students should be able to	PSO addressed	CL
CO- 1	have an overall knowledge about liquid and gaseous states of matter	1,2 , 3	Re
CO- 2	explain the relationship between kinetic energy and temperature of a gas; between temperature and the velocity of a gas; and between molar mass and the velocity of a gas.	1,3	Un
CO- 3	understand the basis of nuclear forces , nuclear stability , radioactivity and nuclear reactions	1,2,4	Un
CO- 4	interpret phase rule	1,3,4	Ev
CO- 5	prioritise the phenomenon of catalysis in industry and biological systems and learn the basic concepts of adsorption and its applications in various walks of life	1 , 2,5,7,8	Ap
CO- 6	enumerate the general characteristics of catalytic reactions and thorough knowledge of the theory behind homogeneous and heterogeneous catalysis	1 ,2,7	Re
CO- 7	distinguish adsorption/desorption and the kinetics of catalytic reactions on a surface.	3,4,5,7,8	An
CO- 8	justify the significance of Freundlich, Langmuir isotherms and BET isotherm	1,2	Ev

SEMESTER- III			
Core V		Physical Chemistry-I	
Code : 18UCHC31	Hrs/Week : 4	Hrs/ Sem : 60	Credits : 4

Unit I Gaseous State

Kinetic theory of gases – justification of postulates-derivation of kinetic gas equation- deduction of gas laws from the kinetic gas equation-Charle's law, Boyle's law, Avogadro's law, ideal gas equation – Dalton's law of partial pressure – Graham's law of diffusion- kinetic theory and temperature – Maxwell's law of distribution of velocities (no derivation) –types of molecular velocities – graphical representation and its significance- collision diameter – collision number – collision frequency – mean free path – viscosity of gases-calculation mean free path and collision diameter from Chapman equation- deviations from ideal behavior-compressibility factor- effect of pressure and temperature on deviation-explanation of deviation-volume correction-pressure correction – Van der Waal's equation—limitations-liquefaction of gases-critical phenomenon—Andrew's isotherms of CO₂- Van der Waal's equation and critical constants-experimental determination- law of corresponding states.

Unit II Nuclear Chemistry – I

Nuclear size- Nuclear Forces – Packing Fraction – mass defect and binding energy – mass energy relation – stability of nucleus – n/p ratio – odd even rule – magic numbers – nuclear models (Shell model and liquid drop model) – Types of radioactive decay – Radioactive series – β^- electron capture and internal conversion- group displacement law – detection and measurement of radioactivity by G.M Counter – rate of decay – half life and average life – Geiger Nuttal rule – radioactive equilibrium – nuclear isomerism

Unit III Nuclear Chemistry – II

Artificial radioactivity – different types of artificial radioactivity – Nuclear reactions (elastic, inelastic, scattering and spallation) – Nuclear Fission and atom bomb – Nuclear Fusion and hydrogen bomb –Stellar energy – fertile and fissile isotopes – Neutron activation analysis – Application of radioactive isotopes in medicine, reaction mechanism and carbon dating – Nuclear reactor –and its components – fast breeder reactors – Nuclear power reactors in India – Particle accelerators (Cyclotron, Synchrotron)- Chemistry of Hot atom – Radiation Dosimetry – Hazards and precautions in Nuclear Technology

Unit IV Phase Rule

Statement – definitions of terms used – thermodynamic derivation of phase rule –phase diagrams- areas- curves- triple point- meta stable equilibrium- polymorphism-enantiotropy-monotropy- -experimental determination of transition point –colour change,density change,- solubility change, and cooling curve methods.

One component system-water system, Sulphur system -two component system – condensed system and reduced phase rule – simple eutectic system – Ag-Pb system –Pattinson's process for the desilverisation of argentoferrous Lead –Zn-Cd system -principles of freezing mixture –

KI-H₂O -system forming compounds with congruent and incongruent melting points – (Zn – Mg system, FeCl₃ – H₂O system)

Unit V Surface Chemistry

Adsorption – types- physisorption and chemisorption – adsorption of gases by solids- adsorption isotherm – derivation and significance of Freundlich and Langmuir isotherms – BET isotherm (no derivation) – applications of adsorption – adsorption indicator- heterogenous catalysis-froath floatation process-

Catalysis - General characteristics of catalytic reactions – acid-base catalysis and enzyme catalysis– Fischer Lock and key theory – characteristics of enzyme catalysis. Mechanism and kinetics of enzyme catalysed reaction (Michaelis-Menton equation). Activation energy and catalysis – theories of homogeneous and heterogeneous catalysis – mechanism of the hydrogenation of ethene on nickel surface. Acid base catalysis – mechanism – promoters – promotion action – examples of catalytic poisoning – negative catalysis – mechanisms of negative catalysis, autocatalysis and photocatalysis.

Text Books

1. B.R.Puri. L.R. Sharma, Madan S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2008.
2. Arun Bahl, B.S. Bahl, G.D. Tuli, Essentials of Physical Chemistry, S. Chand & Company Ltd., New Delhi, 2008.

Books for Reference

- 1.Sadhan Kr.Dutta, Principles of Physical Pharmacy and Biophysical Chemistry, Books and Allied (P) Ltd. Kolkata, 2007
2. P.L.Soni, O.P.Dharmaha,Text Book of Physical Chemistry(A Modern Approach), Sultan Chand and Sons Publishers, Revised Edition, 2010.
- 3.Iran.Levine,Physical Chemistry,Mc Graw Hill, Kogakusha Ltd. 1978.

SEMESTER- III			
Allied Physics – Paper I			
Code : 18UPHA31	Hrs/Week : 4	Hrs/ Sem : 60	Credits : 3

Vision: To enable students to understand and appreciate the principle behind various physical phenomena and apply them in appropriate situations

Mission: To provide knowledge in the physical phenomena such as elasticity, bending of beams, surface tension, heat and light through the systematic study of theory and experiments

Course Outcome:

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Define fundamentals of elasticity and discuss concepts of stress and strain and the relationship between both, use the stress-strains equations to solve the problems of elastic modes	1	Re, Un
CO-2	Solve problems related to uniform and non-uniform bending of beams	1	An
CO-3	Define the terms viscosity and surface tension	1	Re
CO-4	Describe the properties of fluids such as viscosity, surface tension and capillary rise and evaluate the value of coefficient of viscosity	1, 2, 6	Un, Ev
CO-5	Estimate the thermal conductivity of a bad conductor	1	Ev
CO-6	Calculate the specific heat capacity of a liquid	1, 6	An
CO-7	Calculate the thickness of a thin wire by forming interference fringes	1, 2, 6	An
CO-8	Assess the dispersive power and resolving power of a grating	1, 2, 6	Ev

SEMESTER- III			
Allied Physics – Paper I			
Code : 18UPHA31	Hrs/Week : 4	Hrs/ Sem : 60	Credits : 3

Unit I: Elasticity

Elastic moduli – Work done in shearing strain – Relation between elastic constants – Twisting couple on a cylindrical wire – Expression for couple per unit twist – Torsion pendulum – Experiment to determine the rigidity modulus of a wire using Torsion pendulum.

Unit II: Bending of beams

Bending of beams – Expression for bending moment – Theory of uniform bending – Expression for elevation in uniform bending – Experiment to find Young's modulus using microscope – Non-uniform bending – Expression for depression – Experiment to find Young's modulus using scale and telescope.

Unit III: Surface tension & Viscosity

Surface tension – Excess of pressure over a curved surface – Coefficient of viscosity and its dimension – Experiment to determine the coefficient of viscosity of a highly viscous liquid (Stoke's) – Rate of flow of liquid through a capillary tube by dimension method and by Poiseuille's method – Experimental determination of surface tension: Drop-weight method – Analogy between current flow and liquid flow.

Unit IV: Thermal Physics

Mean free path – Expression for mean free path – Transport phenomena – Expression for viscosity, thermal conductivity and diffusion – Thermal conductivity – Lee's disc experiment to determine the thermal conductivity of a bad conductor – Newton's law of cooling – Determination of specific heat capacity of a liquid.

Unit V: Interference and diffraction

Young's double slit experiment – Condition for interference – Additional phase difference due to dissimilar reflections – Colour of thin film – Air wedge – Thickness of a wire – Fresnel and Fraunhofer diffraction – Plane transmission grating – Experiment to find wavelength by normal incidence method – Distinction between interference and diffraction bands.

Text Books:

1. A. Ubald Raj and G. Jose Robin, Allied Physics, Indira publication, Marthandam, First edition 2008.
2. A. Ubald Raj and G. Jose Robin, Allied Physics vol. – I (Revised Syllabus), Indira publication, Marthandam, First edition 2006.

Books for Reference:

1. Brijlal & Subramanian, A text book of Optics, S. Chand & Co.
2. D.S. Mathur, Elements of Properties of matter, ShyamLal charitable trust, New Delhi, Reprint 2013.
3. R. Murugesan, Properties of matter, Revised edition, S. Chand & Co. Ltd. 2008.
4. David Halliday & Robert Resnik & Jearl Walker, Fundamentals of Physics, John Wiley & sons Inc.

SEMESTER III			
Core Skill Based		Agricultural Chemistry and Water Management	
Code :18UCHS31	Hrs./Week:4	Hrs/ Sem : 60	Credits:4

Vision

Facilitate the students to know the basic knowledge about agriculture and soil

Mission

- Realize the importance of agriculture
- Understand the chemistry behind fertilizers and pesticides
- Idea to create vermincompost
- Analyze the quality of drinking water

Course Outcome

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	understand the importance of soil its constituents, fertility and to promote agriculture.	1, 7	Un
CO - 2	know the preparation and importance of fertilizers in agriculture	1, 7	Re
CO - 3	realize the importance of pesticides and insecticides	1, 7	Ap
CO - 4	understand the water quality standards and water quality parameters.	2, 3, 7	Un
CO - 5	aware of the harmful effects of pollutants Produce vermi compost and gobar gas	2, 3, 8	An,Cr
CO - 6	understand the processes used for purification of municipal water	4	Un
CO - 7	treat waste water by using different methods	4, 7, 8	Cr
CO - 8	estimate the amount of carbonate, chloride, nitrate, phosphate, zinc and calcium present in soil.	4, 7	Ap

SEMESTER III			
Core Skill Based Agricultural Chemistry and Water Management			
Code :18UCHS31	Hrs/Week:4	Hrs/ Sem 60	Credits:4

Unit I Soil Nature and Plant Nutrients

Saline, alkali and acid soils. Buffering capacity of soil - Soil reclamation. Liming of soil – measurement of soil pH - Soil fertility – essential plant nutrients and their functions – deficiency symptoms – macro and micro nutrients & their functions. Natural and synthetic manures-qualities of a good fertilizer- classification of fertilizers – nitrogeous fertilizers - Preparation and importance of urea, calcium cyanamide - phosphatic fertilizers - preparation and importance of super phosphate, triple super phosphate- potash fertilizers - preparation and importance of potassium chloride and potassium nitrate -complex fertilizers - preparation and importance of DAP, mixed fertilizers (NPK) and human effluent from gobar gas plant as a manure. Vermiculture -vermi compost.

Unit II Pesticides

Pesticides, Insecticides, Repellants, Fungicides- Definition-classification – on the basis of their mode of action, target organisms they control, method of application- environmental hazards - preparation and uses of DDT, BHC, lead arsenate, bordeaux mixture, dithiocarbamates.

Unit III Water Quality Parameters

Water quality standard for drinking water (WHO)- Water quality parameters-pH, EC, alkalinity, Total acidity, hardness, DO, BOD, COD, salinity, nitrate (Methaemoglobinemia), phosphate and fluoride content – Eutrophication- Toxic metals - Heavy metal pollution –Hg, As, and Cd. Case studies (Minamata, arsenic poison in West Bengal, Itai-itai)

Unit IV Water Treatment

Waste water treatment-methods and equipments used-preliminary treatment (screening, skimming) - primary treatment (sedimentation, coagulation) - secondary treatment (trickling filters, oxidation pond, anaerobic digestion)-tertiary treatment (adsorption, ion-exchange, reverse osmosis, electrodialysis, disinfection)-treatment of water of municipal purposes-domestic sewage treatment-industrial waste water treatment.

Unit V LABORATORY WORK (Using Water analyzer and HPLC)

(Internal Evaluation Only)

1. Analysis of carbonate, chloride, nitrate, phosphate, zinc and calcium in soil.
2. Determination of Total Organic Carbon (TOC) in soil.
3. Determination of pH and conductivity of water from different sources.
4. Determination of DO, COD and hardness of water.
5. Samples will be collected from agro ecosystem. Presence of pesticides are recorded / Analysis using HPLC

Industrial Visit

A visit may be made to an industry or a premier institution.

*A report of the industrial visit may be submitted as an assignment.

Text Books

1. Text Book of pharmaceutical chemistry Jayashree Ghosh S.Chand and company,
New Delhi 2003
2. K.Bagavathi Sundari, Applied Chemistry , MJP Publishers.2008

Books for Reference

- 1.B.K.Sharma, Industrial Chemistry, Goel Publishing House, Fifth Edition., 1993-94
- 2.P.S. Sindhu, Environmental Chemistry, New Age International Publishers.2010

SEMESTER- III			
NME I		Industrial Chemistry	
Code :18UCHN31	Hrs/Week:2	Hrs/ Sem: 30	Credits:2

Vision

Enrich students' knowledge on the industrial chemistry and its impact on human life

Mission

- Aware of the impacts of corrosion and polymers
- Educate the students about the chemistry of petrochemicals, fats, oils and waxes
- Recognize the nature and the function of food additives in our food.

Course Outcome

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	understand the process of refining of petroleum and they can develop knowledge of different refining processes	2	Un
CO -2	aware of the importance as well as the impacts of residual chemicals related with petroleum industry	2, 5	Ap
CO - 3	know the adverse effects of corrosion and study the means to prevent it	1	Re
CO - 4	understand the difference and usage of paints, varnishes and lacquers	2	Un
CO - 5	know the fundamental knowledge about rubbers and fibres.	2, 5	Re
CO - 6	understand and apply the various processing and manufacturing techniques of rayons, nylons and polyesters	2, 5	Un
CO - 7	know the chemistry of oils, fats and waxes and their manufacturing process	1, 2	Re
CO - 8	know the government regulations required for the usage of food additives in food products.	5	Re

SEMESTER- III			
NME I		Industrial Chemistry	
Code :18UCHN31	Hrs/Week:2	Hrs/ Sem: 30	Credits:2

Unit I Petro Chemicals

Occurrence – composition of petroleum - Refining of petroleum – purification – cracking – types of cracking – catalytic cracking – thermal cracking – knocking and antiknocking properties – octane number – activation. Gasoline – cetane number – flash point - synthetic petrol

Unit II Corrosion and Protective Coating

Corrosion of metals – definition – disadvantages – types of corrosion-theories of corrosion (Direct Chemical corrosion, electrochemical corrosion) – methods of preventing corrosion-corrosion inhibitors

Protective coatings - types- paint-characteristics of a good paint – constituents of paints and their functions

Unit III Rubber Industry and Fibres

Manufacture of rubber, Gutta-percha –properties of rubber – compounding of rubber – vulcanization - properties of vulcanized rubber– synthetic rubber – SBR rubber and Neoprene rubber - Reclaimed rubber and foam rubber –uses.

Fibres - Difference between natural and synthetic fibres

Unit IV Fats, Oils and Waxes:

Fats and oils – definition – physical and chemical properties - Analysis of fats and oils– Saponification value, iodine value, acid value, Reichert-Meissel value– manufacture of vanaspathi or vegetable ghee.

Waxes – definition and classification.

Unit V Food Additives

Baking soda – food color natural and artificial – intentional food additives – acid base and their salts – antioxidants – stabilizers– bleaching – maturing agents – leavening agents – humectants and preservatives.

Text books

1. Jayashree Ghosh, Fundamental concepts of Applied chemistry Edition, S. Chand & company Ltd New Delhi 2006,
2. B.S.Bahl, Arun Bahl, Advanced Organic chemistry, S.Chand & company.2005

Books for Reference

1. K.Bagavathi Sundari Applied Chemistry Mjp publishers, Tamil Nadu Book House Chennai, 2008
2. Siva Sankar B., Food processing and preservation Prentice–hall of India Pvt., ltd New Delhi 2002.

SEMESTER III	
Self Study I	Applied Chemistry
Code :18UCHSS1 (Optional)	Credit : +2

Vision: Create awareness for employability in cottage industries

Mission: Develop a knowledge about the manufacture of soaps, paper, beverages and household articles

Course Outcome

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	describe the process of manufacture of soaps	1,7	Re
CO - 2	aware of comparison of soaps and detergents.	5	Ap
CO - 3	list out the characteristics of good paint	1,7	Re
CO - 4	understand the constituents of varnishes and their functions	2,7	Un
CO - 5	describe the manufacture of sugar	2,5	Re
CO - 6	understand the manufacture of paper	2, 5,7	Un
CO - 7	know the chemistry of oils, fats and waxes and their manufacturing process	1, 7	Re
CO - 8	know the government regulations required for the usage of food additives in food products.	1,5,7	Re

SEMESTER III	
Self Study I	Applied Chemistry
Code :18UCHSS1 (Optional)	Credit : +2

Unit I Soaps and Detergents

Soap – definition and types – manufacture of different types of soaps (toilet soaps, transparent soaps and liquid soaps) and their uses – cleansing action of soaps. Detergents – classification of detergents (cationic, anionic and non-ionic) – comparison of soaps and detergents.

Unit II Paint and Varnishes

Purpose of surface coating – Paint – characteristics of good paint – constituents of paints – classification of paints – fluorescent paints (traffic signal), fire retardant paints – Varnishes – constituents and their functions. Emulsion paints.

Unit III Sugar and Paper Industry

Manufacture of sugar – recovery of alcohol from molasses – fermentation. Beverages preparation of beer and wine. Paper industry – Manufacture of paper.

Unit IV Pigments and Perfumes

Pigments – Definition – Examples – colours imparted by the pigments and their uses (lithopone, titanium dioxide, ultramarine blue, Red lead, chrome green)

Perfumes – Ingredients of perfumes- Isolation of essential oils – Artificial flavours – apple, grape, banana, pineapple, jackfruit (Naming of a few compounds only structure not needed)

Unit V Articles Of Day Today Life

An Outline of the preparation and uses of the following:

- | | | | |
|----------------|-----------------|-----------------------|-------------------|
| i) Candle | ii) Tooth paste | iii) Blackboard chalk | iv) Moth balls |
| v) boot polish | vi) Phenyle | vii) Cleaning powder | viii) Face powder |
| ix) Lipstick | x) Eyetex | | |

Text book

1. Fundamental concepts of Applied chemistry, Jayashree Ghosh Edition S. Chand & company Ltd. New Delhi, 2006,

Books for Reference

1. Engineering chemistry by P.C. Jain and Monika Jain Dhanpat Rai & Sons, New Delhi, 1995.
2. Industrial Chemistry B.K.Sharma Goel Publishing House, Meerut, 2003.

SEMESTER- IV			
Core VI		Organic Chemistry-II	
Code :18UCHC41	Hrs/Week:4	Hrs/ Sem: 60	Credits:4

Vision:

Acquire adequate knowledge to design a reaction in organic chemistry

Mission:

- Know the chirality of molecules and understand the stereoisomerism
- Study the conformational analysis
- Appreciate the application of organometallic compounds in synthesis

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	interpret the elements of symmetry, chirality	1	Un
CO - 2	explain the rules of stereochemical configuration to perspective drawings, Newman projections and Fischer projections Apply the Cahn Ingold Prelog rule for ascertaining the geometric configuration (cis or trans and/or E or Z) of disubstituted cycloalkanes	2	Un, Ap
CO - 3	define Sachse Mohr theory – Newman projection ,Sawhorse & Fischer formulae Know about the conformational analysis	1	Re
CO - 4	classify carbohydrates and compare and contrast the reactions and structure of glucose and fructose Illustrate the structure and reactions of carbohydrates	5,6	Un
CO - 5	discuss epimerization and mutarotation	1	Un
CO - 6	demonstrate various Theories of colour and constitution, know the applications of dyes .	1	Ap, Re
CO - 7	synthesize and Characterize acetoacetic ester, malonic ester and cyanoacetic ester	5,7	Cr
CO - 8	recall the preparation of NBS and wilkinsons catalyst Prepare reagents in organic synthesis like Lithium Aluminium hydride, Periodic acid, Sodamide, Selenium dioxide, lead tetra acetate, Osmium tetroxide, Raney nickel, Sodium borohydride	3, 8 4	Re Cr

SEMESTER- IV			
Core VI		Organic Chemistry-II	
Code :18UCHC41	Hrs/Week:4	Hrs/ Sem: 60	Credits:4

Unit - I Stereochemistry

Stereoisomerism – Optical activity of compound with one and two chiral centres. Elements of symmetry – Plane of symmetry, axis of symmetry and centre of symmetry. Enantiomers and diastereo isomers (d, l and meso forms) with examples – asymmetric and dissymmetric molecules. Cahn Ingold Prelog conversion DL and RS configuration.-notations for compounds containing more than one asymmetric C-atoms racemisation and methods of resolution of racemic mixture – Walden inversion – Stereochemistry of diphenyl compounds, allenes and spiranes with examples. Geometrical isomerism – Definition – cis – trans and syn – anti concept E-Z notation. Determination of configuration – Method of cyclisation – Conversion of a compound into known configuration.

Unit – II Conformational Analysis

Definition – Bayer’s strain theory – Sachse Mohr theory – Newman projection ,Sawhorse & Fischer formulae - difference between conformation and configurations. Conformation analysis of ethane, 1,2 – dichloro ethane and cyclohexane (boat form, Chair form)—dihedral angle (torsional angle) – factors affecting stability of conformation – Dipole - Dipole interaction, bond opposite strain- factors affecting conformational stability.

Unit- III Carbohydrates

Introduction and classification – laboratory and industrial preparation of glucose and fructose – reactions of glucose and fructose – structure of glucose and fructose – open chain and ring structure – epimerisation – mutarotation – interconversion of glucose and fructose and vice versa – ascending and descending the series – (Kiliani & Wohl’s synthesis). Manufacture of sucrose – Structure of maltose, lactose and sucrose (elucidation not included) – Starch and cellulose – reactions –uses – differences between starch and cellulose.

Unit-IV Active Methylene Compounds & Dyes

Active methylene compounds –preparation, synthetic applications of acetoacetic ester, malonic ester and cyanoacetic ester

Dyes-Witt’s theory of colour and constitution – chromophore – Auxochrome –classification of dyes according to chemical structure – preparation and uses of Nitrodyes – Martius yellow.

Azo dyes – Aniline yellow, Methyl orange, Congo red, Bismark brown,

Diphenylmethane dyes- Auramine O. Xanthene dyes – Fluorescein, Eosin and Rhodamine B.

Phthalein dyes – Phenolphthalein. Indigo and Thioindigoid dyes – Indigo and Thioindigo.

Anthraquinoid dyes – Alizarin.

Classification of dyes according to method of application-Direct dyes, Mordant dyes, Vat dyes, Ingrain dyes and Disperse dyes.

Unit-V Synthetic Reagents

Preparation and synthetic applications of the following reagents in organic synthesis – Aluminium isopropoxide, N-Bromo succinimide (NBS), Lithium Aluminium hydride, Periodic acid, Sodamide -Selenium dioxide- lead tetra acetate-Osmium tetroxide- Raney nickel- Sodium borohydride- Wilkinson's catalyst.

Text Books

1. K.S.Tewari,N.K.Vishnoi,S.N.Mehrotra, A Text Book of Organic Chemistry, 2nd Revised Edition, 1998.
2. Arun Bahl and B.S.Bahl, Advanced Organic Chemistry,S.Chand and Company Ltd., Reprint 2005.

Books for Reference

1. Ernest L. Eliel, Stereochemistry of Organic compounds,Tata McGRAW –Hill Publication company Ltd., New Delhi, 1975
2. D. Nasipuri, Stereochemistry of Organic Compounds - Principles and Applications, New Age International Publishers, 1994
3. P. S. Kalsi, Stereochemistry -Conformation and Mechanism, New Age International Publishers, 1994
4. M.K.Jain and S.C.Sharma , Modern Organic chemistry, Vishal Publishing Company, 2008.
5. Jerry March, Advanced Organic Chemistry, Reactions Mechanisms and Structure, 4th Edition. 2013
6. N.Tewari, Advance Organic Reaction mechanism Books and allied (P) Ltd. Kolkata 700010 India Second revised edition 2005

SEMESTER III & IV			
Core Practical II		Semimicro Inorganic Qualitative Analysis	
Code :18UCHCR2	Hrs/Week : 2	Hrs/ Sem : 30	Credits : 2

Systematic qualitative analysis of a mixture containing two anions and two cations. One of the anions should be an interfering radical which should be eliminated. The two cations should be of different groups.

Principles of flame testing – concept of solubility and solubility product – concept of pH and Buffer action – common ion effect - theory of testing anions (Simple and interfering) – Principle of grouping of cations –Theory of testing cations.

The combination of mixture containing two halides,(sulphates along with lead, barium, strontium and calcium), (oxalate and carbonate) & (one oxidizing and one reducing group), should be avoided.

Anions:

(i) Carbonate (ii) Sulphide (iii) Sulphate (iv) Chloride (v) Bromide (vi) Iodide.
(vii) Nitrate (viii) Borate (ix) Oxalate (x) Fluoride (xi) Chromate (xii) Phosphate

Cations :

(i) Lead (ii) Copper (iii) Bismuth (iv) Cadmium (v)Antimony (vi) Nickel (vii) Manganese
(ix) Zinc (x) Barium (xi) Strontium (xii) Calcium (xiii) Magnesium (xiv) Ammonium.

Books for Reference

1. J. N. Gurtu and R. Kapoor, Advanced Experimental Chemistry Volume II, S.Chand & Company Ltd 1980.
2. A.O. Thomas, Practical Chemistry for B. Sc. Main students, Scientific book centre, Cannanore 1992.

SEMESTER – IV			
Allied Physics - Paper II			
18UPHA41	Hrs / Week: 4	Hrs / Semester: 60	Credits: 3

Vision: To enable students to understand the importance of Physics in the development of latest technology and apply them in appropriate situations

Mission: To offer knowledge in the physical phenomena such as electrostatics, electromagnetism, relativity, electronics and energy physics through the systematic study of theory and experiments

Course Outcome:

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Apply the Gauss law in calculation of electric fields due to various charge distributions and understand coulomb's law which gives an idea about the electrostatic force between point charges	1	Ap, Un
CO-2	Define and explain self and mutual inductance	1	Re, Un
CO-3	Employ Lenz law and Faraday's law for magnetically coupled circuits	1	An
CO-4	Apply knowledge of electricity and magnetism to explain the nature of physical process and related technological advances	1	Ap
CO-5	Understand the principle of energy release in nuclear reactions and identify the present energy scenario and the need for energy conservation	8	Un
CO-6	Examine the structure of various number system and its application in digital design	6, 8	Un, An
CO-7	Analyse the environmental aspects of renewable energy sources	5	An
CO-8	Acquire the knowledge of solar cells, photovoltaic cells, wind energy and solar energy principles and applications	5	Un

SEMESTER – IV			
Allied Physics - Paper II			
18UPHA41	Hrs / Week: 4	Hrs / Semester: 60	Credits: 4

Unit I: Electrostatics

Coulomb's law – Electric field and field intensity – Electric field due to point charge – Electric dipole – Electric flux – Gauss law – Applications – Electric field due to a charged conducting sphere (point inside and point outside) – Uniformly charged cylinder (line charge) – Electric potential – Potential difference – Relation connecting electric field and electric potential at a point – Equipotential surface

Unit II: Electromagnetism

Faraday's laws of induction – Induced current and charge – Self induction – Self inductance of toroidal solenoid – Determination of self inductance using Rayleigh method – Mutual inductance – Coefficient of coupling – Determination of mutual inductance using B.G.

Unit III: Nuclear Physics

Nuclear Reactions – Energy balance in nuclear reactions and Q-value – Threshold energy of an endoergic reaction – Nuclear fission – Energy released in fission – Chain reaction – Atom bomb – Nuclear reactors – Uses of nuclear reactors – Nuclear fusion – Sources of stellar energy – Thermonuclear reactions – Hydrogen bomb – Controlled thermonuclear reactions.

Unit IV: Digital electronics

Binary numbers – Conversion of decimal number into binary number – Binary to decimal – Binary addition – Multiplication – Subtraction by 2's complement – Basic logic gates – OR, AND, NOT (Implementation only for basic gates), NOR, NAND gates – De Morgan's laws – Boolean equations and logic circuit from truth table – NOR and NAND gates as universal building blocks – Binary adder – Half adder.

Unit V: Energy Physics

World's reserve of commercial energy source and their availability – Various forms of energy – Conventional and Non-conventional energy sources – Solar energy – Photo voltaic effect – Photo voltaic cells – Conversion of solar energy into electricity – Solar cells – Solar heaters – Wind energy – Power of wind – Wind mill – Wind farms – Energy crisis and possible solutions – Global warming.

Text Books:

1. A. Ubald Raj and G. Jose Robin, Allied Physics, Indira Publication, Marthandam, First edition 2008.
2. A. Ubald Raj, Electromagnetism and Plasma Physics, Indira Publication, Marthandam, Revised edition 1998.
3. R. Murugesan, Er. Kiruthiga Sivaprasath, Modern Physics, S. Chand & Co. Pvt. Ltd., New Delhi, Reprint 2014.

4. S.L.Kakani, K.C. Bhandari, Electronics Theory and Applications, New Age International Publishers, New Delhi, Reprint 2014.
5. G. D. Rai, Non–conventional energy sources, Khanna Publishers, 11th reprint 2014.

Book for reference:

1. Brijlal N. Subramanian, Electricity & Magnetism, Published by Ratan Prakashan Mandir, 14th revised edition, (1985).
2. G. Jose Robin and A. Ubald Raj, Energy Physics, Indira Publications, Marthandam, Revised edition: December 2014.
3. R. Murugesan, Electricity and Magnetism, S. Chand and Company Ltd., 7th Revised edition 2018

SEMESTER – I & II			
Allied Physics - Practicals			
18UPHAR1	Hrs / Week: 2	Hrs / Semester: 30	Credits: 2

Any twelve Experiments

1. Young's modulus – Uniform bending – Pin and microscope
2. Young's modulus – Non-uniform bending – Scale and telescope
3. Rigidity modulus – Torsion pendulum
4. Specific heat capacity of liquid – Newton's law of cooling
5. Spectrometer – Grating – Normal incidence
6. Spectrometer – Refractive index of the prism
7. Air wedge – Thickness of a wire
8. Basic logic gates – OR, AND and NOT
9. Thermal conductivity of a bad conductor – Lee's disc
10. Determination of surface tension – Drop weight method
11. Coefficient of viscosity – Burette method
12. Co-efficient of viscosity – Stoke's method
13. De Morgan's law verification
14. Boolean expression verification
15. Half adder

SEMESTER IV			
Core Skill Based		Pharmaceutical Chemistry	
Code :18UCHS41	Hrs/Week: 4	Hrs/ Sem : 60	Credits: 4

Vision

Inculcating the basic knowledge about disease, preventive measures and drugs

Mission

- Rationalize the causes and curative measures of various diseases
- Apply Indian medicinal plants for diseases
- Know about the first aid to be done during emergency
- Create an awareness about hypertension and diabetes

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	understand the importance of drugs and their mode of action	4	Un
CO - 2	know the causes of common diseases and their treatment	3, 4, 7	Re
CO - 3	apply Indian medicinal plants for treatment.	3	Ap
CO - 4	aware about first aid rules and first aid box	4, 7	Ap
CO - 5	predict common poisons and their antidotes.	3, 4, 7	Ev
CO - 6	estimate the sugar and cholesterol levels in blood.	4, 5, 7	Ev
CO - 7	describe about the cardiovascular drugs	3, 4, 7	Un
CO - 8	know about diabetics and its treatment	4, 7	Re

SEMESTER IV			
Core Skill Based		Pharmaceutical Chemistry	
Code :18UCHS41	Hrs./Week:4	Hrs/ Sem 60	Credits:4

Unit I Classification and metabolism of drugs

Classification of drugs – biological Classification –(drugs acting on central nervous system and peripheral nervous system, Chemotherapeutic drugs, pharmacodynamic agent, metabolic diseases and endocrine function) and chemical classification-metabolism of drugs bio transformation-oxidative, reductive and hydrolytic biotransformations — conjugate reactions — glucuronides, amino acids, ethereal sulphate, methylated and acetylated conjugations. Absorption of drugs-routes of administration-factors that affect absorption.

Unit II Causes of common diseases and their treatment by drugs

Common diseases and their treatment:

Insect borne diseases-malaria, filariasis, plague,

Air borne diseases-diphtheria, whooping cough, influenza, measles, mumps, common cold, tuberculosis (T.B)

Water borne diseases-cholera, typhoid, dysentery,

Disorder of digestive system-Jaundice

Important Indian medicinal plants and trees and their uses:

Hibiscus Rosa-sinensis, *adathoda vasica*, *ocimum sanctum*, *mangifera indica*, *azadirachta indica*, *phyllanthus Niruri*, *solanum trilobatum*.

Unit III Clinical chemistry cum Hands on Training

Determination of sugar (glucose) in serum-Folin and Wu's method — -determination of serum cholesterol Sackett's method for total cholesterol --tests for cholesterol — estimation of glucose in urine -blood parameters (glucose, cholesterol, protein etc.,- automatic analyser -Benedict's test-detection of anemia — estimation of hemoglobin (Hb concentration)-First aid for accidents-important rules — composition of first aid box — some common poisons and their antidotes

Unit IV Blood pressure and cardio vascular drugs

Blood pressure types and treatment -Hypertension-primary and secondary hyper tension treatment, hypo tension-measurement.

Functions and uses of the following drugs- cardiovascular drugs-antiarrhythmic drugs-quinidine-antihypertensive agents- (hypotensive drugs) — clonidine and reserpine.

Unit V Diabetes and some common drugs

Diabetes types – Diabetes insipidus and diabetes mellitus – control of Diabetes –oral hypoglycemic agents –sulphonyl urease -tolubutamide, chlorpropamide, biguanides-phonformin and metformin.

Anti Convulsant agents-structure and uses of Barbiturates-Phenobarbitone, amylobarbitone, pentobarbitone sodium, hydantoin- diphenyl hydantoin and diazepam. Anaesthetics- definition, characteristics – classification based on mode of action- general Anaesthetics, local Anaesthetics-advantages and disadvantages of vinyl ether, halothane, trichloroethylene and thiopental sodium.

Text Books

1. Text Book of pharmaceutical chemistry Jayashree Ghosh S.Chand and company, New Delhi 2003.
2. Applied Chemistry – Bhagavathi Sundari MJP Publishers, 2008

Books for Reference:

1. Fundamental Concepts of Applied chemistry, Jayashree Ghosh, S.Chand and Company, New Delhi 2006.
2. Pharmaceutical chemistry-Dr.S. Lakshmi Sultan Chand & Sons, New Delhi.
3. Medicinal chemistry- Ashutosh Kar 1997 New age International (P) Limited, New Delhi 2004.

SEMESTER- IV			
NME II		Everyday Chemistry	
Code :18UCHN41	Hrs./Week: 2	Hrs/ Sem: 30	Credits: 2

Vision

Deepen the basic facts and concepts of the materials used in our daily life

Mission

- Provide a significant knowledge on the drugs and their applications
- Realize the quality of drinking water and its parameters
- Recognize the nature and the function of food additives in our food.

Course Outcome

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	differentiate between hard and soft water in terms of origin and content	2	Ap
CO - 2	analyse samples of water to assess their suitability for drinking	5	An
CO - 3	know the importance of some common drugs	5	Un
CO - 4	understand the chemistry behind mouth washes, antacids, analgesics, antipyretics, sedatives and hypnotics	2, 5	Un
CO - 5	correlate the importance of colloids in day to day life	1	Cr
CO - 6	know the preparation of some special milks		Re
CO - 7	understand the basic principles behind the preparation of some useful compounds	1	Un
CO - 8	knowledge on the preparation of commercial products such as candle, Tooth paste, Blackboard chalk, Moth balls, Cleaning powder, Face powder, Lipstick and Eytex	2, 7	Cr

SEMESTER- IV			
NME II		Everyday Chemistry	
Code :18UCHN41	Hrs./Week: 2	Hrs/ Sem: 30	Credits: 2

Unit I Water Softening Techniques

Water– water quality parameters - Hardness of water – temporary and permanent hardness, disadvantages of hard water – softening of hard water – zeolite process, demineralization process and reverse osmosis – sterilization of water for domestic use by chlorine, ozone and UV light

Unit II Pharmaceutical Chemistry

Drugs- Definition – Importance of some common drugs with examples – mouth washes – antacids – analgesics – antipyretics – sedatives and hypnotics. Anesthetics – Basic requirements of anesthetics – Classification with examples – distinction between antiseptics and disinfectants.

Unit III Colloids

Colloids- coagulation of colloid - protective colloids- gold number- Gels- preparation and properties (imbibition, thixotropy, syneresis). Emulsion - types - emulsifiers. Polymers - Number average and weight average molecular weights- determination of molecular weights by osmotic pressure method.

Unit IV Dairy Chemistry

Milk – composition of milk - Types of milk - Special milks – sterilized milk – flavoured milk – irradiated / vitaminised milk – toned milk – condensed milk. Fermented milks – Cultured butter milk – Acidophilus milk – Yoghurt (Firm-bodied milk).

Unit V Articles Of Day Today Life

An Outline of the preparation and uses of the following:

- i) Candle ii) Tooth paste iii) Blackboard chalk iv) Moth balls
- v) Cleaning powder vi) Face powder
- vii) Lipstick viii) Eyetex

Text books

1. K.Bagavathi Sundari Applied Chemistry Mjp publishers, 2008, Tamil Nadu Book House Chennai, 2008
2. B.S.Bahl, Arun Bahl, Advanced Organic chemistry, S.Chand& company,2004

Books for Reference

1. Puri B.R, Sharma and Pathania, Elements of Physical Chemistry, Vishal publishing Co. 2013 – 2014.
2. B.K. Sharma, Industrial Chemistry Goel Publishing House, Meerut, 2003.

SEMESTER IV	
Self Study II	Informative Chemistry
Code :18UCHSS2 (Optional)	Credits : +2

Vision

Encouraging the students to learn independently

Mission

- Make the students aware of the latest news in chemistry
- Enable the students to handle the chemicals safely
- Realize the hazardous chemical effects and the need to save our planet
- Appreciate the contributions made by pioneers in chemistry

Course Outcome

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	recognize contribution of chemistry to the nation	5	Re
CO - 2	know the national resource centers	1,7	Re
CO - 3	facilitate the structure and types of MOOCs	5	Cr
CO - 4	practice flip class rooms	5	Ap
CO - 5	apply the concepts of Reduce, Reuse and Recycle	7	Ap
CO - 6	know the methods of disposal of Chemical waste	7	Re
CO - 7	recognize the impact of chemical reactions on our planet earth	5	Re
CO - 8	identify the Nobel laureates in Chemistry	4	Re

SEMESTER IV	
Self Study II	Informative Chemistry
Code :18UCHSS2 (Optional)	Credits : 2

Unit I Latest chemistry informations

Development of Chemistry - challenges – contribution of chemistry to the nation – research in emerging trends in Chemistry - National resource centers – prohibition of chemical weapons – plastic pollution – chemical disasters.

Unit II Chemistry education in modern era

ICT enabled learning- self learning using available e-content - e-learning through MOOC, MOOC platforms - structure and types of MOOCs – Change in learning methods of Chemistry education in India - Flip class rooms.

Unit III Safety in chemistry laboratory

General precautions – hygiene in chemistry laboratory - some common laboratory practices
Need for safe disposal – methods of safe disposal of chemical waste - Safe disposal of solids - Safe disposal of liquids/Solutions - Reduce, Reuse and Recycle.

Unit IV Chem applications

Chemical reactions – impact on our planet earth – forensic chemistry – methods of finger print detection - hydrocarbons in fossil fuels - combustion reaction of hydrocarbons - need to change our dependence on fossil Fuels – green house effect - ocean acidification- green fuels

Unit V Nobel Laureates in Chemistry

Noble prizes in chemistry from 2013 – 2018.

Reference

*Course Material is available in the Department of Chemistry

SEMESTER- V			
Core VII (Common Core) Solid State and Material science			
Code : 18UPCC51	Hrs/Week : 6	Hrs/ Sem : 90	Credits : 4

Vision: Understand the usage of the appropriate materials while designing electronic system.

Mission: Enrich the students to know the background theory and properties of different materials.

Course Outcome

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	understand the basic symmetry elements and operations of crystals.	1, 2	Un
CO - 2	distinguish the types of crystals and enumerate the various crystal imperfections.	3,4	An
CO - 3	get a clear knowledge about metallic glasses, ceramics and biomaterials.	1, 3, 5,7, 8	Re
CO - 4	justify the wave nature of matter and its experimental study.	1,3	Ev
CO - 5	apply Bragg's law for x-ray study.	2	Ap
CO - 6	distinguish magnetic materials based on susceptibility.	2	An
CO - 7	usage of magnetic materials in various field.	2	Ap
CO - 8	discuss the synthesis methods of nano materials.	2	Un

SEMESTER- V			
Core VII (Common Core) Solid State and Material science			
Code : 18UPCC51	Hrs/Week : 6	Hrs/ Sem : 90	Credits : 4

Unit-I Crystal structure and crystal imperfections

Crystal lattice -primitive and unit cell- Basic symmetry elements and operations - Plane of symmetry, centre of symmetry & axis of symmetry -Types of crystals - Bravais lattices - Simple cubic, body centered cubic, FCC, structures with an example - miller indices, inter planar spacing – crystal imperfections – point defects – Schottky and Frenkel defects – line defects – Edge & screw dislocations – surface defects – volume defects (imperfection).

Unit-II New materials

New materials – metallic glasses – Fiber reinforced plastics – Fiber reinforced metals – Bio materials – Ceramics – Cements – High temperature materials – intermetallic compounds - Alloys - Smart materials.

Unit-III Wave nature of matter and X-ray diffraction

Wave nature – introduction – De Broglie Hypothesis – experimental study of matter waves – Davison – Germer’s experiment – Heisenberg’s Uncertainty principle.

Bragg’s law – Derivation of Bragg’s equation - Experimental methods of X-ray study – Laue, rotating crystal and powder methods.

Unit-IV Magnetic and dielectric materials

Classification of magnetic materials – Langvein theory of diamagnetism – theory of paramagnetism– Domain theory of ferromagnetism – Antiferro magnetic materials – Application of Different magnetic materials.

Dielectric materials – Types of dielectric materials – different types of electric polarization –Internal field – Clausius-Mossotti equation – Frequency and temperature dependence of dielectric constant.

Unit- V Nanomaterials

Nanomaterials- Synthesis- Plasma arcing – Chemical vapour deposition – Sol gels- Electro deposition – Ball milling –Properties of nano particles and applications. Carbon nanotubes fabrication – Arc method –Pulsed laser deposition- Chemical vapour deposition- Structure- Properties- Applications.

Text books

1. M.Arumugam, Material Science, Anuradha Publication 2008.
2. C M Sri Vasta & C Srinivasan, Science of Engineering materials, New Age International (P) Ltd, Second Edition,1999.
3. P. K. Palanisamy, Solid state Physics Copyright (2003), Scitech Publication (India) Pvt Ltd Chennai, 3rd reprint 2008.

4. R.Mureghesan, Modern Physics, Kiruthiga Sivaprasath, S.Chand & Co Ltd, 17th Edition, 2013.
5. Dr. P.Mani, A Text Book of Engineering Physics, Dhanam Publications Chennai, Revised Edition, 2008.

Books for Reference

1. Charles Kittel, Introduction to solid state Physics, John Wiley and Sons 2010
2. P. K. Palanisamy, Material Science, Scitech Publication (India) Pvt Ltd., Chennai, 2005.
3. M.H Fulekar, Nano Technology Importance and applications, I.K International Publishing House Pvt Ltd,2010.

SEMESTER- V			
Core VIII		Organic Chemistry III	
Code :18UCHC52	Hrs./Week:5	Hrs/ Sem: 75	Credits:4

Vision: Develop novel molecules and methods to synthesize Organic molecules

Mission:

- Understand Retrosynthesis and its relay approach to synthesis
- Study Specific name reactions
- Have an idea on Green Chemistry

Course Outcome

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	compare the general reactions of aldehydes and ketones	5	Ap
CO - 2	explain the mechanism of Claisen, Benzoin, Perkin, Knoevenagel reaction- Wittig reaction-iodoform reaction explain the factors influencing strength of acid - effect of substituent in benzene ring	2	Un
CO - 3	generalize the properties of carbonyl and carboxyl compounds	1,6	Cr
CO - 4	classify the polynuclear hydrocarbons Structure Elucidation of alizarin	1.5	Ap Cr
CO - 5	state synthons and synthetic equivalent- Protection and deprotection of different groups	3	Re
CO - 6	explain Retrosynthesis of 5-hexanoic acid	1,3,6	Un
CO - 7	apply green chemistry in day-to-day life, dry cleaning, versatile bleaching agent	4,7	Ap
CO - 8	implement an awareness about green chemistry and the methods of microwave assisted synthesis	3,8	Ap

SEMESTER- V			
Core VIII		Organic Chemistry III	
Code :18UCHC52	Hrs./Week:5	Hrs/ Sem: 75	Credits:4

Unit I- Carbonyl Compounds

Aliphatic aldehyde& ketones-Reactivity of carbonyl groups-general reactions of aldehydes and ketones-mechanism of addition and condensation reaction- Cannizzaro reaction-Aldol condensation-Distinction between aldehydes and ketones-Reduction reaction-MPV reduction-Wolf-kishner- Clemmenson reaction

Aromatic aldehydes and ketones- general methods of preparation, reaction and test-Mechanism of Claisen, Benzoin, Perkin, Knoevenagel reaction- Wittig reaction-iodoform reaction

Unit-II Carboxylic Acid And Their Derivative

Aliphatic monocarboxylic acid- general methods of preparation and reactions- acidic nature-factors influencing strength- dicarboxylic acid- Blanc's rule-Aromatic monocarboxylic acid-effect of substituent in benzene ring- Aromatic dicarboxylic acid-Reactions of phthalic acid –Test for Carboxylic acid – Aliphatic hydroxy acids – Preparation reactions of maleic acid and citric acid – Action of heat on hydroxy acid – aliphatic acid derivative- reaction of ester, acid halide and acid amide.

Unit - III Polynuclear Hydrocarbons

Isolated Systems – Preparation of diphenyl, triphenylmethane and 1,2-diphenyl ethane.**Condensed systems** – Synthesis, reactions and structure of naphthalene and anthracene. Phenanthrene – synthesis and structure of phenanthrene. Derivatives of naphthalene and anthracene – Naphthols - Naphthyl amines, Naphtha quinones, Anthraquinone. Alizarin -structural elucidation of alizarin.

Unit-IV Organic Synthesis – An Introduction

Synthons and synthetic equivalent (electrophilic and nucleophilic). Carbon-carbon bond forming reactions involving Michael and Dieckmann reaction-Protection of functional groups and removal of protecting groups-Application of Protection and deprotection to alcohols, aldehydes, ketones, acids, phenols and amines. Retrosynthetic analysis of 5-hexanoic acid

Unit – V Green Chemistry

Introduction – need for green chemistry – twelve principles of green chemistry – green chemistry in day-to-day life – dry cleaning, versatile bleaching agent – atom economy – green solvents – supercritical fluid CO₂, ionic liquids and water

Microwave assisted organic synthesis – introduction – microwave assisted reactions in water – Hofmann elimination and hydrolysis of benzyl chloride – microwave assisted reactions in organic solvents – esterification and Fries rearrangement – microwave assisted reactions in solid state – deacylation, oxidation of alcohols using clayfen.

Text Books

1. K.S. Tewari, N.K. Vishnoi, S.N. Mehrotra. A Text Book of Organic Chemistry, 2nd Revised Editions, 1998
2. Arun Bahl and B. S. Bahl Advanced Organic chemistry, S. Chand and Company Ltd., Reprint 2005.

Books for Reference

1. Bhupinder Mehta, Manju Mehta, Organic chemistry, PHI Learning pvt. Ltd., 2005.
2. Rashmi Sanghi, Green Chemistry Environmental Friendly Alternatives Editors M.M.Srivatsava Narosa Publishing House, Reprint 2008.
3. V. Kumar, An introduction to green chemistry, Vishal Publishing Company, Jabudhar Delhi Edition, May 2007.
4. V. K. Ahluwalia, Green Chemistry , Ane Books Pvt. Ltd; Second edition.2012
5. I.L.Finar Organic chemistry, The Fundamental Principles, Volume I, 6th edition, 1973.
6. N.Tewari Advance Organic Reaction mechanism Books and allied (P) Ltd. Kolkata 700010 India Second revised edition 2005.
7. M.K.Jain and S.C.Sharma Modern organic chemistry, Vishal publishing co., 4th edition 2012.

SEMESTER V			
Core IX		Physical Chemistry II	
Code :18UCHC53	Hrs/Week : 5	Hrs/ Sem : 75	Credits : 4

Vision:

Educate the students about the chemistry behind living system and physical processes.

Mission:

- Inculcate a wide understanding about
- Reaction kinetics and its applications
- Chemistry behind light and sound
- Concept of group theory to various molecule
- Probe into the importance of electrochemistry and its application

Course Outcome

CO.No.	Upon completion of this course, students should be able to	PSO addressed	CL
CO - 1	understand the kinetics of the reaction and to determine the reaction mechanism	1	Un
CO - 2	apply reaction kinetics to determine the rate of chemical reactions; understand the factors that influence rates of reaction.	2 , 3	Ap
CO - 3	summarize the chemical reactions under light and sound	3	Un
CO - 4	outline the principle behind sonochemical reactions	3	Re
CO - 5	apply the concept of group theory to various molecules	1	Ap
CO - 6	have a thorough knowledge of symmetry elements, symmetry operations and point groups	1, 2	Re
CO - 7	build an Elementary treatment of Debye-Huckel theory of strong electrolytes ,conductometric titrations, hydrolysis and calculation of pH.	1 , 3	An
CO - 8	probe into the importance of electrochemistry and its application	4	Ev

SEMESTER V			
Core IX		Physical Chemistry II	
Code :18UCHC53	Hrs/Week : 5	Hrs/ Sem : 75	Credits : 4

Unit I Chemical Kinetics

Reaction rate –units of rates –rate laws- order and molecularity of a reaction– differences between order and molecularity of a reaction- Pseudo unimolecular reactions – examples- Experimental determination of inversion of cane sugar- Differential and integrated forms of rate expressions for first, second and zero reactions – first order reaction – examples- Experimental determination of rate constant of decomposition of N_2O_5 in CCl_4 - second order reaction—examples-experimental determination of alkaline hydrolysis of ester. Time for half change for first, second order reactions – determination of order of the reactions (integrated rate equation method ,differential method, graphical method ,half life method)

Effect of temperature on reaction rate – Arrhenius equation – Activation energy and its significance. Collision theory and derivation of rate constant of a bimolecular reaction – Limitations of collision theory – unimolecular reactions and Lindemann's theory –Transition state theory –potential energy diagram for activation energy as applied to catalysis- endothermic and exothermic reaction.

Unit II Chemical Reactions under Light and Sound

Photochemistry – photochemical reaction – Beer-Lambert law(derivation)– photochemical rate law – Grotthus-Draper law, Starck-Einsteins law of photochemical equivalence – quantum yield – validity of Einstein's law – reason for low and high quantum yield – determination of quantum yield using actinometer – flash photolysis. Photolysis of NH_3 and chlorination of methane. Kinetics of decomposition of HI – combination of H_2 and Cl_2 reaction – kinetics of the H_2 and Br_2 reaction. Photophysical processes – explanation of fluorescence and phosphorescence using Jablonski diagrams. Incandescence – luminescence – chemiluminescence– thermoluminescence – bioluminescence. Applications of photochemistry.

Sonochemistry – definition, principle and applications.

Unit III Group Theory

Symmetry elements and symmetry operations –centre of symmetry –axis of symmetry- plane of symmetry -proper axis of rotation- improper axis of rotation– Inversion and identity operations – symmetry elements in water, ammonia, boron trifluoride, benzene, allene and 1,2-dichloro ethylene. Group postulates and types of groups - abelian and non-abelian groups-cyclic groups-order of a group–sub group-multiplication table for C_{2v} and C_{3v} – molecular point groups.

Unit IV Electrochemistry - I

An Elementary treatment of Debye-Huckel theory of strong electrolytes – Significance of Debye-Huckel Onsager equation (Derivation not required) – Transport Number – Determination by Hittorff's and moving boundary methods – Abnormal transport numbers – Absolute velocity of an ion and its determination – Kohlrausch's law and its applications – Mobilities of hydrogen and hydroxyl ions – Conductometric titrations – Different types – Advantages – Hydrolysis – Expression for hydrolysis constant and degree of hydrolysis for salts of different types – Salts of strong acid-strong base, strong acid-weak base, weak acid-strong base and weak acid-weak base. Calculation of pH of salt solutions (due to hydrolysis). Buffers – types-(acid buffer, basic buffer and neutral buffer) buffer action – Henderson-Hasselbalch equation-significance.

Unit V Electrochemistry - II

Reversible cells – cell representation, cell reaction, single electrode potential-standard electrode potential. Types of electrodes- metal – metal ion- gas electrode- metal-insoluble metal salt electrode(calomel), membrane and redox electrodes.

EMF –definition-determination of EMF of a cell Electrochemical series and significance – Thermodynamics of reversible / irreversible electrodes – Electrical energy in galvanic cell – Free energy of cell reaction. Relation between EMF and ΔG of the cell reaction – Determination of ΔH , ΔG , ΔS of the cell reaction. Relation between EMF and equilibrium constant. Effect of concentration of electrolyte on cell potential – Nernst equation – Derivation and applications. Concentration cells – Electrode concentration cells – Electrolyte concentration cells with and without transference liquid junction potential – salt bridge.

Applications of EMF- solubility product, pH (Using hydrogen, glass and quinhydrone electrodes) and Potentiometric titration (acid-base, redox and precipitation) .

Text Books

- 1.B.R.Puri. L.R. Sharma, Madan S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2008.
2. Arun Bahl, B.S. Bahl, G.D. Tuli, Essentials of Physical Chemistry, S. Chand & Company Ltd., New Delhi, 2008.
- 3.F.Albert Cotton, Chemical Applications of Group Theory, III Edition, John Wiley and Sons, 1999.

Books for Reference

1. P.K. Bhattacharya, Group Theory and its Chemical Applications, Himalaya Publishing House, Mumbai, 1988.
2. Samuel Glasstone, An introduction to electrochemistry, Affiliated East-West Press (P)Ltd, New Delhi, 1965.
3. V.Ramakrishnan and M.S.Gopinathan, Group Theory in Chemistry, Vishal Publications, New Delhi 1991.
4. Morris Sylvain, Photochemistry and Sonochemistry, Ivy Publishing House, New Delhi, 2003.

SEMESTER- V			
Core Integral I		Essentials of Inorganic Chemistry	
Code :18UCHI51	Hrs./Week:4	Hrs/ Sem: 60	Credits:4

Vision

Acquire knowledge about the different groups present in periodic table

Mission

- Have a profound understanding of carbon and nitrogen group elements
- Know the chemistry behind d and f block elements

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	provide knowledge about non-aqueous solvents	1	Un
CO - 2	helps to learn the positions of the zero, d– and f-block elements in the periodic table	1	Ev
CO - 3	explain the general characteristics of non-aqueous solvents d– and f–block elements and the general horizontal and group trends in them	1	Ap
CO - 4	recall relevant oxidation states for the zeros, d and f block elements	1	Re
CO - 5	appreciate the relative stability of various oxidation states in terms of electrode potential values	1, 7	Ev
CO - 6	derive equations for reactions of compounds of the zero , d and f block elements	1, 2, 8	Cr
CO - 7	describe the synthesis of the zeros, d and f block elements	3, 5, 6	Ap
CO - 8	recall the structures, the properties, applications of silicones and silicates	1, 2	Re

SEMESTER- V			
Core Integral I		Essentials of Inorganic Chemistry	
Code :18UCHI51	Hrs./Week:4	Hrs/ Sem: 60	Credits:4

Unit I Reactions in non-aqueous solvents

Solvent- definition- water as a universal solvent - classification of solvents – factors affecting the solvating ability– liquid range-dielectric constant – dipole moment and viscosity.

Liquid NH_3 as non aqueous solvent-reason –auto ionisation – ammonio acid and bases. Reactions - neutralization, precipitation, solvolysis, complex formation and redox reactions. Advantages and disadvantages of liquid NH_3 as a solvent.

Liquid SO_2 as non aqueous solvent – reason. Reactions- precipitation, neutralization, solvolysis, complex formation and redox reactions. Advantages and disadvantages of liquid SO_2 as a solvent.

Unit II Zero Group Elements

Position of zero group in the periodic table – Ramsay- Rayleigh's method – Fisher-Ringe's method – separation of noble gases from liquid air –compounds of xenon – preparation, properties and structure (valence bond approach) of XeF_2 , XeF_4 , XeF_6 , XeO_2F_2 , XeO_3 , XeO_4 , XeOF_4 , clathrates - type of clathrates –preparation, stability and structure of clathrates

Unit III d- Block Elements

General characteristics of d-block elements – comparative study of Ti,Zr,Hf-extraction,properties and uses of titanium-preparation and uses of titanium dioxide and titanium tetrachloride. polyvalency of vanadium. Comparative study of Cr, Mo, W – polyvalency of chromium-extraction, properties and uses of molybdenum and tungsten. Platinum-Extraction,properties and uses. Platinum sponge, Platinum black,platinized asbestos and colloidal Platinum, potassium chloroplatinate. Comparative study of Cu,Ag,Au.(similarities and dissimilarities)

Unit IV f- Block Elements

General characteristics of lanthanides – separation of lanthanides – precipitation – thermal reaction – fractional crystallization – complex formation – solvent extraction – valency change method – ion exchange method. Extraction of a mixture of lanthanides from monazite sand – applications of lanthanides and their compounds – lanthanide contraction – causes and consequences. General characteristics of actinides – comparison between lanthanides and actinides- extraction of Th and U. Preparation and uses of UF_6 and uranyl acetate.

Unit V Inorganic materials

Inorganic polymers – general properties - Classification of inorganic polymers - polymer containing phosphorous – preparation, properties and structure of polyphosphonitrilic chloride - polymer containing sulphur - preparation, properties and structure of polymeric sulphur nitride - polymer containing boron – preparation, properties, structure of borazine, substituted borazine – boron nitride and polycarbonates – polymer containing silicon - preparation, properties, structure and uses of silicone fluids, silicone rubbers and silicon resins. Silicates – classification and structure of silicates.

Text book

1. B.R.Puri, L.R.Sharma, K.C.Kalia, Principles of Inorganic Chemistry, Milestone publishers and distributors, Delhi. 2016 – 2017.

Books for Reference

1. R.D.Madan Modern Inorganic Chemistry, S.Chand& Co. Ltd, 2005
2. Gurdeep Raj, Advanced inorganic Chemistry, Goel Publishing house 1986.
3. Sathya Prakash and R.D. Madan, Advance Inorganic Chemistry, Chand and Co. 2005.

SEMESTER V			
Core Practical III		Physical Chemistry Experiments	
Code : 18UCHCR3	Hrs/Week : 5	Hrs/ Sem : 75	Credits : 3

Objective: Enable the student to get analytical skills and help them to plan and execute experimental projects.

List of Experiments:

1. Critical solution temperature of phenol water system and effect of impurities on CST.
2. Transition Temperature of a salt hydrate – determination of molecular weight
3. Kinetics of Ester Hydrolysis
4. Conductometric Acid base Titration
5. Conductometric precipitation Titration
6. Potentiometric Redox Titration
7. Molecular weight determination by Rast Method
8. Phase Diagram – Simple eutectic
9. Phase Diagram – Compound formation
10. Heat of solution by solubility method ($K_2Cr_2O_7$ / oxalic acid)
11. Adsorption kinetics of oxalic acids/acetic acid on charcoal. Determination of concentration of the given acid.

Course Work

1. Verification of Beer's Law using spectrophotometer.

Books for Reference

1. J.N. Gurtu and R. Kapoor, Advanced experimental chemistry, S.Chand and Co., 1987.
2. Dr. S. Sundaram, Dr.Krishnan and Dr. P.S.Raghavan, S.Viswanathan, Practical chemistry, (Printers & Publishers), Pvt. Ltd., 2007
3. R.Mukhopadhyay P.Chatterjee Advanced practical chemistry, Books and allied (p)Ltd. Kolkata, Third Edition 2007.

SEMESTER V	
Self study	Chemistry For Competitive Examination
Code :18UCHSS3 (Compulsory)	Credits : 2

Vision: Prepare students to face competitive examinations

Mission:

- Classify the elements based on electronic configuration
- Know the importance of fullerenes in Nanoscience
- Know the importance of Hydrogen bonding in day today life

Course Outcome :

CO No.	Upon completion of this course, students should be able to	PSO addressed	CL
CO - 1	classify homogeneous and heterogeneous mixtures	1	Re
CO - 2	understand the separation principles used in metallurgy	1, 7	Un
CO - 3	know the Rutherford, J.J Thomson and Bohr's atomic models	1	Re
CO - 4	apply the principles governing the filling up of electrons in the orbitals	1	Ap
CO - 5	classify elements into s, p, d and f block	1, 3	Un
CO - 6	categorise Ionic, Covalent and Coordinate bond	1, 3	An
CO - 7	assess the difference between diamond and graphite.	1 ,6	Ev
CO - 8	know the desalination of water using Reverse Osmosis	5,7	Re

SEMESTER V	
Self Study	Chemistry for Competitive Examination
Code :18UCHSS3 (Compulsory)	Credits : 2

Unit I Matter

Definition— classification — physical classification, properties of solids, liquids and gases changes of physical state — chemical classifications — elements, compounds, mixtures — elements — definitions and their classifications viz. metals, non-metal and metalloids with example — physical states of some important elements. Compounds — definition — classifications viz. inorganic and organic compounds with examples. Some important compounds and their common names and uses — characteristics of compounds. Mixtures — definitions- classifications — homogenous and heterogeneous — examples — properties of mixtures — differences between compounds and mixtures. Separation of mixtures — techniques, principles and examples : Handpicking, sieving, magnetic separation, sublimation, sedimentation, Decantation, filtration, evaporation, Distillation, Crystallization.

Unit II Structure of Atoms

Atoms – Definition – Dalton’s atomic theory - sub atomic particles - charges of sub - atomic particles discoveries of subatomic particles - atomic and mass number - isotopes - - symbols for elements - principles governing filling up of electrons in the orbitals - Electronic configurations of first twenty elements. Rutherford; J.J Thomson and Bohr’s atomic models - valency; formula and naming of compounds - Molecular mass and mole concept.

Unit III Classification of Elements and Periodicity of Properties

Classification of elements Doberiner, Newlands, Mendeleev and modern Periodic tables - Groups & Periods - classifications of elements into s, p, d and f block with examples - periodicity of properties - metallic character, atomic - ionic radii, ionization potential energy, electron affinity and electronegativity.

Unit IV Chemical Bonding and Non - Metals

Need for the Chemical bond formation - introduction to ionic bond, covalent bond, coordinate bond and metallic bond - ionic bond formation - definition, and explanation using NaCl, - covalent bond - definition and explanation using H₂, O₂, N₂, CH₄, Properties of ionic and covalent compounds Noble gases and their applications - Halogens and their applications preparation and uses of hydrogen, phosphorus and sulphur, Differences between diamond and graphite.- Fullerenes.

Unit V Air and Water

Atmosphere - different layers of atmosphere and their compositions - composition of air
- uses of various components of air - air pollution - sources, effects and control measures
- water - abnormal properties of water and its explanation using H-bonding - Hard and soft water - temporary and permanent hardness - Removal of hardness - Boiling, Clarks process, washing soda process, Calgon - Reverse osmosis - preparation and uses of distilled water.

Reference: Question Bank

SEMESTER- VI			
Core X		Inorganic Chemistry - II	
Code :18UCHC61	Hrs./Week:4	Hrs/ Sem: 60	Credits:4

Vision

Obtain an intense knowledge about coordinating chemistry and its applications in various fields

Mission

- Know the theories behind the formation of coordination complexes.
- Understand the nature of metal carbonyls and their applications
- Identify the role of metal ions in biological systems

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	acquire knowledge in the chemistry of coordination compounds and their properties.	1	Un
CO - 2	characterize and synthesize of coordination compounds	1, 5,6	Ap
CO - 3	explain the definition of coordination compounds, naming them and decide isomerism	1	Re
CO - 4	describe the formation and bonding in coordination compounds	1, 6	An
CO - 5	grasp the knowledge of bonding in metal carbonyls	1, 2	Re
CO - 6	identify the structure and bonding in metal carbonyls of mono, bi nuclear and poly nuclear carbonyls	3, 6	Ap
CO - 7	formulate independent research ideas in the field of bioinorganic chemistry	1, 3, 7	Cr
CO – 8	recall the importance of metals in biological systems and the application of metal chelates in various fields	1, 4, 8	Re

SEMESTER- VI			
Core X	Inorganic Chemistry - II		
Code :18UCHC61	Hrs./Week:4	Hrs/ Sem: 60	Credits:4

Unit I Co-ordination Compounds I

Co-ordination compounds –definition –addition (or) molecular compounds double salts-complex salts. Terminology – complex ions (central metal ion) coordination number- ligands - types of ligands (monodentate– bidentate-polydentate- bridging ligands) – oxidation number, co-ordination sphere, effective atomic number (EAN). Nomenclature of coordination compounds – isomerism in co-ordination compound – structural and stereo isomerism. Hydrate isomerism – ligand isomerism – linkage isomerism – coordination isomerism – coordination position isomerism – polymerisation isomerism.

Unit II Co-ordination Compounds II

Valence bond theory(Pauling's theory) – salient features of valence bond theory. Valence Bond theory as applied to octahedral complexes (inner and outer orbital complexes) – square planar and tetrahedral complexes. Limitation of valence bond theory – crystal field theory –postulates of Crystal field theory- CF splitting in tetrahedral, square planar and octahedral complexes. Strong and weak field ligands, Crystal field stabilization energy (CFSE) – factors influencing the magnitude of CF splitting — applications of crystal field theory - magnetic properties, colour of transition metal complexes – Jahn Teller theorem- Consequences of Jahn- Teller distortion.

Unit III Reaction Mechanism in Co-ordination Compounds

Stability of complexes in solution – thermodynamic stability-factors influencing the stability of complexes-kinetic stability – factors influencing the lability of complexes – stabilisation of unusual oxidation states by complexation. – substitution reaction in octahedral complexes – dissociative(S_N^2), associative(S_N^1) mechanism. Substitution reactions in octahedral complexes (acid and base hydrolysis) and substitution reactions in square planar complexes. Trans effect- pi bonding theory of trans effect – uses of trans effect.

Unit IV Metal Carbonyls

Definition – low oxidation state of metal ion in metal carbonyls – classification of carbonyls- based on the number of metal atoms present in carbonyl- based on the structure of carbonyls - General methods of preparation, properties of transition metal carbonyls. Nature of M-CO bonding in metal carbonyls -Evidences for back bonding-Structure of carbonyls on the basis of VB theory. Structure and bonding in metal carbonyls of mono, bi nuclear and poly nuclear carbonyls of Ni, V, Cr, Fe, Co and Mn [(Ni(CO)₄), V(CO)₆, Fe(CO)₅, Cr(CO)₆, Co₂(CO)₈, Fe₂(CO)₉, Mn₂(CO)₁₀, and Fe₃(CO)₁₂].

Unit V Bio-Inorganic Chemistry

Role of metal ion in living systems (excess and deficiency of trace metals) – metallo-proteins, metallo-enzymes – characteristics of metallo-enzymes – characteristics of metal

activated enzymes – functions of metal in enzymes – elementary idea of metallo-porphyrins. Structure and function of haemoglobin, chlorophyll and vitaminB₁₂. Function of Na/K pump. Applications of co-ordination compounds in medicine, industry, biological systems and analytical chemistry.

Text book

1. Puri B.R. Sharma L.R. Kalia Principles of Inorganic Chemistry K.K. Milestone Publishers & Distributors, Delhi, 2016 – 2017.

Books for Reference

1. Lee J.D. Concise Inorganic Chemistry, Blackwell Science, 5th Edn.1996.
2. P.Basalo and Johnson Benjamin ,Co-ordination Chemistry Ink,1964
3. R. Gopalan, V.Ramalingam, Concise co-ordination Chemistry Vikas Publishing House Pvt Ltd, 2001.
4. R.D.Madan Modern Inorganic Chemistry, S.Chand & Co,Ltd, 2005.

SEMESTER- VI			
Core XI		Organic Chemistry-IV	
Code :18UCHC62	Hrs./Week: 4	Hrs/ Sem: 60	Credits: 4

Vision: Empathize the structure, reactions, properties Organic compounds and contribute to the future of humanity

Mission:

- Understand the different applications of Photochemistry in Organic compounds
- Know the importance of Heterocyclic compounds, Alkaloids and Terpenes
- Analyze structure of different types of nucleotides

Course Outcome:

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	identify the type of the photochemical and thermal reactions	1,7	Re
CO - 2	understand the important applications of photochemistry in organic compounds	1	Un
CO - 3	illustrate the mechanisms of specific reactions	1	Ap
CO - 4	know about the importance of heterocyclic compounds, alkaloids and terpenes Identify the nature of compounds in heterocyclic compounds	1, 5	Re
CO - 5	apply the methods of extraction of Alkaloids	1, 2,6	Ap
CO - 6	compare quinoline and isoquinoline	1,4	Ap
CO - 7	analyse amino acid spectrophotometrically	1, 2, 8,	An
CO - 8	recall the colour reactions of proteins Classify the structure of DNA and RNA	1, 3 5	Re Un

SEMESTER- VI			
Core XI		Organic Chemistry-IV	
Code :18UCHC62	Hrs./Week: 4	Hrs/ Sem: 60	Credits: 4

Unit – I Organic Photochemistry

Introduction – Photochemical vs thermal reactions – singlet and triplet states – allowed and forbidden transitions – Jablonski diagram – photosensitization – photochemical reaction – elimination reaction – Norrish type I and Type II – photolysis of cyclic ketone – photolysis of aldehyde – photolysis of compounds containing Nitrogen – Barton reaction – photocycloaddition– Paterno-Buchi reaction – photo induced reaction of α,β -unsaturated ketone

Unit-II Name Reactions and their Mechanism

Reformatsky reaction-Birch reduction- Cope elimination- Bayer-villiger oxidation-Ritter reaction-Jones oxidation-Hell-Volhard –Zelinsky reaction-Dakin reaction- Darzens reaction.

Unit- III Heterocyclic Compounds

Introduction – preparation and reactions of furan, pyrrole and thiophene. Aromatic character and basic nature – comparative reactivity. Preparation and reactions of pyridine – preparation and reactions of quinoline, isoquinoline and indole. Structural elucidation of pyridine, quinoline and isoquinoline.

Unit-IV Alkaloids and Terpenoids

Alkaloids – definition – classification – occurrence – extraction using soxhlet apparatus pigment analysis using flame photometer-extraction of oil from plants using Clevenger-general characteristics. General methods of identification –functional nature of oxygen, nitrogen. Oxidation, Hofmann’s exhaustive methylation – structure and synthesis of coniine, piperine and nicotine

Methods of extraction –Qualitative analysis of phytochemicals –Quantitative estimation of tannin, phenolic compounds.

Terpenoids – introduction – classification – isolation of terpenoids – isoprene rule – general properties of terpenoids. General procedure for determining structure of terpenoids – synthesis and structure of geraniol, Citral, dipentene and menthol.

Unit-V Amino acids and Proteins

Amino acids - classification, general methods of preparation and reactions of amino acids, zwitter ion - isoelectric points, action of heat on α,α and α,β amino acids. Peptides and proteins - Peptide linkage - polypeptide - classification of proteins - synthesis of peptides - Merrifield synthesis - primary structure - end group analysis - Dansyl chloride, Edman method - secondary structure - tertiary structure - denaturation - colour reactions of proteins – nucleotides- Structure of DNA-Watson and Crick model- structure and types of RNA.

Estimation of folic acid , amino acid and protein by colorimetry/spectrophotometrically

Text Books

- 1.K.S. Tewari, N.K. Vishnoi, S.N. Mehrotra. A Text Book of Organic Chemistry, Vikas publishing house (P) Ltd.2002.
- 2.Arun Bahl and B. S. Bahl Advanced Organic chemistry, S. Chand and Company Ltd., Reprint 2005.
3. Organic Reaction Mechanisms, V. K. Ahluwalia and Rakesh Kumar Parashar, 2011,Narosa Publishing House, New Delhi

Books for Reference

1. I.L Finar Organic Chemistry Volume II, Stereochemistry and the Chemistry of Natural Products Edition V Reprint 1986.
2. Jerry March, Advanced Organic Chemistry, Reactions Mechanisms and Structure, 4th Edition. 2013

SEMESTER VI			
Core XII		Physical Chemistry III	
Code :18UCHC62	Hrs/Week : 5	Hrs/ Sem : 75	Credits : 4

Vision:

Inspiring and educating the students the core concepts in Physical Chemistry

Mission:

Enable the young Chemistry buds to sustain a deep knowledge in thermodynamics, solutions and thermochemistry

Course Outcome

CO No.	Upon completion of this course, students should be able to	PSO addressed	CL
CO - 1	study various thermodynamic parameters and its applications in different physical states of the systems	1, 2, 3	Re
CO - 2	understand the kinetics of the reaction and to determine the reaction mechanism	1,2,4	Re
CO - 3	apply reaction kinetics to determine the rate of chemical reactions; understand the factors that influence rates of reaction.	1,2, 3,5	Ap
CO - 4	categorise fundamental uniqueness of the chemical and physical properties of nanomaterials and their potential impact in science, engineering, medicine, and the environment	1,2, 3,5	An
CO - 5	outline the concepts of top down and bottom up methods of nanomaterials preparation	2, 3,5,6	An
CO - 6	have a thorough Learning of miscible and immiscible liquids	2,3,4	Re
CO - 7	comparison of vapour pressure of partially miscible liquids and mixture of immiscible liquids and understand the theory of fractional distillation and steam distillation and its applications.	2,3	An
CO - 8	outline the statement of Nernst distribution law , its deviations and applications	1, 2,3,4	An

SEMESTER VI			
Core XII	Physical Chemistry III		
Code :18UCHC62	Hrs/Week : 5	Hrs/ Sem : 75	Credits : 4

Unit I Thermodynamics I

Terminology – thermodynamic equilibrium – types of thermodynamic system – thermodynamic processes – (Isothermal, adiabatic, isobaric, isochoric) – definition and example – sign conventions – first law of thermodynamics – enthalpy of a system – relation between ΔH and ΔE – molar heat capacities – definition – molar heat capacity at constant volume – molar heat capacity at constant pressure – relation between C_p and C_v . Joule Thomson effect – Joule Thomson coefficient – inversion temperature.

Unit II Thermodynamics II

Limitations of first law of thermodynamics .Second law of thermodynamics – Different statements – Concept of entropy – Entropy changes in isothermal expansion of an ideal gas – Entropy changes in reversible and irreversible processes – Work function and free energy function – Variation of free energy with temperature and pressure – Gibbs Helmholtz equation – Derivation and significance – Partial molar properties – Chemical potential – Gibb's Duhem equation – Derivation and significance ..

Unit III Thermodynamics III

Claussius-Claypeyron equation – application in ice skating – derivation (integral and differential forms) and significances – derivation of Van't Hoff isotherm and isochore. Concept of fugacity– fugacity of a gas in a gaseous mixture –physical significance of fugacity. Nernst heat theorem – third law of thermodynamics – statement – determination of absolute entropy of solids, liquids and gases – experimental verification of the third law of thermodynamics – entropy change in chemical reactions – derivation of the Boltzmann entropy equation – residual entropy – zeroth law – energy relations in living systems.

Unit IV Solution

Liquids in liquids –completely miscible liquids- ideal and non-ideal mixtures-Raoult's law - distillation of homogenous binary liquid mixtures -Theory of fractional distillation – Azeotropic distillation.

Partially miscible liquids – Phenol-water, Triethylamine-water and Nicotine-water systems –Variation of solubility with temperature – vapour pressure of partially miscible liquids-critical solution(consolute) temperature-upper, lower,upper and lower - influence of impurity on CST and applications.

Immiscible liquid systems- vapour pressure of mixtures of immiscible liquids- theory of steam distillation and its applications.

Nernst distribution law – statement–conditions - thermodynamic derivation —deviations from the law(molecular association and dissociation) — applications-distribution indicators-study of complex ions-solvent extraction

Unit V Chemical Equilibrium

Reversible reactions- nature of chemical equilibrium- characteristics-law of mass action-explanation of the law of mass action based on the molecular collision theory-equilibrium constant; equilibrium law-relationship between K_c and K_p -Application of law of mass action to the equilibria involving the formation of NH_3 , dissociation of CaCO_3 and the dehydration of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. Lechatelier's principle – statement-application to the formation of NH_3

Text Books

- 1.B.R.Puri, L.R. Sharma, Madan S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2008.
2. Arun Bahl, B.S. Bahl, G.D. Tuli, Essentials of Physical Chemistry, S. Chand & Company Ltd., New Delhi, 2008.

Books for Reference

1. Samuel Glasstone, Thermodynamics for chemists, Affiliated East-West Press (Pvt.) Ltd, New Delhi, III printing, 2010.
- 2.Sadhan Kr.Dutta, Principles of Physical Pharmacy and Biophysical Chemistry, Books and Allied (P) Ltd. Kolkata, 2007
3. P.L.Soni, O.P.Dharmaha,Text Book of Physical Chemistry(A Modern Approach), Sultan Chand and Sons Publishers, Revised Edition, 2010.
- 4.Iran.Levine, Physical Chemistry, Mc Graw Hill, Kogakusha Ltd. 1978.

SEMESTER- VI			
Core Integral II		Spectroscopy	
Code : 18UCHI61	Hrs/Week : 4	Hrs/ Sem : 60	Credits : 4

Vision:

Aware of the excitement of science behind electromagnetic radiation and structural elucidation of molecules

Mission:

Understand how molecules and materials behave, interact and transform at molecular, atomic and electronic level.

Discover the applications of spectroscopic techniques which fundamentally relate to the interaction of light with matter.

Course Outcome

CO No.	Upon completion of this course, students should be able to:	PSO addressed	CL
CO - 1	have a basic knowledge of electromagnetic spectrum and various types of spectra	1 , 2 , 3	Re
CO - 2	understand the theory , instrumentation and applications of rotational spectroscopy	1, 2	Un
CO - 3	know the types of electronic transitions and various selection rules	1,3	Re
CO - 4	apply Woodward-Fieser rule for calculation of absorption maxima of dienes and α , β unsaturated ketones and enumerate the applications of UV spectroscopy in coordination complexes.	2, 3,6	Ap
CO - 5	generalise the theoretical principle, selection rules and instrumentation of IR and Raman spectroscopy	1, 2,4,6	Cr
CO - 6	categorise IR absorption frequencies and applications of IR and Raman spectroscopy	1 , 2,4	An
CO - 7	assess C^{13} NMR and the principle behind ^{31}P , ^{19}F and ^{15}N NMR , Magnetic Resonance Imaging and applications of NMR spectroscopy.	1 ,2 ,4,6,7,8	Ev
CO - 8	know the basic principles and instrumentation of mass spectrometry	3,7,8	Re

SEMESTER- VI			
Core Integral II		Spectroscopy	
Code : 18UCHI61	Hrs/Week : 4	Hrs/ Sem : 60	Credits : 4

Unit-I Electromagnetic Spectrum and Rotational Spectroscopy

Regions of electromagnetic spectrum - interaction of radiation with matter – Different types of energy levels in molecules – rotation, vibration and electronic levels. Various types of spectra – atomic spectroscopy – molecular spectroscopy.

Rotational spectroscopy - Micro wave (rotational) spectra – theory – instrumentation and applications in the determination of bond distances in diatomic molecules –microwave oven

Unit-II UV Spectroscopy

Theory – types of electronic transitions - selection rules – forbidden and allowed transitions - Chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic and hypochromic effect – instrumentation – Woodward - Fieser rule for calculation of absorption maxima of dienes and α , β unsaturated ketones (simple problems can be asked using Woodward-Fieser rule)

Unit-III IR Spectroscopy and Raman spectroscopy

Vibrational (IR) spectra – theoretical principle – harmonic oscillator and anharmonicity – modes of vibrations – selection rules – Number of fundamental vibrations – Force constant – Fermi resonance – zero point energy - instrumentation.. Finger print region, characteristics of IR absorption frequencies, intermolecular and intramolecular hydrogen bonding. – Applications in the determination of bond strength.

Raman spectra – theoretical principle – selection rules – stokes and anti stokes line – PQR branches – instrumentation and Mutual exclusion principle – applications to CO₂ and HCN molecules.

Unit-IV NMR Spectroscopy

Introduction – spin moment-theory – number of signals - instrumentation - internal standard (TMS) –chemical shift – factors influencing chemical shift – splitting of the signals, spin-spin coupling, coupling constant. NMR spectrum of ethanol, benzyl alcohol, propionic acid, anisole, benzaldehyde, 2,3-dibromopropene, ethyl methyl ketone and mesitylene. C¹³ NMR - Applications of NMR spectroscopy-Magnetic Resonance Imaging.

Unit-V Mass spectrometry

Basic Principles - instrumentation– isotope abundance - techniques of Ion production - EI, CI - Base peak- molecular ion – meta stable ion - daughter ion--calculation of molecular formula - fragmentation pattern of various classes of organic compounds- hydrocarbons, alcohols, amines, aldehyde, ketone, ether, ester, acids and phenols- Mc-Lafferty rearrangement.

Text Books

1. B.R.Puri. L.R. Sharma, Madan S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co., 2008.
2. Arun Bahl, B.S. Bahl, G.D. Tuli, Essentials of Physical Chemistry, S. Chand & Company Ltd., New Delhi, 2008.
3. P.S.Kalsi, Spectroscopy of Organic compounds, IV Edition, New Age International (P) Ltd., New Delhi, 1999.
4. B.K.Sharma, Spectroscopy, Goel Publishing House, Fourteenth Edition, 2000.

Books for Reference

1. C.N.Banwell, Fundamentals of Molecular Spectroscopy, Mc.graw Hill, Fourth Edition, 2003.
2. John.R.Dyer, Applications of Absorption Spectroscopy of organic compounds, Sixth Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 1984.
3. Jag Mohan, Organic Spectroscopy- Principles and Applications, Second Edition, Alpha Science International Limited, Harrow, U.K., 2000.
4. Robert.M.Silverstein, G.Clayton Bassler, Terrence .C. Morrill, . Spectroscopic Identification of Organic Compounds John Wiley and Sons, Inc., Newyork, 1974.

SEMESTER- VI			
Core Integral III		Selected Topics In Chemistry	
Code :18UCHI62	Hrs/Week:5	Hrs/ Sem: 75	Credits: 4

Vision

Provide adequate knowledge about the chemistry behind the products that we use in our daily life.

Mission

- Grasp the principles behind milk processing, corrosion and polymer processing
- Employ the separation process effectively for solid and liquids in our daily life
- Recognize the nature and the function of food additives in our food.

Course Outcome :

CO No.	Upon completion of this course, students should be able to	PSO addressed	CL
CO - 1	have a basic knowledge about milk and its composition	1 , 2 , 3	Re
CO - 2	understand the theory behind fermented milks	1, 2	Un
CO - 3	know the types of different types of purification techniques	1,3	Re
CO - 4	apply Chromatographic techniques for the recovery of Organic substances	2, 3,6	Ap
CO - 5	generalize the types of corrosion	1, 2,4,6	Cr
CO - 6	categorize the constituents of paint and its uses	1 , 2,4	An
CO - 7	assess the properties of conductive polymers	1 ,2 ,4,6,7,8	Ev
CO - 8	know the preparation of synthetic polymers	3,7,8	Re

SEMESTER- VI			
Core Integral III		Selected Topics In Chemistry	
Code :18UCHI62	Hrs./Week:5	Hrs/ Sem: 75	Credits: 4

Unit I – Dairy Chemistry

Milk – definition – composition and constituents of milk – factors affecting the composition of milk – properties of milk – physical state – flavour – aroma – acidity – density – viscosity – boiling point – freezing point – acid-base equilibria – estimation of acid number – saponification number – iodine number – RM number – estimation of fat in milk – Babcock method – Majonnier method – nutritive value of milk.

Non-Fermented milks – definition and manufacture of special milks – sterilized milk – flavoured milk – sterilized-flavoured milk – irradiated / vitaminised milk – standardised milk – reconstituted milk – recombined milk – toned milk – condensed milk.

Unit II Separation and Purification Techniques

Purification of solid organic compounds – recrystallization, use of miscible solvents – use of drying agents – sublimation – purification of liquids – distillation – fractional distillation– use of immiscible solvents –solvent extraction.

Chromatography – principle of adsorption and partition chromatography – column chromatography, adsorbents – classification of adsorbents – solvents – preparation of column, adsorption, recovery of substances. Thin layer chromatography – choice of adsorbent – choice of solvent – preparation of chromatogram.

Unit III Corrosion and Protective Coating

Corrosion of metals – definition – disadvantages – types of corrosion-theories of corrosion (Direct Chemical corrosion, electrochemical corrosion) – methods of preventing corrosion-corrosion inhibitors

Types of protective coating (metallic, organic, organic lining and ceramic coating) paint-characteristics of a good paint – constituents of paints and their functions varnish, resins and lacquers, their characteristics – uses – difference between paint, varnish and lacquer

Unit IV Food Chemistry

Manufacture of sugar from beetroot and sugarcane – molasses – manufacture of alcoholic beverages – manufacture of vinegar food additives – baking soda – food color natural and artificial – intentional food additives – acid base and their salts – antioxidants – stabilizers– bleaching – maturing agents – leavening agents – humectants and preservatives.

Unit V Polymer Chemistry

Introduction-Classification based on chemical structure,mode of synthesis and composition –Characteristics of the polymers - nomenclature of polymers – Homopolymers and Hetero polymers — Conducting polymers- Tacticity – Copolymer - types.Plastics(thermoplast and thermosets)–elastomers –fibres. Degree of polymerization.

Synthetic Polymers:Poly olefins – Polyethylene – HDPE, LDPE,LLDPE – Polypropylene – Polyvinyl chloride – grades of PVC – Teflon.Polyethylmethacrylate

(pexiglass) polystyrene, polyamide – Nylon6, Nylon66, Nylon610 Nylon11, - polyester – polyurethanes – polycarbonates

Text books

1. K. Bagavathi Sundari, Applied Chemistry MJP Publishers, Tamil Nadu Book House, Chennai, 2006.
2. Jayashree Ghosh, Fundamental concepts of Applied chemistry Edition, S. Chand & company Ltd New Delhi, 2006.

Books for Reference

1. Siva Sankar B, Food processing and preservation, Prentice, Hall of India Pvt., Ltd., New Delhi 2002.
2. Arora M.G., Singh M., Polymer Chemistry-Anmol Publications Pvt.Ltd., New Delhi, 2002.
3. B.K. Sharma, Industrial Chemistry Goel Publishing House, , Meerut, 2003.

SEMESTER V & VI			
Core Practical IV		Organic Analysis and Organic Preparations	
Code : 18UCHCR4	Hrs/Week : 3	Hrs/ Sem : 45	Credits : 3

Objective: Enable the students to develop analytical skill in organic qualitative and quantitative analysis and to develop skill in preparing organic compounds.

1. Organic Analysis:

Analysis of simple organic compounds

- Nature of the compound- Aromatic / Aliphatic
- Test for saturation/ unsaturation.
- Detection of element present/ absent
- Characterization of functional groups (Acids, amide, amines, phenol, aldehyde, ketone, anilide, ester, carbohydrates, nitro compounds), Confirmation by preparation of a solid derivative.

2. Preparation of Organic compounds involving the following chemical conversions

- Oxidation
- Hydrolysis
- Nitration
- Bromination
- Diazotization
- Benzoylation
- Osazone formation

3. Determination of physical constant(melting point/boiling point)

4.Course work

- Extraction of various phytochemicals using soxhlet apparatus and to analyse plant pigments
using flame photometer
- Extraction of oil from plants using Clevenger apparatus.

Books for Reference

- Raghupati Mukhopadhyay, Pratul Chatterjee, Advanced Practical Chemistry - Books and Allied (P) Ltd. Third Edition-2007
- J.N. Gurtu and R. Kapoor, Advanced experimental chemistry, S.Chand and Co., 1987.
- Arthur I.Vogel, A text book of practical organic chemistry including qualitative analysis, Longman Group Ltd. ELBS edition, 1975
- N.S.Gnanapragasam, G.Ramamoorthy, Organic Chemistry Lab Manual, S.Viswanathan printers and publishers Pvt. Ltd. 2007

SEMESTER VI			
Core Practical V Gravimetry and Inorganic Preparation			
Code : 18UCHCR5	Hrs./Week:5	Hrs/ Sem: 75	Credits : 2

Objective:

Enable the student to get analytical skills and help them to plan and execute experimental projects.

a) Gravimetric Analysis

1. Estimation of Lead as Lead Chromate.
2. Estimation of Barium as Barium Chromate
3. Estimation of Zinc as Zinc Oxinate
4. Estimation of copper as copper (I) thiocyanate
5. Estimation of calcium as calcium oxalate.

b) Inorganic Preparations

1. Preparation of Potash alum
2. Preparation of Hexamminenickel(II)chloride
3. Preparation of Tetramminecopper(II)sulphate
4. Preparation of Prussian blue.
5. Preparation of Potassiumtrioxalatochromate (III) trihydrate
6. Preparation of Potassiumtrisoxalatoferate(III)
7. Preparation of Trithioureacopper(I) sulphate

Course work

1. Estimation of Nickel as Nickel – DMG complex
2. Estimation of Iron/ Nickel by spectrophotometer.