



A.D.M College For Women (Autonomous)

Nationally Accredited with 'A' Grade by NAAC (Cycle-III)
Nagapattinam -611 001
TamilNadu.



B.Sc., Chemistry

 Employability

 Entrepreneurship

 Skill Development

Name of the Programme	Course Code	Title of the Course	Employability	Entrepreneurship	Skill development
B.Sc., Chemistry	QUA	General chemistry I	✓		
	QUBY	Volumetric analysis practical			✓
	QUD	General chemistry III	✓		
	QUEY	Semi micro analysis practical			✓
	QUE1	Chemistry of consumer products		✓	
	QUS1	Pharmaceutical chemistry	✓		
	QUE3	Analytical chemistry	✓		
	QUI	Physical chemistry	✓		
	QUS3	Polymer chemistry			✓
	QUS2	Applied chemistry	✓		
	QUE5	Agricultural chemistry			✓
	QUE4	Nuclear, industrial and metallic state	✓		

EMPLOYABILITY

Semester-I/ Core Course-I	GENERAL CHEMISTRY-I	Course Code: QUA
Instruction Hours:6 Internal Marks:25	Credits: 6 External Marks:75	Exam Hours:3 Total Marks:100

Cognitive Level	K1-Acquire / Remember K2-Understanding K3-Apply K4-Analyze K5-Evaluate K6-Create	
Course Objectives	<ul style="list-style-type: none"> • To study atomic structure, chemical bonding and molecular structure • To understand the basic properties of alkali metals. • To understand the basic properties and naming of organic compounds. • To learn various methods of preparation and mechanism of reactions of Hydrocarbons. • To study about colloidal state and macromolecules 	
UNIT	CONTENT	HOURS
Unit I	<p>ATOMIC STRUCTURE , QUANTUM MECHANICS & VOLUMETRIC ANALYSIS</p> <p>Atomic Structure – Rutherford,Thomson-Review of Bohr’s theory and its limitations–Dual behavior of matter and radiation–Debroglie’s relation- Heisenberg uncertainty Principle–Hydrogen atom spectra.</p> <p>Quantum Mechanics – Time independent Schrodinger equation and meaning of various terminit–significance Ψ and Ψ^2,Schrodinger equation for hydrogen atom – significance of quantum numbers – Orbital angular momentum quantum numbers m_l and m_s. Shapes of s, p and d atomic orbitals, nodal planes. Spin quantum number(s)and magnetic spin quantum number(m_s)</p>	18 Hrs

	<p>Volumetric Analysis -Definitions of molality, normality, molarity and mole fraction-definition and examples for Primary and secondary standards. Calculation of equivalent weights, theories of acid & base, redox, complexometric, Iodo and iodimetric titrations –indicators.</p>	
Unit II	<p>ALKALI METALS, ALKALINE EARTH METAL & P-BLOCK ELEMENT</p> <p>Alkali Metals – General characterization - Lithium diagonal relationship of Li and Mg. Comparison with other members of the family– justification of its position in the periodic table.</p> <p>Alkaline Earth metals – General characterization - Beryllium – diagonal relationship of Be& Al. Justification of their position of Be and Mg in the periodic table –Beryl extraction and uses of Be.</p> <p>p-Block Elements- Comparative study of boron family elements – Compounds of boron – borax, borazole, boron trioxide, ortho boric acid, boron halides, borazine and diborane (Structure only). Compounds of Aluminium –Aluminium Oxide, Aluminium Chloride, Sulphates, Alum.</p>	18 Hrs
Unit III	<p>ORGANIC COMPOUNDS–ALKANE & ALKENE</p> <p>Nomenclature of organic compounds – IUPAC naming of simple and substituted aliphatic, aromatic and alicyclic compounds.</p> <p>Alkanes–Sources of alkanes, general methods of preparation, properties and reactions. Mechanism of free radical substitution in alkanes.</p> <p>Cycloalkanes- Methods of preparation of cycloalkanes – Chemical Properties and reactions -Bayers strain theory and its limitations.</p> <p>Alkenes– Preparation and properties of alkenes–electrophilic and free radical addition, addition reactions with hydrogen bromide (peroxide effect), sulphuric acid,water, hydroboration, ozonolysis, hydroxylation with KMnO₄ – allylic substitution byNBS(with mechanism of all the above reactions)</p>	18 Hrs

Unit IV	<p>CONCEPTS INORGANIC CHEMISTRY & REACTION INTERMEDIATES</p> <p>Basic concepts in organic chemistry–Inductive, mesomeric, hyperconjugation and electromeric effects. Hybridization and geometry of molecules –methane, ethane, ethylene and acetylene(sigma and pi bonds, bond lengths, bond angles, bond energy)</p> <p>Reaction intermediates–carbocations, carbanions, carbenes and free radicals–generation and their stability. Homolytic and Heterolytic cleavage of carbon – carbon bonds.</p>	18 Hrs
Unit V	<p>COLLOID & MACROMOLECULES</p> <p>Colloids–types of colloidal system–true solution–colloidal solution and suspension–property of colloidal system–optical property-tyndall effect, kinetic property–Brownian movement, electrical properties–Electrophoresis–Electro Osmosis– Gold number–Theories of protection– Stabilities of sols.</p> <p>Gel and Emulsion–Preparation, Properties and Uses.</p> <p>Macromolecules - Determination of Number average and weight average molecular weight of macromolecules.</p>	18 Hrs

Text Book:

1. A.K.De,“ A Textbook of Inorganic Chemistry” New age international publishers,9thedition,2002.
2. B.S. Bahl and ArunBahl “Advanced Organic Chemistry, New Delhi, Sultan Chand and Co. , (22thedition)(2016)
3. B.R.Puri, .R.Sharma, K.K.Kalia“ Principles of Inorganic Chemistry”,New edition: ShobanLalNaginchand and co.,35thedition, 2013.

Reference Books:

1. J.D.Lee,“Concise Inorganic Chemistry”,Sultan Chand and Sons,20th revised edition,2000.
2. F.A.Cotton, G.Wilkinson, “ Advanced Inorganic Chemistry”, Wiley Eastern Private Ltd.,3rd edition,

- Huheey J. E., Keiter E. A. and Keiter R. L. and Medhi O. K., Inorganic Chemistry - Principles of Structure and Reactivity Pearson Education,, 4thedition, 2006.
- R.T Morrison and R.N.Boyd , “ Organic Chemistry” New york, Allyn& Bacon Ltd., (6th edition) (2006).
- PuriB.R.. Sharma L.R., Kalia K.K –“Principles of Inorganic chemistry” New edition: ShobanLalNagin Chand andco.,35th edition ,2013.
- GilbertW.Castellan“Physical chemistry”,Narosa publishing House ,New Delhi,(3rdedition),(2004)

Resources:

- <https://www.topfreebooks.org>.
- <https://bookboon.com>.
- <https://www.e-booksdirectory.com>

Course Outcomes:

On completion of the course the learner will be able

CO 1:	To understand the address of the electron and the concept of indicators and dilution.
CO 2:	To know the physical and chemical properties and uses of alkali metals, alkaline earth metals
CO 3:	Recognize the basic practical skills for the synthesis of alkenes, alkynes, and cycloalkanes.
CO 4:	Predict the geometry and hybridization of molecules inorganic chemistry.
CO 5:	Apply the concept and uses of gels and colloids in the applied field.

MAPPING OF COS WITH POS & PSOS:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO 1	S	S	S	S	S	S	S	S	M	S
CO 2	S	S	S	M	S	S	S	S	M	S
CO 3	S	S	S	M	S	S	S	S	W	S
CO 3	S	S	S	S	S	S	S	S	W	S
CO 5	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

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N – No Correlation

Semester-III/Core Course-III	GENERAL CHEMISTRY-III	Course Code:QUD
Instruction Hours:6	Credits: 6	Exam Hours:3
Internal Marks:25	External Marks:75	Total Marks:100

Cognitive Level	K1-Acquire / Remember K2-Understanding K3-Apply K4-Analyze K5-Evaluate K6-Create	
Course Objectives	1. To learn about nature and formation of compounds of oxygen and Interhalogen compounds. 2. To become aware of the fundamental aspects of stereochemistry and its influence chemical properties. 3. To acquire knowledge about qualitative analysis. 4. To learn about properties, packing arrangement 5. To learn about structural determination of solids state.	
UNIT	CONTENT	URS
Unit I	CHEMISTRY OF P – BLOCK ELEMENTS General characteristics of p-block elements. Metallurgy: Occurance of metals–concentration of ores – froth floatation, magnetic separation, calcination, roasting, smelting, flux, aluminothermic process, purification of metals-electrolysis, zone refining, van Arkelde-Boer process. Extraction of Al and Pb- alums, alloys of Al. Chemistry of oxides of carbon- CO, CO ₂ . Compounds of Nitrogen - Preparation and Properties - Ammonia and Oxides of Nitrogen - N ₂ -Cycle, fixation of N ₂ . Compare Nitrogen and Phosphorus–Phosphorous Cycle.	18Hrs

Unit II	<p>INTERHALOGEN COMPOUNDS & ZERO GROUP ELEMENTS</p> <p>Sodiumthiosulphate-preparation, properties, structure and uses. Chemistry of Sodium Hydroxide, Potassium iodide and Magnesium ammonium Phosphate.</p> <p>Interhalogen compounds, Pseudohalogens, Oxyacids of halogens, Polyhalides and basic nature of iodine.</p> <p>Zero –position in the periodic table, occurrence, isolation, applications, compounds of Xe– XeF₆ & XeOF₄.</p>	18Hrs
Unit III	<p>STEREOCHEMISTRY</p> <p>Principals of symmetry- symmetry elements (C_n, C_i and S_n)- Asymmetry and dissymmetry-isomerism- constitutional isomers- stereoisomers- enantiomers- diastereomers- geometrical isomerism- meso and di compounds –conventions used in stereochemistry :Newman, Sawhorse and Fischer notations and their inter conversions.</p> <p>Nomenclature, correlation of configuration- Cahn-Ingold-Prelog rules for simple molecules- R, S and D, L notations to express configuration- chirality –optical isomerism- optical activity- polarimeter- specific rotation- stereochemistry of allenes and spiranes.</p> <p>Atropisomerism- erythro and threo conventions- stereoselectivity, stereospecificity inorganic reactions with examples. Resolution of racemic mixture- walden Inversion- conformational analysis of cyclohexane- asymmetric induction.</p>	18Hrs
Unit IV	<p>ANALYTICAL METHODS</p> <p>Qualitative Inorganic Analysis- Dry Test, flame test, cobalt nitrate test- wet confirmatory test for acid radicals, interfering acid radicals- elimination of interfering acid radicals.</p> <p>Solubility product, common ion effect, complexation, oxidation-</p>	18Hrs

	reduction reactions involved in identification of anions and cations- separation of cations into groups- Semimicro analysis of simple salts.	
Unit V	<p>SOLID STATE AND LIQUID CRYSTALS</p> <p>Classification of solids – Isotropic and anisotropic crystals – elements of symmetry – basic seven crystal systems -laws of crystallography – representation of planes – miller indices, space lattice and unit cell.</p> <p>X-Ray diffraction–derivation of Bragg’s equation–determination of structure-Sodium Chloride by Debye Scherrer (Powder method) and rotating crystal methods.</p> <p>Types of Crystals, close packing of identical solid spheres, interstitial sites, limiting radius ratios (derivation not needed), radius ratio and shapes of ionic crystals, structures of NaCl, CsCl and ZnS.</p> <p>Semiconductors – Intrinsic and extrinsic semiconductors – n and p-type semiconductors. Liquid crystals –types and applications.</p>	18Hrs

Text Book:

1. B.R.Puri,L.R.Sharma, K.K.Kalia, Principles of Inorganic Chemistry, 23rdedition, New Delhi, ShobanLalNagin Chand & Co., (1993).
2. Bahl,B.S.andBahl,A., Advanced Organic Chemistry, (12thedition), New Delhi, Sultan Chand & Co., (2010).
3. BahlB.S.,ArunBahl and TuliG.D. (2012). Essential of Physical Chemistry, NewDelhi: Sultan Chand and sons.

Reference Books:

1. GurdeepRaj,“Advanced Inorganic Chemistry”,20threvised edition,Sultan Chand & Sons, 2000.
2. MorrisonR.T. and Boyd R.N.Bhattacharjee S.K. “Organic chemistry” ,7thedition, Pearson India, 2011.

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Semester-IV/ SKILL BASEDELECTIVE – I	PHARAMACEUTICAL CHEMISTRY	Course Code:QUS1
Instruction Hours:2	Credits:2	Exam Hours:3
Internal Marks:25	External Marks:75	Total Marks:100

Cognitive Level	K1-Acquire / Remember K2-Understanding K3-Apply K4-Analyze K5-Evaluate K6-Create	
Course Objectives	<ol style="list-style-type: none"> 1. To learn the terminology and routes of administration of drug. 2. To learn the use of Indian Medicinal plants. 3. To know about designation of drugs 4. To know about common body ailment sand treatment. 5. To gain knowledge in vitamins, micronutrients and antioxidant. 	
UNIT	CONTENT	URS
Unit I	INTRODUCTION Common diseases–Infective diseases–insect–borne,and water-borne–hereditarydiseases–Terminology– drug, pharmacology, Pharmacognosy, pharmacodynamics,, pharmacokinetics, antimetabolic. Absorption of drugs–routes of administration of drugs , factors affecting absorption–Assay of drugs –chemical, biological, immunological assays.	6 Hrs
Unit II	DRUGS Various sources of drugs, pharmacologically active constituents in plants. Indian medicinal plants – tulsi ,neem ,keezhanelli– their importance. Classification of drugs–biological chemical–mechanism of drug action– action at cellular and extra cellular sites.	6 Hrs

Unit III	<p>CHEMOTHERAPY</p> <p>Designation of drugs based on physiological action , Definition and two examples each of Anesthetics – General , IV and local – Analgesics – Narcotic and synthetic –Antipyretic and anti inflammatory agents – Antibiotics – penicillin , streptomycin, chloramphenicol, tetracyclines– Antivirals .</p> <p>AIDS–symptoms, prevention, treatment.</p>	6 Hrs
Unit IV	<p>COMMONBODY AILMENTS</p> <p>Diabetes– causes, hyper and hypoglycemic drugs.</p> <p>Blood pressure–Sistolie& Diastolic Hypertensive drugs–Cardiovascular drugs–antiarrhythmic, antianginals ,vasodilators.CNS depressants and stimulants–Psychedelic drugs, hypnotics, sedatives(barbiturates, LSD).</p>	6 Hrs
Unit V	<p>HEALTH PROMOTING DRUGS</p> <p>Nutrients – Vitamins A, B, C, D, E and K. Micronutrients Na, K, Ca, Cu, Zn and I –Medically important inorganic compounds of Al P AS Hg Fe- L examples each their role and application.</p> <p>Organic Pharmaceutical acids , Agents for pituitary function (metyrapone) – Organic pharmaceutical bases –antioxidants.</p>	6 Hrs

Text Book:

1. JayasreeGhose,Pharmaceuticalchemistry,S, Chand and Company Ltd.,NewDelhi,2006.
2. Lakshmi S., Pharmaceutical chemistry,S.Chand& sons,NewDelhi,1995.

Reference Books:

1. AshutoshKar, Medicinal chemistry, Willey Eastern Ltd ,.NewDelhi,1993.
2. David William &Thomas Lemke, Foyes principles of medicinal chemistry, 5th edition BI publishers, 2005 .
3. RomasNogrady ,Medicinal chemistry, II Edition, Oxford Univ. Press, 2004.

4. Cherilyn Tilman, "Principles of Occupational Health and Hygiene-an introduction" Allen and Unwin, Sydney, 2007.
5. Fryer, Jane Eayre, "First Aid Book", John C. Winston Company.

Resources:

<https://www.topfreebooks.org>.

Course Outcomes:

On completion of the course the learner will be able

CO 1:	To know the terminology in Pharmaceutical chemistry.
CO 2:	To understand the assay of drugs, administration of drugs.
CO 3:	To classify drugs based on biological and chemical methods.
CO 3:	To recognize the chemotherapy of some common diseases.
CO 5:	To learn depth concepts of nutrients and organic pharmaceutical aids.

MAPPING OF COS WITH POS & PSOS:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO 1	S	S	S	S	S	S	S	S	S	S
CO 2	S	S	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S	S	S
CO 5	S	S	S	S	S	S	S	S	S	S

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Semester-V/ Core Course-VII	PHYSICAL CHEMISTRY I	Course Code: QUI
Instruction Hours:6	Credits: 6	Exam Hours:3
Internal Marks:25	External Marks:75	Total Marks:100

Cognitive Level	K1-Acquire / Remember K2-Understanding K3-Apply K4-Analyze K5-Evaluate K6-Create	
Course Objectives	<ol style="list-style-type: none"> 1. Students gain knowledge in Photo chemistry and Group theory. 2. Students understand the efficient way of converting work into energy and vice versa from the thermodynamic perspective. 3. Students get to know the energy changes involved in the natural and the industrial processes– that are the applications of thermodynamics. 4. Students understand the method of enhancing the efficiency of the certain industrial processes. 5. Students learn about solutions, their types, colligative properties, effect of added salt and molecular weight determination. 	
UNIT	CONTENT	HOURS
Unit I	PHOTO CHEMISTRY AND GROUP THEORY Consequences of light absorption- Jablonski diagram- radiative and non-radiative transitions .Lambert’s Beer law,quantum efficiency. Photochemical reactions- Comparison between thermal and photochemical reactions. Photosensitization and quenching. Fluorescence, Phosphorescence and chemiluminescence. Laser and uses of lasers Group theory- symmetry elements and symmetry operation- group postulates	18 Hrs

	<p>and types of groups-abelian and non abelian-symmetry operation of H₂O molecule.</p> <p>Illustration of group postulates using symmetry operation of H₂O molecule- construction of multiplication table for the operation of H₂O molecules - point group-definition- elements symmetry operations of the following molecules-H₂O,BF₃ and NH₃.</p>	
Unit II	<p>THERMODYNAMICS II</p> <p>Second law of thermodynamic – need for the law – different statements of the law-Carnot cycle and efficiency of heat engine-Carnot’s theorem-thermodynamic scale of temperature. Concept of entropy- definition and physical significance of entropy- entropy as a function of P,V and T – entropy changes during phase changes – entropy of mixing-entropy criterion for spontaneous and equilibrium processes in isolated system.</p> <p>Gibb’s free energy (G) and Helmholtz free energy(A)-variation of A and G with P,Vand T-Gibb’s-Helmholtzequation and its applications.</p> <p>Thermodynamics equation of state, Maxwell’s relations-A and G as criteria for spontaneity and equilibrium.</p>	18 Hrs
Unit III	<p>THERMODYNAMICSIII</p> <p>Equilibrium constant and free energy change- thermodynamic derivation of law of mass action- equilibrium constants in terms of pressure and concentration-NH₃,PCl₅ and CaCO₃.</p> <p>Thermodynamic interpretation of Lechatelier’s principle (Concentration, temperature, pressure and addition of inert gases).</p> <p>System variables composition- partial molar quantities- chemical potential-variationof chemical potential with T, P and X (mole fraction)- Gibb’s Duhem equation. Van’t Hoff’s reaction isotherm- van’t Hoff’s isochore. Clapeyron equation and Clausis-Clapeyron equation-applications.</p> <p>Third law of thermodynamics- Nernst heat theorem. Statement of III law and concept of residual entropy-evaluation of absolute entropy from heat capacity data</p>	18 Hrs

Unit IV	<p>SOLUTIONS</p> <p>Raoult's law, Henry's law, Ideal and non-ideal solutions, completely miscible liquid systems-benzene and toluene. Derivation from; Raoult's law and Henry's law. DuhemMargules equation. Theory of fractional distillation. Azeotropes- HCl- water and ethanol-water system.</p> <p>Partially miscible liquids-phenol-water,triethylamine-water and nicotine-water systems. Lower and upper CSTs-effect of impurities on CST. Completely immiscible liquids-principle and applications of steam distillation. Nernst distribution law, derivation. Dilute solutions- colligative properties, relative lowering of vapour pressure, osmosis,law of osmotic pressure, derivation of elevation of boiling point and depression in freezing point. Determination of molecular masses using colligative properties. Abnormal molecular masses, molecular dissociation-degree of dissociation-molecular association.</p>	18 Hrs
Unit V	<p>PHASE CHANGES</p> <p>Definition of terms in the phase rule-derivation and application to one component system-water and sulphur-super cooling, sublimation.</p> <p>Two- component systems- solid liquid equilibria, simple eutectic(lead-silver, Bi-Cd), desilverisation of lead. Compound formation with congruent melting point (Mg-Zn) and incongruent melting point(Na-K).</p> <p>Solid solutions-(Ag-Au)-fractional crystallization, freezing mixtures-FeCl₃-H₂O system, CuSO₄-H₂O system.</p>	18 Hrs

Text Book:

1. Raman,K., Group theory and its application to Chemistry,NewDelhi:TataMcGraw-Hill.(1990).
2. PuriB.R.,SharmaL.R.andPathania M.S., Principles of Physical Chemistry, (35thedition), New Delhi: ShobanLalNagin Chand and Co. (2013).

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Semester-V / MAJOR BASED ELECTIVE-I	ANALYTICAL CHEMISTRY	Course Code:QUE3
Instruction Hours:5	Credits:5	Exam Hours:3
Internal Marks : 25	External Marks : 75	Total Marks:100

Cognitive Level	K1-Acquire / Remember K2-Understanding K3-Apply K4-Analyze K5-Evaluate K6-Create	
Course Objectives	<ol style="list-style-type: none"> 1. Students shall learn the storage and handling of various chemicals and first aid procedures. 2. Students shall demonstrate competence in collecting and interpreting data from their knowledge on analytical techniques. 3. Students know the separation and purification technique of solvents. 4. Students learn about thermogravimetric analysis, differential thermal analysis, analytical electrochemistry and its applications. 5. Students learn about colorimetric analysis, coulometry analysis and its application. 	
UNIT	CONTENT	URS
Unit I	LABORATORYHYGIENE &FIRSTAID Laboratory Hygiene and safety: Storage and handling of corrosive, flammable, explosive, toxic, carcinogenic and poisonous chemicals. Simple first aid procedure from accident: Acid in eye, alkali in eye, acid burns, alkali burns, bromine burns, poisoning, inhalation of gases, cut by glasses and heat burns.	15 Hrs

Unit II	<p>DATA ANALYSIS</p> <p>Errors in chemical analysis, classification of errors, determinant errors, instrumental errors, personal errors, constant errors and proportional errors—correction of determinant errors, random errors. Precision, accuracy and rejection of data questioned. Significant figures. Mean and standard deviation. Curve fitting.</p>	15 Hrs
Unit III	<p>SEPARATION & PURIFICATION TECHNIQUE</p> <p>General principles involved in the separation of precipitates. Solvent extraction. Chromatography: Principles involved in adsorption, partition and ion exchange, paper, thin layer, column, Electrophoresis applications. Desiccants, vacuum drying, distillation, fractional distillation, steam distillation, azotropic distillation, crystallization and sublimation—principles and techniques.</p>	15 Hrs
Unit IV	<p>THERMOANALYTICAL METHODS & ANALYTICAL ELECTROCHEMISTRY</p> <p>Thermoanalytical Methods: Principles involved in TGA and DTA—instrumentation. Characteristics of TGA ($\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) and DTA curves ($\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$). Factors affecting TGA and DTA curves. Thermometric titration of HCl vs NaOH Analytical Electrochemistry: Redox potential – measurement and applications. Interpretation of chemical behavior. Electrolytic separations. Principles of Electrodeposition. Electrogravimetric (estimation of Cu and Ag).</p>	15 Hrs
Unit V	<p>COLORIMETRIC ANALYSIS</p> <p>Colorimetric analysis: Laws of colorimetry—instrumentation. Nessler's and photoelectric colorimetric method- operation and application. Estimation of Ni, Cu and Fe. Techniques in kinetics: Principles and techniques used to follow the kinetics of ordinary and fast-photochemical reactions.</p>	15 Hrs

Text Book:

- 1..R.Gopalan, P.S.Subramanian,andK.Rengarajan–“Elements of Analytical Chemistry”, 2nd edition,Sultanchand& Co.,
- 2.Vogel.A “ Text book of Quantitative Inorganic analysis”, 4th edition, English language book society

Reference Books:

1. B.K.Sharma, “Instrumental methods of chemical analysis”,Goel Publishing House, Merrut (1997).
2. GurdeepChatwal and Sham Anand, “Instrumental methods of chemical analysis” Himalaya publishing house (2005).
3. D.A.Skoog and D.M.West, “Fundamentals of analytical chemistry”, 7th edition, Hart court College Publishers.
4. R.A.Day and A.L.Underwood –Quantitative analysis.
5. MendhamJ,DennyR.C.,BarnesJ.D.,Thomas M, “Vogel’s Textbook of quantitative chemical analysis” , 6th edition, Pearson education.

Web Resources:

<http://www.chemexper.com>

Course Outcomes:

On completion of the course the learner will be able

CO 1:	Aware of Laboratory hygiene and safety.
CO 2:	Predict the data analysis in analytical techniques
CO 3:	Learn about separation and purification techniques
CO 3:	Recognize the thermoanalytical methods such as TGA, DTA and analytical electrochemistry.
CO 5:	Understand the colorimetric analysis and techniques in kinetics.

MAPPING OF COS WITH POS & PSOS:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO 1	S	S	M	S	S	S	S	S	M	W
CO 2	S	S	S	M	S	S	S	S	S	W
CO 3	S	S	S	S	S	S	S	S	M	S
CO 3	S	S	S	M	S	S	S	S	M	S
CO 5	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-V/ SKILL BASED ELECTIVE – II	APPLIED CHEMISTRY	Course Code:QUS2
Instruction Hours:2	Credits:2	Exam Hours:3
Internal Marks : 25	External Marks : 75	Total Marks:100

Cognitive Level	K1-Acquire / Remember K2-Understanding K3-Apply K4-Analyze K5-Evaluate K6-Create	
Course Objectives	1. Students learn about types and hardness techniques of water. 2. Students learn how to determine TDS, COD and BOD. 3. Students understand about the application of Leather Chemistry. 4. Students shall know about the physio chemical properties of milk. 5. Students understand about the constituent of diary products.	
UNIT	CONTENT	HOURS
Unit I	WATER CHEMISTRY I Water–types of water - soft and hard water–hardness, degree of hardness - Reverse osmosis and ion exchange methods–principles and techniques.	6 Hrs
Unit II	WATER CHEMISTRY II Water Analysis-Determination of TDS, Total hardness by EDTA, BOD and COD.	6 Hrs
Unit III	LEATHER CHEMISTRY Introduction, chief process used in leather manufacture, structure of hide and skin ,leather processing–process before tannage–tanning process–vegetables tanning and chrome tanning.	6 Hrs

Unit IV	DIARY CHEMISTRY I Milk- Definition, physio chemical properties of milk, constituents of milk, chemical change taking place in milk boiling, pasteurization, sterilization and homogenization.	6 Hrs
Unit V	DIARY CHEMISTRY II Definition of creams, butter, ghee and icecreams. Milk powder– definition, need for making Powder. Principles involved in drying process.	6 Hrs

Text Book:

1. B.K.Sharma, Industrial Chemistry, 13th edition, Goel Publishing House, Reprint 2008.
2. MpMathur, Datta Roy D, Dinakar P, “Textbook of Diary Chemistry” , Indian council of Agricultural Research, New Delhi.

Reference Books:

1. Dilip Kumar Das, Introductory Soil Science, 1st Edition, Kalyani Publishers, Reprint 2002.

Web-Resources:

<http://chemcollective.org/home>

Course Outcomes:

On completion of the course the learner will be able

CO 1:	Develop an understanding about type of water.
CO 2:	Experience in water analysis such as TDS, Total hardness, BOD and COD
CO 3:	Expertise in Leather manufacture and processing.
CO 4:	Learn about constituent physical and chemical properties of milk.
CO 5:	Skills in preparation of dairy products such as butter, ghee, ice-cream.

MAPPING OF COS WITH POS & PSOS:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO 1	S	S	S	S	S	S	S	S	S	S
CO 2	S	S	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S	S	S
CO 4	S	S	S	S	S	S	S	S	S	S
CO 5	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

Semester-VI / MAJOR BASED ELECTIVEII	NUCLEAR, INDUSTRIAL CHEMISTRY AND METALLIC STATE	Course Code: QUE4
Instruction Hours:6	Credits:5	Exam Hours:3
Internal Marks : 25	External Marks:75	Total Marks:100

Cognitive Level	K1-Acquire / Remember K2-Understanding K3-Apply K4-Analyze K5-Evaluate K6-Create	
Course Objectives	<ol style="list-style-type: none"> 1. Students learn about fundamental of Nuclear Chemistry. 2. Students will learn measurement and applications of radioactive isotopes. 3. Students study composition and uses of fossil fuels, safety matches, paint and varnish. 4. Students understand the various theories of metallic bonding, different types of semiconductors. 5. Students shall know the composition and uses of Inorganic polymers and silicates 	
UNIT	CONTENT	HOURS
Unit I	NUCLEAR CHEMISTRYI Introduction–composition of nucleus and nuclear forces. Nuclear stability – o/p ratio, mass defect, binding energy, packing fraction and magic numbers, shell and drop models. Isotopes – detection and separation. Isotopic constitution of elements and whole number rule. Deviation of atomic weights from whole numbers. Isobars, isotones and isomers.	18 Hrs

Unit II	NUCLEAR CHEMISTRY II Radioactivity- Radioactive emanations. Disintegration theory– modes of decay–Group displacement law –Rate of disintegration–Half life and average life–Radioactive series, Geiger Nuttal rule. Detection and measurements-Wilson cloud chamber & Geiger Muller Counter. Nuclear transformations use of projectiles nuclear reactions fission and fusion. Nuclear reactors. Applications of radio isotopes – Medicine, Agriculture, Industry &Carbon dating–Radio active waste disposal.	18 Hrs
Unit III	INDUSTRIAL CHEMISTRY Fossil fuels – varieties of coal and petroleum – petroleum refineries in India. Gaseous fuels – natural, gobar, coal, water, semi water and producer gases. Liquefied Petroleum Gases(LPG) Safety matches– Introduction, Raw materials and manufacturing methods. Paints and varnishes-Definition, types and composition.	18 Hrs
Unit IV	METALLIC STATE Metallic state – packing of atoms in metal (BCC,CCP,HCP).Theories of metallic bonding- Electron gas Pauling and Band theories. Structure of alloys substitutional and interstitial solid solutions– humerothery ratios crystal defects. Semi conductors – Extrinsic and Intrinsic – n-type and p-type conductors. Structure and uses in electronic industry.	18 Hrs
Unit V	INORGANIC POLYMERS & SILICATES Inorganic polymers –coordination polymers, metal alkyls, phosphonitrilic polymers. Silicates–Classification into discrete anions, one, Two and three dimensional structure with typical examples. composition, properties and uses of beryl, asbestos, talc, mica, zeolites and ultramarines.	18 Hrs

Text Book:

1. R.D.Madan,“ Modern Inorganic Chemistry”,2nd edition,S.Chand& Company Ltd.,2000.
2. P.L.Soni,‘TextBook of Inorganic Chemistry’,20th revised edition,Sultan Chand & Sons,2000.

Reference Books:

1. Gilreath,‘Fundamental concepts of Inorganic Chemistry’ ,18th Printing, McGraw Hill International Book Company, 1985
2. S.Glasstone,‘Source book on AtomicEnergy’, East-West Press,1967.
3. R.Gopalan, P.S.Subramanian and K.Rengarajan, ‘Elements of Analytical Chemsitry’ ,Sultan Chand & Sons, 2nd edition, 1991.
4. B.K.Sharma,“Industrial Chemistry”,13th edition,Goel Publishing House,Reprint 2008.
5. F.W.Bilmeyer,“Text book of Polymer Science”,Jr.John Wiley and Sons,1984.

Web-Resources:

1. <http://www.chemistryguide.org/>
2. <http://chemcollective.org/home>

Course Outcomes:

On completion of the course the learner will be able

CO 1:	Acquire knowledge of nuclear structure, stable and unstable atomic nuclei.
CO 2:	Know the fundamentals of radioactivity, isotopic chemistry, radiation chemistry and the applications of these in medicine, agriculture and industry.
CO 3:	Learn about the fossil fuels, safety matches, paints and varnishes.
CO 4:	Handle the semiconductors.
CO 5:	Gain a preliminary understanding of inorganic polymers.

MAPPING OF COS WITH POS & PSOS:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO 1	S	S	S	S	S	S	S	S	M	S
CO 2	S	S	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S	S	S
CO 4	S	S	S	S	S	S	S	S	S	S
CO 5	S	S	S	S	S	S	S	S	S	S

S - Strongly Correlated

M - Moderately Correlated

W -Weakly Correlated

N – No Correlation

ENTREPRENEURSHIP

Semester-V/ SKILL BASED ELECTIVE-III Instruction Hours:2 Internal Marks :25	POLYMER CHEMISTRY Credits:2 External Marks:75	CourseCode:QUS3 Exam Hours:3 Total Marks:100
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Cognitive Level	K1-Acquire / Remember K2-Understanding K3-Apply K4-Analyze K5-Evaluate K6-Create	
Course Objectives	1. Students learn the chemistry of polymers. 2. Students learn about Polymer structure, properties and methods of molecular weight determination of polymers. 3. Students shall know the kinetics of polymers. 4. Students gain knowledge about the natural and synthetic polymers. 5. Students learn the constituents and importance of Plastics and Resins.	
UNIT	CONTENT	HOURS
Unit I	INTRODUCTION Introduction to polymers and Macromolecules. Molecular forces and Chemical bonding in polymers. General methods of preparation of polymers.	6 Hrs
Unit II	MOLECULAR WEIGHT OF POLYMERS Polymer structure-Linear, branched and cross linked polymers Stereochemistry of polymers-Isotactic, syndiotactic and Atactic.Properties of Polymers. Molecular weight of Polymers-Number average molecular weight and	6 Hrs

	weight average molecular weight. Viscosity and molecular weight. Osmometry.	
Unit III	<p>KINETICS</p> <p>Co polymerization - Definitions –homo and copolymers, Block copolymers and graft copolymers. Kinetics of polymerization-Kinetics of free radical polymerization kinetics of cationic polymerization. Mean kinetic chain length. Degree of polymerization. Inhibition and retardation. Chain transfer.</p>	6 Hrs
Unit IV	<p>NATURAL & SYNTHETIC POLYMER</p> <p>Natural and synthetic rubbers, constitution of natural rubber. Thiocol, Polyurethane and silicone rubbers. Thermocole polymers related to natural rubber – Chlorinate drubber, oxidized rubber, cyclised rubber and ebonite. Acrylic polymers -Polymers of acrylic acid, methacrylic acid and polyacrylates.</p>	6 Hrs
Unit V	<p>PLASTICS & RESINS</p> <p>Plastics and Resins-Definitions, Thermoplastic and thermosetting resins. Constituents of plastics fillers, dyes, pigments, plasticizers, lubricants and catalysts.</p> <p>Important thermoplastic resins acrylics, polyvinyl and cellulose derivatives. Important thermosetting resins – Phenolic resins, amino resins, epoxy resins, alkyd resins and silicone resins.</p>	6 Hrs

Text Book:

1. V.R.Gowarikar, N. V.Viswanathan “Polymer science”, Wiley Eastern Ltd., New Delhi, 1978.
2. M.G.Arora, M.Singh and M.S.Yadav “Polymer Chemistry” 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.

Reference Books:

1. F.W.Bilmeyer, "Text book of Polymer Science", Jr. John Wiley and Sons, 1984.
2. B.K.Sharma "Polymer Chemistry", Goel Publishing House, Meerut, 1989.

Web-Resources:

<http://chemcollective.org/home>

Course Outcomes:

On completion of the course the learner will be able

CO 1:	To help students explore about polymers and macromolecules.
CO 2:	To assess the molecular weight of polymers, structure and its stereochemistry.
CO 3:	To recognize the kinetics of polymerization.
CO 4:	To distinguish the natural and synthetic polymer.
CO 5:	How to make plastics and resins.

MAPPING OF COS WITH POS & PSOS:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO 1	S	S	S	S	S	S	S	S	S	S
CO 2	S	S	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S	S	S
CO 5	S	S	S	S	S	S	S	S	S	S

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Semester-VI/ MAJORBASED ELECTIVE III	AGRICULTURAL CHEMISTRY	Course Code:-QUE5
Instruction Hours:5	Credits:5	Exam Hours:3
Internal Marks:25	External Marks:75	Total Marks:100

Cognitive Level	K1-Acquire / Remember K2-Understanding K3-Apply K4-Analyze K5-Evaluate K6-Create	
Course Objectives	1. Students learn about the composition and properties of soil. 2. Students understand the source and properties of Micronutrient fertilizer. 3. Students know the importance of Green manure. 4. Students study about the pest management and its control. 5. Students know the chemistry of Fungicide, Herbicide and Acaricide.	
UNIT	CONTENT	HOURS
Unit I	COMPOSITION AND PROPERTIES OF SOIL Definition of soil – soil composition. Soil Physical properties – soil separates and particle size distribution – soil texture and structure. Bulk density, particle density, pore space, soil air, soil temperature, soil water. Soilchemicalproperties–soilcolloids–Inorganiccolloids–clayminerals–amorphous– Ion exchanger actions–organiccolloids–soilorganicmatter–Decomposition–Humusformation–significance on soil fertility, soil reaction.	15 Hrs
Unit II	MICRONUTRIENT FERTILIZER Secondary and micronutrient fertilizers–complex and mixed fertilizers–sources, manufacture, properties and reactions in soils. Preparation of slow release fertilizer–compatibility of fertilizers–fertilizer blending–preparation of different fertilizer mixtures.	15 Hrs

<p>Unit III</p>	<p>GREEN MANURE</p> <p>Nutrient potential of different organic manures Agricultural, industrial and urban wastes– preparation of enriched farm yard manures-Zinc enriched organics.</p> <p>Green manures–green leaf manure –bulky organic and concentrated organic manures -Compost –composting of coir pith; sugarcane trash, leaf litters and farm wastes – oil cakes, bone meal,fishmeal,guano poultry manures-fertilizer use efficiency–integrated nutrient management.</p>	<p>15 Hrs</p>
<p>Unit IV</p>	<p>PEST MANAGEMENT & CONTROL</p> <p>Pesticides – formulations – emulsifiable concentrate, water miscible liquids, wet table powders dusts, granules, classification of pesticides – mode of action – characteristics –uses and safety measures in the analysis and handling of pesticides. Insecticides – plant products – Nicotine, pyrethrum, rotenone, petroleum oils. Inorganic Pesticides–Arsenical fluorides, borates. Organic pesticides – organochlorine compounds–D.D.T, B.H.C., methoxychloro ,chlorethane, endosulfon. Organophosphorous compounds dichlorodiphenyl dimethyl phosphorotriethyl phosphorothioic acid derivatives –carbaryl– structure and mode of action.</p>	<p>15 Hrs</p>
<p>Unit V</p>	<p>FUNGICIDES, HERBICIDES & ACARICIDES</p> <p>Fungicides–inorganic–sulphur compounds–copper compounds–Mercuric compounds, organic – dithiocarbamates – Dithane .Bordeaux mixture.</p> <p>Herbicides:Inorganic herbicides–Arsenical compounds Boron compounds cyanamide– cyanides and thiocyanates, chlorates and sulphamates. Organic herbicides- Nitro-compounds–chlorinated compounds–2,4D-Pyridine compounds–Triazine compounds– Propionic acid derivatives–urea herbicides, alachlor.Acaricides – Rodenticides –Attractance–Repellants – Fumigants Defoliant.</p>	<p>15 Hrs</p>

Text Book:

1. N.C.Brady, The nature and properties of soils Eurasia publishing house, (P)Ltd. 9thEd. 1984.
2. Colling G.H., Commercial Fertilizers McGraw publishing house., 1955

Reference Books:

1. Biswas, T.D. and Mukherjee S.K. Textbook of soil science 1987.
2. A.J. Daji A. Textbook of soil science Asia publishing house, Madras (1970).
3. Donahue, R.L. Miller, R.W. and Shickluna, J.C. soils—An introduction to soils and plant Growth— Prentice Hall of India (P)Ltd., New Delhi 1987..
4. Colling G.H., Commercial Fertilizers McGraw publishing house 1955.
5. Lakshmanan, “Agricultural Chemistry”, VV Publishers.,

Web-Resources:

<http://www.chemistryguide.org/>

<http://chemcollective.org/home>

Course Outcomes:

On completion of the course the learner will be able

CO 1:	Students acquire the basic knowledge of Composition, Physical and Chemical properties of soil.
CO 2:	Students able to understand the secondary and micronutrient fertilizer.
CO 3:	Students can accumulate skills about green manure.
CO 4:	Students should be able to apply the knowledge of Pest Management and control.
CO 5:	Students should know the preparation and applications of fungicides and herbicides.

MAPPING OF COS WITH POS & PSOs :

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO 1	S	S	S	S	S	S	S	S	S	S
CO 2	S	S	S	S	S	S	S	S	S	S
CO 3	S	S	S	S	S	S	S	S	S	S
CO 4	S	S	S	S	S	S	S	S	S	S
CO 5	S	S	S	S	S	S	S	S	S	S

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SKILL DEVELOPEMENT

Semester-I& II/Core Course-II	Volumetric Analysis(P)	Course Code: QUBY
InstructionHours:3	Credits: 3	ExamHours:3
InternalMarks-40	ExternalMarks-60	TotalMarks:100

Course Objectives:

- To know the estimation of several cations and anions.
- To know the estimation of total hardness of water.
- To carry out the saponification value of an oil

I	Titrimetric Quantitative analysis <ol style="list-style-type: none">1. Estimation of HCl2. Estimation of Na₂CO₃3. Estimation of Oxalicacid4. Estimation of Iron(II) Sulphate5. Estimation of Ca(II)6. Estimation of KMnO₄7. Estimation of Fe(II)solution using internal and external indicators8. Estimation of Cu(II) sulphate by K₂Cr₂O₇solution9. Estimation of Mg(II) by EDTA Solution10. Estimation of Ca(II) by EDTA Solution
II	Applied Experiments <ol style="list-style-type: none">1. Estimation of Total hardness of water2. Estimation of Saponification value of an oil

TextBooks:

1. V.Venkateshwaran, R.Veerawamy, A.R.Kulandaivelu Basic Principles of Practical Chemistry 2nd edition 1997

ReferenceBooks:

1. G.Svehla-Vogel's QuantitativeInorganicAnalysis7th edition Pearson education Ltd.
2. J.Mendham, R.C. Denney, J.D. Barnes &M.J.K.Thomas- Vogel's Textbook of quantitative chemical analysis 6thedition Pearson education Ltd.

Resources:

<https://www.bookrix.com>.

Course Outcomes:

On completion of the course the learner will be able

CO 1:	Understand the basic chemistry skills through quantitative analytical experiments
CO 2:	The learners able to know the techniques of titrimetric analysis.

Scheme of valuation	Max.Marks
Internal Marks	40
Brief Procedure	05
Record	10
Experiment	45
Mark Distribution Bond:	
% of Error	
<1%	45
1-2%	35
2-3%	25
3-4%	15
>4%	10

MAPPING OF COS WITH POS & PSOS:

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO 1	S	S	S	S	S	S	S	S	S	M
CO 2	S	S	S	S	S	S	S	S	S	M

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Semester-III&IV/ Core Practical-II(Practical)	SEMI MICRO ANALYSIS (P)	Course Code: BQEY
Instruction Hours:3 Internal Marks:40	Credits:3 External Marks-60	Exam Hours:3 Total Marks:100

Course Objectives:

- To learn the techniques of semi micro qualitative analysis of Inorganic Salt mixtures.
- To become familiar with elimination of interfering acid radicals.

SEMI MICRO INORGANIC QUALITATIVE ANALYSIS

1. Analysis of a mixture containing two cations and two anions of which one will be interfering acid radical. Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted.

2. Cations to be studied: Lead, Copper, Bismuth, Cadmium, Iron, Aluminium, Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium.

3. Anions to be studied : Carbonate, Sulphide, Sulphate, Nitrate, chloride, Bromide, Fluoride, Borate, Oxalate and Phosphate

Text Book:

1. V.Venkateshwaran, R.Veerawamy, A.R.Kulandaivelu Basic Principles of Practical Chemistry 2nd edition 1997

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