GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005.

(Re-accredited with 'A' Grade by NAAC and Affiliated to Bharathidasan University, Tiruchirappalli)

PG AND RESEARCH DEPARTMENT OF CHEMISTRY

Course structure under CBCS system

B.Sc., CHEMISTRY

(For the candidates admitted from the year 2021-2022 onwards)

About the Department of Chemistry

The Chemistry department was started in the year 1969 with UG program (Both English and Tamil Medium). The students and faculty in our department create experimental and theory knowledge to develop students community. The department is located in close proximity to other department and industries. We are dedicated to developing the future generation of students and scholars in chemical sciences developing a learning environment.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS)

VISION

It is our vision to persuade every mind in this temple of learning to tirelessly seek the truth to face the challenges of the times and honestly participate in the establishment of universal peace, progress and love.

MISSION

It is our mission to create in everyone an honest searching mind to be ready for value-based creative citizenship for regional, national and global peace and progress.

DEPARTMENT OF CHEMISTRY

VISION

- The Chemistry Department prepares students for bright future by chemistry Knowledge through teaching and guiding services.

MISSION

- The Chemistry Department provides rigorous preparation of students in Chemistry.
- We are dedicated to standards for content chemistry knowledge.
- The Faculty in the Chemistry Department are committed to science as a Human endeavor.

What is Credit system?

Weightage to a course is given in relation to the hours assigned for the course. The following Table shows the correlation between credits and hours. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work. For **UG** courses, a student must earn a minimum of **140 (+4)** credits as mentioned in the table below. The total number of minimum courses offered by a department is given in the course pattern.

UNDER GRADUATE COURSE PATTERN (2021 ONWARDS)

PART	SEMESTER	SPECIFICATION	NO. OF COURSES	HOURS	CREDITS	TOTAL CREDITS
I	I - IV	Part I	**4**	**22**	**12**	**24**
II	I - IV	Part II	**4**	**22**	**12**	
III	I - VI	Core courses Theory	**9**	**49**	**42**	**92**
	I - IV	Allied Course Theory	**4**	**20**	**12**	
	V - VI	Elective Course	**3**	**15**	**13**	
	I - IV	Core courses Practical	**4**	**23**	**17**	
	I - IV	Allied Course Practical	**2**	**8**	**8**	
IV	I II V	Value Education Environmental Studies Soft Skills Development	**3**	**6**	**6**	**22 + (4)**
	I	Value Added Course (CLP)	**2**	**4**	**(2)**	
	III	Extra Credit Course Massive Open Online Course (MOOC)	**1**	**-**	**(2)**	
	III - IV	Non Core Elective	**2**	**4**	**4**	
	IV - V	Skill Based Elective	**3**	**6**	**12**	
V	VI	Gender Education	**1**	**-**	**1**	**2**
		Extension Activities	1	1	1	
TOTAL				**180**	**140 + (4)**	**140 + (4)**

Course Pattern

The Undergraduate degree course consists of five vital components. They are as follows:

Part - I: Language (Tamil)

Part - II: General English

Part - III: Core Course (Theory) Allied, Core Electives)

Part - IV: Value Education, Value Added Course, Extra Credit Course, Environmental Studies, Non Core Elective and Soft Skills Development.

Part - V: Gender Education and Extension Activities (NSS, NCC, Sports and Games, PEC, FAPA, YRC, RRC, RC, LC and CC).

Core Courses

A core course is the course offered by the parent department related to the major subjects, components like theories, practical's, Project work, field visits and etc.

Noncore elective

Noncore elective Core should be shared by the various Departments of college. This course should be opted by all the students belonging to the particular Department. Each department of the respective college should allocate themselves the schedule and the units of the course.

Core Elective

The core elective course is also offered by the parent department. The objective is to provide choice and flexibility within the department. There are THREE core electives. They are offered in different semesters according to the choice of the college.

Extra Credit Courses

In order to facilitate the students gaining extra credits, the extra credit courses are given. There are two extra credit courses - Massive Open Online Courses (MOOC) and Skill-based Course - offered in the III and V Semesters respectively. According to the guidelines of UGC, the students are encouraged to avail this option of enriching by enrolling themselves in the MOOC provided by various portals such as SWAYAM, NPTEL, etc. Skill based course is offered by the department apart from their regular class hours.

Value Education Courses

There are four courses offered in the first semesters for the First year students.

Non-Major Elective / Skill Based Elective

These courses are offered in two perspectives as electives “Within college”.

Subject Code Fixation

The following code system (11 characters) is adopted for Under Graduate courses:

Year of Revision	UG Code of the Dept	Semester	Specification of Part	Running number in the part
↓	↓	↓	↓	↓
21	**U21**	***x***	***x***	***xx***
21	**UCH**	**1**	**x**	**1**

For example:

I B.Sc., CHEMISTRY - GENERAL CHEMISTRY - I,

The code of the paper is **U21 CH 1C1.**

Thus, the subject code is fixed for other subjects.

EXAMINATION

Continuous Internal Assessment (CIA):

UG - Distribution of CIA Marks	
Passing Minimum: 40 Marks	
Theory CIA Maximum = 25	**Theory CIA Minimum = 10**
Practical CIA Maximum = 40	**Practical CIA Minimum = 16**

End - Semester Tests

Centralized - Conducted by the office of Controller of Examinations.

Semester Examination

Testing with Objective and Descriptive questions.

Section - A: 10 Questions x 2 Marks = 20 Marks (No Choice - Two questions from each unit)

Section - B: 5 Questions x 5 Marks = 25 Marks (Either… or Type - One pair from each unit)

Section - C: 3 Questions x 10 Marks = 30 Marks (3 Out of 5 - One question from each unit)

Duration of Examination:

3- Hours examination for courses.

Grading System

1. Grading

Once the marks of the CIA and the end-semester examination for each ofthe courses are available, they will be added. The marks thus obtained, will then be graded as per the scheme provided in Table 1.

From the second semester onwards the total performance within a semester and the continuous performance starting from the first semester are indicated by **Semester Grade Point Average (GPA)** and **Cumulative Grade Point Average (CGPA),** respectively. These two are calculated by the followingformulae

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i} \qquad \text{WAM (Weighted) Average Marks} = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$

Where, 'C_i' is the Credit earned for the Course - i,

'G_i' is the Grade Point obtained by the student for the Course 'i'.

'M' is the marks obtained for the course 'i', and

'n' is the number of Courses **Passed** in that semester.

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

2. Classification of Final Results

i) For each of the three parts, there shall be separate classification on the basis of the CGPA, as indicated in the following Table - 2.

ii) For the purpose of Classification of Final Results, the Candidates who earn CGPA 9.00 and above shall be declared to have qualified for the Degree as 'Outstanding'. Similarly, the candidates who earn the CGPA between 8.00 - 8.99, 7.00 - 7.99, 6.00 - 6.99 and 5.00 - 5.99 shall be declared to have qualified for their Degree in the respective programmes as 'Excellent', 'Very Good', 'Good' and 'Above Average' respectively.

iii) Absence from an examination shall not be taken as an attempt.

Table - I - Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above but below 90	9	A+
70 and above but below 80	8	A
60 and above but below 70	7	B+
50 and above but below 60	6	B
40 and above but below 50	5	C
Below 40	0	RA

Table - 2 - Final Result

CGPA	lassification of Final Results	Corresponding Grade
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
4.00 to 4.99	C	Average
Below 4.00	RA	Re - Appearance

Credit based weighted Mark System is adopted for individual semesters and cumulative semesters in the column 'Marks Secured' (for 100).

Declaration of Result:

Mr./Ms. _____ has successfully completed the Under Graduate in _____ programme. The candidate's Cumulative Grade Point Average (CGPA) in Part - III is _____ and the class secured is _____ by completing the minimum of **140** credits. The candidate has acquired _____ (if any) extra credits offered by the parent department courses.

Programme Outcomes

1. Students have firm foundation in the fundamental and application of current chemical and scientific theories.

2. Students are able to design carryout, record and analyze the results of chemical experiments.

3. Students are skilled in problem solving, critical thinking and analytical reasoning.

4. Students are able to use modern library searching and retrieval methods to obtain information about a topic, chemical, chemical techniques and issue relating to chemistry.

5. Find gainful employment in industry, government, graduate or professional schools. Instructors or administrators.

Programme Specific Outcomes

1. Students have knowledge about chemistry basics, application of chemical and scientific theories.

2. Every branches of science is related to chemistry.

3. Students are well versed in qualitative and quantitative analysis of chemical laboratories and industries.

4. Students are familiar in different branches of chemistry like Analytical, Organic, Inorganic, Physical, Environment, Polymer and Biochemistry.

5. Students get the Entrepreneur skills in home - made consumer products, Water treatment skills (RO), Dyeing skill in fabrics by chemistry learning.

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B.Sc., CHEMISTRY COURSE STRUCTURE UNDER CBCS SYSTEM

(For the candidates admitted from the year 2021- 22 onwards)

SEMESTER	PART	COURSE	COURSE TITLE	COURSE CODE	INSTR HOURS. WEEK	CREDIT	EXAM HOURS	MARKS		TOTAL
								INT	ESE	
I	I	Tamil - I	Tamil - I	**U21L1T1**	5	**3**	3	**25**	**75**	100
	II	English - I	English - I	**U21L1E1**	5	**3**	3	**25**	**75**	100
	III	Core Course - I	General Chemistry - I	**U21CH1C1**	6	**5**	3	**25**	**75**	100
	III	Core Course - II	Core Course Practical - I		3					
	III	First Allied Course - I	Allied Physics - I	**U21PH1A1**	5	**3**	3	**25**	**75**	100
	III	First Allied Course - II	Allied Physics - II (Practical)		2					
	IV	Value Education	Value Education	**U21VE1**	2	**2**	3	**25**	**75**	100
	IV	Value added course	CLP/SAP (Special Assistance Programme) SAP Applicable for B.Sc (CS) and B.Com(CA)		2		-	-	-	-
					30	**16**				**500**
II	I	Tamil - II	Tamil - II	**U21L2T2**	5	**3**	3	**25**	**75**	100
	II	English - II	English - II	**U21L2E2**	5	**3**	3	**25**	**75**	100
	III	Core Course - II	Core Course Practical - I	**U21CH2C2P**	3	**4**	3	**40**	**60**	100
	III	Core Course - III	General Chemistry - II	**U21CH2C3**	6	**5**	3	**25**	**75**	100
	III	First Allied Course - II	Allied Physics - II (Practical)	**U21PH2A2P**	2	**4**	3	**40**	**60**	100
	III	First Allied Course - III	Allied Physics - III	**U21PH2A3**	5	**3**	3	**25**	**75**	100
	IV	Environmental Studies	Environmental Studies	**U21ES2**	2	**2**	3	**25**	**75**	100
	IV	Value added course	CLP/SAP (Special Assistance Programme) SAP Applicable for B.Sc (CS) and B.Com(CA)		2	**(2)**	-	-	-	-
					30	**24**				**700**
III	I	Tamil - III	Tamil - III	**U21L3T3**	6	**3**	3	**25**	**75**	100
	II	English - III	English - III	**U21L3E3**	6	**3**	3	**25**	**75**	100
	III	Core Course - IV	General Chemistry - III	**U21CH3C4**	6	**5**	3	**25**	**75**	100
	III	Core Course - V	Core course - Practical II		3	**-**	-	**-**	**-**	-
	III	Second Allied Course - I	Allied Mathematics - I / Allied Zoology	**U21MM3A1/ U21ZO3A4**	5	**3**	3	**25**	**75**	100
	III	Second Allied Course - II	Allied Zoology Practical / Allied Maths - II		2	**-**	-	**-**	**-**	-
	IV	Non Core Elective - I	Energy Physics - I	**U21PH3N1**	2	**2**	3	**25**	**75**	100
	IV	Extra Credit Course	Massive Open Online Course (MOOC)		-	**(2)**	-	-	-	-
					30	**16**				**500**

IV	I	Tamil - IV	Tamil - IV	**U21L4T4**	6	**3**	3	**25**	**75**	100
	II	English - IV	English - IV	**U21L4E4**	6	**3**	3	**25**	**75**	100
	III	Core Course - V	Core Course Practical - II	**U21CH4C5P**	2	**4**	3	**40**	**60**	100
	III	Core Course - VI	General Chemistry - IV	**U21CH4C6**	5	**5**	3	**25**	**75**	100
	III	Second Allied Course - II	Allied Mathematics II / Allied Zoology - II Practical	**U21MM4A2P / U21ZO4A5P**	2	**4**	3 3	**25** **40**	**75** **60**	100
	III	Second Allied Course - III	Allied Mathematics - III / Allied Zoology - III	**U21MM4A3/ U21ZO4A6**	5	**3**	3	**25**	**75**	100
	IV	Skill Based Elective - I	Laboratory Hygiene and Safety	**U21CH4S1**	2	**4**	3	**25**	**75**	100
	IV	Non Core Elective - II	Energy Physics - II	**U21PH4N2**	2	**2**	3	**25**	**75**	100
					30	**28**				**800**
V	**III**	Core Course - VII	Inorganic Chemistry - I	**U21CH5C7**	5	**5**	3	**25**	**75**	100
	III	Core Course - VIII	Organic Chemistry - I	**U21CH5C8**	5	**4**	3	**25**	**75**	100
	III	Core Course - IX	Physical Chemistry - I	**U21CH5C9**	4	**3**	3	**25**	**75**	100
	III	Core Course - X	Physical Chemistry - (Practical)		3	**-**	-	**-**	**-**	-
	III	Core Course - XI	Gravimetric, Organic Preparation and Physical constant -Practical		3	**-**	-	**-**	**-**	-
	III	Elective Course - I	Industrial Chemistry	**U21CH5E1**	4	**4**	3	**25**	**75**	100
	IV	Skill Based Elective - II	Spectroscopy - I	**U21CH5S2**	2	**4**	3	**25**	**75**	100
	IV	Skill Based Elective - III	Agricultural Chemistry	**U21CH5S3**	2	**4**	3	**25**	**75**	100
	IV	Soft Skill Development	Soft Skill Development	**U21SSD3**	2	**2**	3	**25**	**75**	100
					30	**26**				**700**
VI	**III**	Core Course - X	(Practical) - III - Physical Chemistry	**U21CH6C10P**	3	**4**	3	**40**	**60**	100
	III	Core Course - XI	Practical - IV - Gravimetric Analysis And Organic Preparation And Physical Constants	**U21CH6C11P**	3	**5**	6	**40**	**60**	100
	III	Core Course - XII	Inorganic Chemistry - II	**U21CH6C12**	6	**5**	3	**25**	**75**	100
	III	Core Course - XIII	Organic Chemistry - II	**U21CH6C13**	6	**5**	3	**25**	**75**	100
	III	Elective Course - II	Analytical Chemistry	**U21CH6E2**	5	**5**	3	**25**	**75**	100
	III	Elective Course - III	Physical Chemistry - II	**U21CH6E3**	6	**4**	3	**25**	**75**	100
	V	Gender Studies	Gender Studies	**U21EA4**	-	**1**	-	**-**	**-**	-
		Extension Activities	Extension Activities (NSS/ NCC/ RRB/YRC/Fine Arts/Environmental Education/ Population Education Club/ Retract Club/ Leo Club/ Consumer Club/ Sports &Games)		1	**1**	3	**25**	**75**	100
					30	**30**				**700**
TOTAL					**180**	**140 + (4)**				**3900**

CHAIRMAN
BOARD OF STUDIES IN CHEMISTRY **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 5	COURSE CODE: U21CH1C1

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - I SEMESTER - CORE COURSE - I

(For the candidates admitted from the year 2021-2022 onwards)

GENERAL CHEMISTRY - I

Course Educational Objectives:

1. To learn General chemistry.
2. To learn detailed study of chemical bonding.
3. To learn kinetic theory of Gases.

UNIT- I	**1.1 Inorganic Chemistry** **(15 hours)** Volumetric Analysis Standard Solutions - Primary and Secondary Standards - Types of Titrimetric reactions - Red ox - Precipitation - EDTA - Titrations. Indicators Effect of change in pH. **1.2 Boron Family** Comparative study of Boron Family Elements and their Compounds (Hydrides, Oxides and Halides) - Chemistry of Diaborane, Borax and Borazole. **1.3 Carbon Family** Comparative study of Carbon Family Elements and their Compounds (Hydrides, Oxides and Halides) - Chemistry of Cyanogens, Hydrocyanic Acid, Cyanic Acid, Thiocyanic Acid, Ammonium Thirocyanate and Carbon Disulphide. Structure of Graphite, Diamond and Fullerene.
UNIT-II	**2.1 Inorganic Chemistry** **(15 hours)** Chemical Bonding Lattice Energy and Born - Haber Cycle Polarising power and Polarisability - Partial ionic character from electronegativity - Trasition from ionic to covalent character and vice - versa - Fajan's rule - Concept of hard and soft acids and bases. **2.2** VSEPR Theory shapes of simple inorganic molecules ($BeCl_2$, $SiCl_4$, PCl_5, SF_6, IF_7, H_2O, NH_3, and XeF_6 containing lone pair and bond pairs of electrons - Lewis structures. Hydrogen bonding - Its nature, types, effect on Properties.
UNIT - III	**Organic Chemistry** **(15hours)** **3.1** IUPAC organic molecule Nomenclature. **3.2** Alkenes Preparation by Dehydration, dehydrohalogenation methods - Reduction of alkynes, Witting reaction Kolbe's electrolysis - Properties of Alkenes - Electrophilic and free redical addition, addition reactions with hydrogen bromide (peroxide effect) sulphuric acid, water, hydroboration, oznolysis, hydroxylation with $KMnO_4$.
UNIT -IV	**4.1 Organic Chemistry** **(15hours)** Electron displacement effects - Inductive, Inductometric, Electrometric, Mesomeric, resonance, hyper conjucation and steric effects. Cleavage of Bonds - Homolytic and Heterolytic fission of carbon - Carbon bonds, Reaction intermediates - Free Radicals, Carboctions and Carbanions, Carbenes their stability. **4.2 Alkynes** Preparation of alkeynes - Dehydrohalgenations, dehalogenation, hydration of calcium carbide - Kolbe's electrolysis. Acidity of alkynes - formation of acetylides - addition of water with $HgSO_4$ catalyst, addition of hydrogen halides and halogens, oxidation, ozonolysis and hydroboration. (An elementary idea).
UNIT - V	**5.1 Physical Chemistry** **(15hours)** Gaseous State Critical Phenomena - PV isotherms of real gases, critical temperature, continuity of state - relation between critical constants and van der Waals constants - Determination of critical volume - the law of corresponding states - reduced equation of state. **5.2** Molecular velocities - Root mean square, average and most probable velocities - Maxwell Boltzmann distribution of molecular velocities (no derivations) - Collision number and mean free path - Collision diameter.

Text Book:

Madhan Malik Tuli Inorgnic Chemitry.

Reference Books:

1. J.D.Lee, Concise Inorganic Chemistry, 5th Edition, Black well science.
2. B.R.Puri, L.R.Sharma and K.C.Kalia, Principles of Inorganic Chemistry, S.L.N.Chand &Co.
3. B.S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand &Co.
4. I.L.Finar, Organic Chemistry, Vol. I Pearson Education, 6th Edition.
5. B.R.Puri, L.R.Harmaand N.S.Pathania, Principles of Physical Chemistry Vishal Publishing Co.41st Edition.
6. P.L.Soni & O.P.Dharmarha, Text Book of Physical Chemistry, Sultan Chand &Sons.

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

Course outcomes

CO1	The basic and general ideas about chemistry will be understood after this General chemistry Paper - I for Ist B.Sc., Students.
CO2	Understand the Inorganic components such as the family of boron and carbon; understand the principle of chemical bonding, hydrogen bonding, and VSEPR Theory.
CO3	Know the products of petro chemistry and grasp the synthesis of alkenes and alkynes.
CO4	The theory of gas kinetics can clearly be understood.
CO5	Apply the Electron Displacement Theory concept.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	4	2	4	4	3	2	3	**3.1**
CO2	4	4	3	3	2	4	3	3	3	3	**3.2**
CO3	3	4	3	3	4	3	3	4	3	4	**3.4**
CO4	4	3	4	3	3	4	3	4	2	3	**3.3**
CO5	4	4	4	2	3	4	3	3	3	2	**3.2**
Mean overall score											**3.24**

Result: The Score for this course is 3.24 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: J.KARTHIKAYANI

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 4	COURSE CODE: U21CH2C2P

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - II SEMESTER - CORE COURSE - II

(For the candidates admitted from the year 2021-2022 onwards)

CORE COURSE PRACTICAL - I
Volumetric analysis and Organic compound analysis

Course Educational Objectives:

1. To apply practical knowledge for the estimation of acids and bases volumetrically.
2. To identify the various functional group present in the organic compound.

	I	**25 hours**
	1. Estimation of HCl 2. Estimation of NaOH 3. Estimation of Na_2CO_3 4. Estimation of Ferrous ion in Mohr' ssalt 5. Estimation of Oxalic acid	
	II. Qualitative Analysis of Organic Compounds	**25 Marks**
	III. Record	**10 Marks**
	Total	**60Marks**

Reference Book:

Practical Chemistry - A.I. Vogel

Course outcomes

CO1	The main outcome of volumetric analysis is to determine the amount of a substance in a given sample.
CO2	To identify the functional group in organic compound.

Course Outcome (COs)	Programme Outcomes (POs)					Programme Specific Outcome (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	4	4	4	2	4	4	3	3	3	3	**3.6**
CO2	4	4	3	3	4	4	3	4	3	3	**3.5**
Mean overall score											**3.55**

Result: The Score for this course is 3.55 (High Relationship)

COURSE DESIGNER:

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 5	COURSE CODE: U21CH2C3

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - II SEMESTER - CORE COURSE - III

(For the candidates admitted from the year 2021-2022 onwards)

GENERAL CHEMISTRY - II

Course Educational Objectives:

1. To accustom the importance of the various preparation and properties of dienes and cyclo alkanes.
2. To study and understand the Nitrogen Family.
3. To understand the adequate knowledge about an unit cell and X-Ray crystallography.

UNIT - I	**Inorganic Chemistry** **(18 hours)** **1.1 Nitrogen family** Chemistry of hydrazine, hydrazoic acid, hydroxyl amine and sodium bismuthate. Non aqueous solvents - classification - liquid ammonia as solvent. **1.2** Ozone - Preparation, Properties, structural elucidation and uses. Green - house effect, ozone hole, causes and protection of ozone layer.Hydrogen peroxide - Preparation, Properties, estimation, structure and uses.
UNIT - II	**Organic Chemistry** **(18 hours)** **2.1 Dienes** Types of dienes - conjugated, isolated and cumulated Stability and chemical reactivity - 1, 2 and 1, 4 additions, kinetic and thermodynamic controls of reaction. Diels - Alder reaction. Synthesis of dienes - 1, 3 - Butadiene, isoprene and chloroprene. **2.2. Cycloalkanes** Preparation using Wurtz's reaction, Dieckmann's ring closure and reductions of aromatic hydrocarbons. Substitution and ring opening reactions. Bayer's strain theory and theory of strainless rings.
UNIT - III	**Polymer Chemistry** **(18 hours)** **3.1** Classification of polymers - natural, synthetic, semi synthetic, plastic, elastomers, addition, condensation polymers. Mechanism of free radical, radical, anionic cationic. **3.2** Synthetic rubber - butyl. Buna - S, buna - N, neoprene, SBR, thiocol, silicone rubber, thermocole, nylons 6 and 6,6 and terylene.
UNIT - IV	**Physical Chemistry** **(18 hours)** **4.1** Colloidal States: Stability of Colloids, Coagulation and protection, Reverse Osmosis, Desalination of sea water, Donnan membrane- Gels and emulsion. **4.2** Macro molecules: Number average and weight average molecular weight of macromolecles - determination of molecular weight by Osometry (number average), ultra centrifuge (weight average), Viscometry and light scattering.
UNIT - V	**Physical Chemistry** **(18 hours)** **5.1** Solid State Isotropic and anisotropic solids. Nature of the solid state - seven crystal systems - Bravais lattice, unit cell, law of rational indices (Weiss indices) Miller indices, symmetry elements in crystals (for cubic system only in detail) **5.2** X-ray diffraction by crystals - derivation of Bragg's - equation - Bragg method - powder method - crystal structure of NaCl, KCl, ZnS and CsCl - radius ratio and packing in Crystals - determination of Avogadro' snumber.

Text Books:

1. B.R.Puri, L.R.Sharmaand N.S.Pathania, Principles of Physical Chemistry Vishal Publishing Co. 41st Edition.
2. P.L.Soni & O.P.Dharmarha, Text Book of Physical Chemistry, Sultan Chand &Sons.

Reference Books:

1. J.D.Lee, Concise Inorganic Chemistry, 5Edition, Blackwell science.
2. B.R.Puri, L.R.Sharmaand, K.C.Kalia, Principles of Inorganic Chemistry, S.L.N.Chand & Co.
3. B.S.Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand &Co.
4. I.L.Finar, Organic Chemistry, Vol.I Pearson Education, 6th Edition.

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

Course outcomes

CO1	The basic and general ideas about chemistry were to be understood after studying this General Chemistry Paper - II for Ist B.Sc., Students.
CO2	Understand ozone and hydrogen peroxide preparation and properties, diene and cycloalkane properties, understand polymer classification and mechanism and the importance of synthetic rubber, and learn how to measure the average molecular number and weight.
CO3	One can know the basic idea about XRD.
CO4	Understand the concept of colloidal chemistry.
CO5	Study the types of crystal lattice

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	4	3	2	3	3	2	3	3	**2.9**
CO2	3	4	4	3	4	3	4	3	4	3	**3.5**
CO3	4	3	4	3	4	4	3	4	2	3	**3.4**
CO4	3	3	3	3	4	4	3	3	3	3	**3.2**
CO5	4	4	4	2	3	4	3	3	3	3	**3.5**
Mean overall score											**3.3**

Result: The Score for this course is 3.3 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: J.KARTHIKAYANI

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 5	COURSE CODE: U21CH3C4

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - III SEMESTER - CORE COURSE - IV

(For the candidates admitted from the year 2021-2022 onwards)

GENERAL CHEMISTRY - III

Course Educational Objectives:

1. To grasp the fundamentals of periodic properties and construct the MO diagram, as Well as to interfere with the industrial product.
2. To explain the stereo isomerism and categorize the polymers.
3. To comprehend the organic halogen compound and explain chromatographic techniques.

UNIT - I	**INORGANIC CHEMISTRY** **(15hours)** **1.1** Principle of qualitative analysis Solubility Product principle of elimination of interfering radicals, common ion effect, complexation reactions including spot tests in qualitative analysis. **1.2** Nitrogen family: Comparative study of nitrogen family elements and their compounds (Oxides, Halides, Hydrides and Ox acids). **1.3** Zero Group Elements Compounds of Xenon - XeF_2, XeF_4, XeF_6, XeO_3 and $XeOF_4$ - preparation, properties, structure and uses.
UNIT - II	**2.1 Metals and Metallurgy:** **(15hours)** Occurrence of metals - concentration of ores - froath floatation, magnetic separation, Calcination, roasting, Smelting, alumino thermic Process. **2.2** Purification of metals - electrolysis, Zone refining, van Arkal de Boer methods. **2.3** Mineral Wealth of India - Important minerals found in India (Magnetite, Haematite, Pyrolusite, Bauxite, Magnesite, dolomite, Gypsum, ilmenite, Monazite, pitchblende, Mica, and Common Salt) Minerals exported from and imported to India.
UNIT - III	**(Organic Chemistry)** **(15hours)** **3.1**Conformational analysis of ethane and n-butane with energy diagrams. Conformations of cyclohexane (boat, chair and Skew - boat forms) - Axial and equatorial bonds ring flipping. **3.2**Aromatic hydrocarbons: Structure and Stability of benzene ring - resonance in benzene - delocalized pi - electron cloud in benzene. **3.3** Aromaticity: Huckel's rule with example like cyclopropenyl cation, benzene, naphthalene anthracene, furan, thiophene, Pyridine, ferrocene and azulene.
UNIT - IV	**(Organic Chemistry)** **(15hours)** **4.1**Electrophilic, Nucleophilic and free radical Substitution reactions in aromatic compounds. General mechanism of electrophilic substitution reaction - nitration, Sulphonation, halogenation, Friedel - Craft's alkylation and acylation reactions - Effect of Substituents - Activating and Deactivating groups Orientation effect. **4.2** Aromatic nucleophilic substitution reaction - Benzyne mechanism, Intermediate Complex formation mechanism.
UNIT - V	**(Physical Chemistry)** **(15hours)** **5.1** V.B. Theory postulates - Overlap of atomic orbitals and principles of hybridization. **5.2** M.O. theory - bonding, antibonding molecula rorbitals - MO diagrams of simple homonuclear diatomic molecules (H_2, He_2, Li_2, B_2, C_2, O_2, N_2 and F_2) and hetero nuclear diatomic molecules (HF and CO). **5.3** Comparision of VB and MO Theories. **5.4** Heisenberg's uncertainty principle - Schrondinger wave equation - Eigenvalues and Eigen functions - Significance of ψ *and* ψ^2 - Concept of orbitals and Shapes of Orbitals.

Books Recommended:

1. P.L.Soniand Mohan Katyal, "Text Book of Inorganic chemistry" 20th Revised Edition, Shoban Lal Nagin Chand & Co NewDelhi.1993.
2. R.B.Pori and I.R.Sharma, K.C.Kaila, "Principle of Inorganic Chemistry" sultan Chand and Co New Delhi 1992.
3. Vogel's "Text Book of qualitative Chemical Analysis" 6th Edition ELBS, Derling Kinderslay (India) Pvt. Ltd New Delhi-2006.
4. R.D.Madan, "Modern Inorganic Chemistry", S.Chand & Co (Pvt) Ltd. NewDelhi.1997.
5. M.K.Jain, "Organic Chemistry", 12th Edition Shoban Lal Nagin Chand and Co. New Delhi1987.
6. P.L.Soni and H.M.Chawla, "Text Book of Organic Chemistry", 23rd Edition Sultan Chand Co. New Delhi1990.
7. K.S.Tewari S.N.Mehrotraand N.K.Vishnol, "A Text Book of Organic Chemistry" 3rd Edition, Vikas, publishing House (Pvt) Ltd. New Delhi2006.
8. R.K.Prasad, "Quantum Chemistry" New Age International (P) Ltd. Publishers1996.
9. B.R.Puri, L.R.Sharmaand Madan S.Pathania, 41thEdition, "Principle of Physical chemistry" Vishal, Publishing. Co, New Delhi, 2004.

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Course outcomes

CO1	After studying this General Chemistry Paper-III for 2nd B.Sc students, the semi micro evaluation, zero group components and metal extraction and purification along with mineral resources in India should be grasped.
CO2	To understand aromaticity. Analysis of conformation, electrophilic and nucleophilic substitution of aromatic compounds.
CO3	To explore the comparison between VBT and MOT and study of Schrodinger wave equation.
CO4	Understand how to recover metal from its ore.
CO5	Understand the concept of Conformation analysis.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**4**	**3.3**
CO2	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**4**	**3**	**3.3**
CO3	**4**	**3**	**4**	**3**	**3**	**4**	**3**	**4**	**3**	**3**	**3.4**
CO4	**4**	**3**	**3**	**2**	**3**	**3**	**4**	**4**	**3**	**3**	**3.2**
CO5	**3**	**3**	**4**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3.0**
Mean overall score											**3.24**

Result: The Score for this course is 3.24 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Dr. D.RAJADURAI

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 4	COURSE CODE: U21CH4C5P

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - IV SEMESTER - CORE COURSE - V

(For the candidates admitted from the year 2021-2022 onwards)

CORE COURSE PRACTICAL - II

Course Educational Objective:

1. To conduct a semi-micro analysis and detect the presence of cations and anions in a compound mixture.

Analysis of a mixture containing two cations and two anions of which one will be an interfering.

CATIONS TO BE STUDIED: Lead, Copper, Bismuth, Cadmium, Iron, Aluminum, Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium.

ANIONS TO BE STUDIED: Carbonate, Sulphide, Sulphate, Nitrate, Chloride, Bromide, Fluoride, Borate, Oxalate and Phosphate.

Marks:

Int. Asst.	**40**
Practical	**60**
Total	**100**

Reference Book:

Practical Chemistry - A.I. Vogel.

Course outcomes

CO1	After doing the semi - micro analysis practical one can understand the complication role in cationic identification.
CO2	One can understand how to identify different types of cations and anions systematically by doing semi - micro methods and classification of cations in relevant groups.

Course Outcome (COs)	Programme Outcomes (POs)					Programme Specific Outcome (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	3	4	3	4	3	3	4	3	3	3.4
CO2	4	3	4	3	3	4	3	3	3	4	3.4
Mean overall score											**3.4**

Result: The Score for this course is 3.4 (High Relationship)

COURSE DESIGNER:

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 5	COURSE CODE: U21CH4C6

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - IV SEMESTER - CORE COURSE - VI

(For the candidates admitted from the year 2021-2022 onwards)

GENERAL CHEMISTRY - IV

Course Educational Objectives:

1. To teach the fundamentals of alkali and alkaline earth metal oxides, halides, hydroxides, and sulphates.
2. To teach students about the different aliphatic and nucleophilic substitutionreactions.
3. The significance of polarization measurements in identifying simple inorganic and organicmolecules.

UNIT - I	**Inorganic Chemistry** **(15 Hours)** **1.1. Alkali and Alkaline earth metals.** Comparative study of metal and alkaline earth metal compounds (Oxides, Halides, Hydroids, carbonates, and Sulphates). **1.2** Diagonal relationship between lithium and magnesium. **1.3** Preparation, Properties and uses of Lithium aluminium hydride and sodiumborohydride. Coinage metals. **1.4** Comparative study of Zinc group metals, Galvanization, Evidences for the existence of mercurous ion as Hg_2^{2+}.
UNIT - II	**Inorganic Chemistry** **(15 Hours)** **2.1 Inner Transition Elements** Lanthanides - occurrence - general study of lanthanides involving electronic Configuration, Oxidation states, Magnetic properties and Complication behavior - Lanthanide contraction. **2.2** Extraction of Uranium. **2.3** Actinides - Occurrence - electronic Configuration, Oxidation states, Magnetic Properties and Complication behavior.
UNIT - III	**(Organic Chemistry)** **(15 Hours)** **3.1.** Aliphatic and nucleophillic substitutions - Mechanism of $SN1$,$SN2$, and SN^i Effect of Solvents, leaving group Nucleophiles and Structure of substrates. **3.2.** Elimination reaction - Hofmann and Saytzeff's eliminations cis and trans eliminations - Mechanism of E1 and E2 reactions.
UNIT - IV	**(Organic Chemistry)** **(15 Hours)** **4.1.** Unsaturated alcohol - Allyl alcohol - Preparation, Properties and uses. Thio alcohols - Preparation, Properties and uses of ethyl mercaptan. **4.2**. **Ethers:** Aliphatic and aromatic ethers - Preparation, properties and uses, 1,4 - dioxane and crown ethers - preparation, properties and uses, Epoxides - preparation reactions and applications.
UNIT - V	**(Physical Chemistry)** **(15 Hours)** **5.1.** Polarization - Induced polarization - Orientation polarization Determination of dipole moment by temperature method. **5.2.** Application of dipole moment measurements - in distinguishing between cis and trans isomers in determining the percent ionic character of bonds - Shapes of simple inorganic and organic molecules ($BCl3$, $H2O$, $CO2$, $NH3$, $CCl4$) Dipole moment of substituted benzene (o, m and p dicholoro benzene).

TEXT BOOK

1. P.L.Soni and Mohan Katyal, "Text Book of Inorganic chemistry" 20 Revised Edition, Shoban Lal Nagin Chand & Co New Delhi.1993.

REFERENCE BOOKS

1. R.B.Puri and I.R. Sharma, K.C.Kaila, "Principle of Inorganic Chemistry" sultan Chand and Co New Delhi. 1992
2. Vogel's "Text Book of qualitative Chemical Analysis" 6 Edition ELBS, Derling Kinderslay (India) Pvt Ltd New Delhi - 2006.
3. R.D.Madan, "Modern Inorganic Chemistry", S.Chand & Co (Pvt) Ltd. NewDelhi.1997.
4. M.K.Jain, "Organic Chemistry", 12th Edition Shoban Lal Nagin chand and Co. New Delhi1987.
5. P.L.Soniand H.M.Chawla, "Text Book of Organic Chemistry", 23rd 1990. Edition Sultan Chand Co. New Delhi 1990.
6. K.S.Tewari S.N.Mehrotra and N.K.Vishnol, "A Text Book of Organic Chemistry" ,3rd Edition, Vikas publishing House (Pvt) Ltd. New Delhi 2006.
7. B.R.Puri, L.R.Sharma and Madan S.Pathania, 41st Edition, "Principle of Physical chemistry "Vishal publishing Co, New Delhi, 2004.

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Course outcomes

CO1	The comparative study of alkali and alkaline earth metals and zinc group elements will be understood after reviewing this General Chemistry Paper - IV for 2nd B.Sc., students.
CO2	Knowing the essential information of the elements of inner transition.
CO3	To review the Elimination and substitution reaction studies.
CO4	To learn about ether and alcohol and to consider polarisation and dipolemoment.
CO5	Understand the properties and concept of Lanthanides and Actinides series.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	4	3	4	3	4	4	3	3	3	3	3.3
CO2	4	3	3	3	3	3	3	3	3	3	3.3
CO3	4	3	3	3	3	4	3	3	4	3	3.4
CO4	4	3	4	3	3	3	3	3	3	3	3.2
CO5	4	3	3	3	4	3	3	4	3	3	3.0
Mean overall score											**3.26**

Result: The Score for this course is 3.26 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Dr. D.RAJADURAI

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 4	COURSE CODE: U21CH4S1

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - IV SEMESTER - SKILL BASED ELECTIVE - I

(For the candidates admitted from the year 2021-2022 onwards)

LABORATORY HYGIENE AND SAFETY

Course Educational Objectives:

1. To disseminate information on laboratory safety steps.
2. To teach students how to store and handle chemicals safely.
3. To disseminate information about how to stop being poisoned.

UNIT - I	**(6 Hours)** **1.1** Laboratory safety measures: Lab discipline - Cleanliness and watchfulness. Maintenance of worktable, washing sink, fume hoods, fuel gas systems, instruments and equipments - Requirements for a safe laboratory. Use of apron overcoats, goggles gloves, etc.,
UNIT - II	**(6 Hours)** **2.1** Storage and handling of chemicals - carcinogenic chemicals - Handling of ethers - toxic and poisonous chemicals.
UNIT - III	**(6 Hours)** **3.1** Safe limits of vapour concentrations - Waste disposal and fume disposal - Precautions for avoiding accidents - cleansing agents - cleaning the apparatus and Instruments.
UNIT - IV	**(6 Hours)** **4.1 First - Aid techniques:** Burns and Damages due to organic substances, acids, alkalis, burns in the eye - Inhalation of toxic vapours, hazardous chemicals, bromine, phenol and hot objects.
UNIT - V	**(6 Hours)** **5.1** Poisons and antidotes - Rules to avoid poisoning - emetics- universal antidote - treatments for specific poisons. Harmful effects of X-rays and lasers.

TEXT BOOK

1. Jayashree Ghosh, A Text Book of Pharmaceutical Chemistry.

Book Recommended:

1. V. Gopalan, P.S. Subramaniam and K. Rengarajan, Elements of Analytical Chemistry.

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Course outcomes

CO1	The safety measures of the laboratory can be understood after reviewing this Laboratory Hygiene and Safety Measures Paper for 2nd B.Sc., Students.
CO2	To know how to handle chemicals, control of waste disposal, laboratory first aid treatment.
CO3	How to obey the rules in the Lab. to prevent poisoning chemicals.
CO4	Precautions for chemical storage.
CO5	To know how to apply First Aid to the Victims.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	4	3	3	4	3	3	3	3	3	4	**3.3**
CO2	4	3	4	3	4	3	3	3	4	4	**3.5**
CO3	3	4	4	3	3	4	3	3	3	3	**3.3**
CO4	4	3	4	3	3	3	3	3	3	3	**3.2**
CO5	3	4	4	3	4	3	3	3	3	3	**3.3**
Mean overall score											**3.32**

Result: The Score for this course is 3.32 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Dr. R.SRINIVASAN

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 5	COURSE CODE: U21CH5C7

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - V SEMESTER - CORE COURSE - VII

(For the candidates admitted from the year 2021-2022 onwards)

INORGANIC CHEMISTRY - I

Course Educational Objectives:

1. To give detailed information about coordination theory.
2. To teach students about the structure and function of chlorophyll, hemoglobin, and vitaminB12.
3. To teach students how to view symmetry elements in simple molecule point groups.

UNIT - I	**Coordination compounds** **1.1** Types of ligands. IUPAC nomenclature Theories of coordination compounds -Werner, Sidgwick, Valence bond, Crystal field, molecular orbital and ligand field theories.
UNIT - II	**2.1** Isomerism - Stability of complexes - factors affecting the stability of complexes. Unimolecular and bimolecular nucleophilic substitution reactions in octahedral and square complexes - Trans effect. Application of coordination compounds - Determination of potassium ions, separation of copper cadmium ions, Estimation of nickel using DMG and aluminium using oxine.
UNIT - III	**3.1** Biologically important coordination compounds - Chlorophyll, hemoglobin, Vitamin B12 Their structure, application (Elucidation is not required) Metal carbonyls - Mono and poly nuclear carbonyls of Ni, Fe and Cr Synthesis, reactions, structure and uses. Nitrosyl compounds - classification, preparation, properties and structure of nitrosyl chloride and sodium nitroprusside.
UNIT - IV	**4.1** Binary compounds - hydrides, borides and carbides - classification, preparation, properties and uses. **4.2** Organometallic compounds of alkenes alkynes and cyclopentadiene.
UNIT - V	**5.1 GRAVIMETRIC ANALYSIS** Characteristics of precipitating agent - choice of precipitants - specific and selective precipitant. Condition of precipitation. Types of precipitations. Purity of precipitant Coprecipitation and post precipitation. Precipitation from homogeneous solution. Digestion and washing of precipitate. Ignition of the precipitate. Use of sequestering agents. **5.2 GROUP THEORY AND ITS APPLICATIONS** Symmetry elements - symmetry operation - mathematical group multiplication tables point group of simple molecules (H_2, HCl, CO_2, H_2O, BF_3, NH_3)

TEXT BOOKS

1. B.R.Puriand & I.R.Sharma, “Principles of Inorganic Chemistry” shoban Lal, Nagin Chand & Co., New Delhi 2000.
2. F.A.Cotton, Chemical Application of Group Theory, Third Edition, John Wiley and Son , New York 2002.

Books Recommended:

1. P.L.Soni Text book of Inorganic Chemistry, S.Chand & Co., New Delhi (1999).
2. R.D.Madan, G.D.Tuli and S.M.Malik, Selected To picin Inorganic Chemistry, S.Chand & Co., New Delhi (1988).
3. J.D.Lee., Concise Inorganic Chemistry, E.L.B.S., IV Edn, m (1991).
4. Jeffery et al: “Vogel Text Book of Inorganic Quantitative Analysis”, Longman (1984).
5. D.A.Skoog and D.M.West: “Fundamentals of Analytical Chemistry W.B.Saunders, New York (1983).
6. P.K.Bhattacharya: Chemical Application of Group Theory, Himalaya publishing House, Mumbai (1998).
7. M.S.Gopinath and V.Ramakrishnan: Group Theory and Applications (1988).
8. D.F.Shriver and P.W.Atkins, “Inorganic Chemistry “III rd Edition, Oxford University Press, 1999.
9. M.C.Dayand Selbin, “Theortical Inorganic Chemistry”, Second Edition; Affiliated East - West New Delhi, 1969.

Course outcomes

CO1	The IUPAC nomenclature and basic theory of coordination compounds can be understood after reviewing this Inorganic Chemistry - I paper for 3rd B.Sc., students.
CO2	Application of coordination compounds to be identified.
CO3	To understand the Biological significance of organ metallic compounds and metal carbonyls in better way.
CO4	To examine the Precipitation analysis and Group Theory applications.
CO5	Stability of complex can be understood.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	4	4	3	3	3	3	**3.2**
CO2	3	4	2	3	3	2	3	3	3	2	**2.8**
CO3	4	3	3	3	4	3	4	2	3	4	**3.3**
CO4	3	3	3	4	3	2	4	3	3	3	**3.1**
CO5	4	2	3	3	3	3	3	4	3	4	**3.2**
Mean overall score											**3.12**

Result: The Score for this course is 3.12 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Dr. P.SIVAJEYANTHI

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 4	COURSE CODE: U21CH5C8

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - V SEMESTER - CORE COURSE - VIII

(For the candidates admitted from the year 2021-2022 onwards)

ORGANIC CHEMISTRY - I

Course Educational Objectives:

1. To teach students how to analyze and classify optical and geometrical isomerism.
2. To teach students how to classify the mechanism of a carbonyl compound and how to make acid derivatives synthetically.
3. To teach students how to write a study on a heterocyclic compound's analysis.

UNIT- I	**STEREOCHEMISTRY - I** Stereoismerism - Definition - classification into optical and geometrical isomerism. Optical isomerism - optical activity - optical specific rotation - conditions for optical activity. Asymmetric centre - chirality - achiral molecule - meaning of + and - and D and L notations - notation for optical isomers - Cahn - Ingold Prelog rules - R.S. notations for optical isomer with one asymmetric carbon. - Element of symmetry -Racemization - Methods of Racemization(by substitution and tautomerism) - symmetry- Resolution - Methods of resolution (Mechanical separation, seeding biochemical and conversion to diastereoisomers) - Walden inversion.
UNIT-II	**STEREOCHEMISTRY - II** Optical activity in compounds containing no asymmetric carbons - Biphenyls, Allenes and Spiranes. Geometrical isomerism - Cis - Trans, Syn - Anti and E and Z notations Geometrical isomerism in Maleic and Fumaric acids in unsymmetrical ketoximes - Methods of distinguishing geometrical isomers (dipole moment, dehydration, heat of hydrogenation cyclization, melting points).
UNIT - III	**REACTIONS OF CARBONYL COMPOUNDS** Carbonyl polarization - Reactivity of carbonyl group - Acidity of alpha Hydrogen. Mechanism of Perkin, Knoevenagal, Benzoin condensation. Reformatsky, and Wittig reactions. Mechanisms of reduction (Sodium borohydride, LiAlH4, Wolff Kishner and MPV reductions) - Mechanisms of haloform reaction and Michael addition and Oppenauer oxidation. Photochemistry of carbonyl compounds - Norrish I and II types.
UNIT -IV	**ACIDS AND ACID DERIVATIVES** Ionization of carboxylic acids - Acidity constant - comparison of acid strengths of substituted halo acids - Hammett equation. Malonic and acetoacetic esters- Characteristics of reactive methylene group - Synthetic uses of Malonic and acetoacetic esters. Tautomerism - Definition - Keto Enol tautomerism - identification - acid - bases catalyzed interconversion mechanism.
UNIT - V	**HETEROCYCLIC COMPOUNDS** Aromatic characteristics of heterocyclic compounds. Preparation, properties and uses of Furan. Pyrole, Thiophene. Synthesis and reactions of pyridine and Piperidine - comparative basic characters of pyrrole, pyridine and piperidine with amines. Synthesis and reactions of Quinoline, Isoquinoline and Indole with special reference to Skraup, Bischler Napieralski and indole synthesis.

Note: Problems where possible (all units).

TEXT BOOKS

1. A.K.Srivastava, Organic chemistry, 1st Edition, New Age International publishers, New Delhi,2002.
2. R.K.Bansal, "Organic Reaction Mechanism," Tata Mc Graw Hill, 1975.

Books Recommended:

1. B.S.Bahl and Arun Bahl "Advanced Organic Chemistry" S. Chand & Co, New Delhi.(1998).
2. P.L.Soniand H.M.Chwla: "Text book of Organic Chemistry: - 28 th Edition (1999) - Sultan Chand, New Delhi.
3. Ravi Bhushan: "Stereoisomerism of carbon compounds" - CBS - Publishers, Delhi - Revisited. (1998).
4. P.S Kalsi: "Stereochemistry, Conformation and Mechanism" Willey Eastern Limited, New Delhi.
5. O.P.Agarwal: "Chemistry of Natural Products" Volume 1 & 2.
6. D.Nasipuri, "Stereochemistry of organic Compounds", Wily Eastern Ltd., New Delhi. (1992).
7. I.L.Finar, "Organic Chemistry" Volume 1, E.L.B.S., London, (1998).
8. Sheyan Egg, "Organic Chemistry Mechanisms".
9. P.S.Kalsi, "Organic reaction and their Mechanism," New Age International Publishers.
10. S.H.Pine, J.B.Hendrickson, D.J.Cramand G.S.Hammomd , "OrganicChemistry' Mc Graw Hil fourth Edition, 1980.

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

Course outcomes

CO1	The optical isomerism and geometrical isomerism for various organic compounds can be comprehended after learning this Organic Chemistry - I paper for 3rd B.Sc., students.
CO2	To describe the Carbonyl compounds and acid derivatives.
CO3	The preparation, properties and uses of heterocyclic compounds should be known.
CO4	Understand the Tautomerism.
CO5	Understand the mechanism of Organic Reaction.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	4	3	3	3	4	4	3	3	3	2	**3.2**
CO2	4	3	3	4	2	4	3	3	2	2	**3.0**
CO3	2	3	4	3	3	3	3	2	4	4	**3.1**
CO4	3	3	3	3	2	3	2	3	4	4	**3.0**
CO5	4	3	3	3	4	3	3	2	3	3	**3.1**
Mean overall score											**3.08**

Result: The Score for this course is 3.08 (High Relationship)

Nature of Course			
Knowledge and skill		Employability oriented	
Skill oriented		Entrepreneurship oriented	

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Dr. K.BALASUBRAMANI

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 3	COURSE CODE: U21CH5C9

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - V SEMESTER - CORE COURSE - IX

(For the candidates admitted from the year 2021-2022 onwards)

PHYSICAL CHEMISTRY - I

Course Educational Objectives:

1. To teach the fundamentals of thermodynamics and their applications.
2. To teach students how to perceive the phase equilibria of two device components.

UNIT - I	**DEFINITION OF THERMODYNAMIC STERMS (15 hours)** Systems and surroundings- isolated, closed and open systems - Homogenous & heterogeneous systems, state of the system intensive and extensive variables. Thermodynamics process - cyclic processes, reversible and irreversible, isothermal and adiabatic processes - state and path functions, exact and inexact differentials, concepts of heat and work.
UNIT - II	**FIRST LAW OF THERMODYNAMICS AND ITS APPLICATION** First law of thermodynamics - statements, definitions of internal energy (U), enthalpy (H), heat capacity relation between Cp and Cv - calculation of W,Q, ∂ u and ∂ H for expansion of ideal and real gases under isothermal and adiabatic condition for reversible and irreversible processes. Joule - Thompson effect, Joule - Thompson experiment. Relationship between μj, t and other thermodynamic qualities. Calculation of μj, t for ideal and gases. Joule - Thompson coefficient and inversion temperature. The zeroth law of thermodynamics - statement - Requirements of thermochemical equation - bond dissociation energy - its calculation from thermochemical data. Temperature dependence of Kirchoff's equation.
UNIT - III	**SECOND LAW OF THERMODYNAMICS AND ITS APPLICATIONS** Heat engine - Carnot's cycle and its efficiency - Carnot's theorem - thermodynamic scale of temperature **CONCEPT OF ENTROPY**: Entropy as a function of P, V and T. Entropy of mixing - Clausius inequality. **GIBBS AND HELMHOLTZ FUNCTIONS:** Δ A and Δ G criteria for thermodynamics equilibrium and spontaneity - Gibbs - Helmholtz equations and their applications -Maxwell's relations. Equilibrium constants and free energy change. Thermo dynamic derivation of law of mass action. Equilibrium between different phases - system of variable composition - partial molar quantities - chemical. potential of component in ideal mixture - Gibbs Duhem equation. Reaction isotherm - Van't - Hoff. Equation Van't - Hoff's isochore. Clapeyron equation and Clausius Clapeyron equation - applications.
UNIT - IV	**THIRD LAW OF THERMODYNAMICS AND ITS APPLICATIONS** Need for the law, Nernst heat theorem, III law of thermodynamics - statement and concept of residual entropy. Evaluation of absolute entropy from heat capacity data. Solutions - Ideal liquid mixtures - (benzene and toluene) - Raoult's law and Henry's law - Deviation from Raoult's law and Henry's law - Activity and activity Coefficient. Duhem -Margule's equation - its application to fractional distillation of binary miscible liquids. Partially miscible liquid pairs - Phenol - Water, Triethanolamine Water and Nicotine - Water systems - Lower and upper CSTs Effect of impurities on CST.
UNIT - V	**PHASERULE** Meaning of the terms - phase, component and degree of freedom. Derivation of Gibb's phase rule. Phase equilibria of one component systems - water, CO_2 and sulphur systems. Reduced phase rule - phase equilibria of two component of systems - solid - liquid equilibria - simple eutectic systems - Bi - Cd and Pb -Ag Systems - Pattinson's process. Compound formation with congruent melting points (Mg-Zn) and incongruent melting points - Efflorescence and Deliquescence.

TEXT BOOK

1. Text book of "Physical chemistry", P.L.Soni.

Books References:

1. "Principles of physical chemistry", B.R.Puri & Sharma.
2. "Advanced Physical chemistry", Grudee Raj.
3. Essentials of Physical chemistry", B.S.Bahl., G.D.Tuli & Arun Bahl, S.Chand & Co., N.Delhi (1999).
4. "Thermodynamics for chemistry", Samuel Glasstone.
5. "Simplified course in Physical chemistry", R.L.Madan, G.D.Tuli, S.Chand &Co., N. Delhi (1999).
6. "Thermo dynamics for students of chemistry", Rajaram and Kuriacose.
7. P.W.Atkins, "Physical Chemistry", ELBS, Oxford Univ. Press, 1998.
8. R.A.Alberty and R.J.Silbay, "Physical Chemistry", John wiley sons. Inc. New York, 1995.
9. Gordon. M.Barrow, "Physical Chemistry", Tata Mc Graw Hill, New Delhi.
10. I.N.Lerine, "Physical Chemistry".

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Course outcomes

CO1	After learning this Physical Chemistry - I paper for 3rd B.Sc., students, students can understand the basic concept of thermodynamics.
CO2	The simple and detailed knowledge of thermodynamic terms can be understood and the meaning and implementation of the first law of thermodynamics.
CO3	Understand the implementation of Second Law of thermodynamics.
CO4	Understand the implementation of third Law of Thermodynamics.
CO5	Step rule for learning the equation and uses of Gibbs - Helmholtz and to learn the phase rule.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	4	3	3	4	3	3	3	3	**3.2**
CO2	4	4	3	3	3	3	3	4	3	3	**3.3**
CO3	4	4	3	3	3	3	3	4	3	3	**3.3**
CO4	4	4	3	3	3	3	3	4	3	3	**3.3**
CO5	3	4	4	3	3	3	3	4	3	3	**3.3**
Mean overall score											**3.28**

Result: The Score for this course is 3.28 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Dr. M.VISHNUDEVAN

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 4	COURSE CODE: U21CH5E1

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - V SEMESTER - ELECTIVE COURSE - I

(For the candidates admitted from the year 2021-2022 onwards)

INDUSTRIAL CHEMISTRY - I

Course Educational Objectives:

1. To teach students how to manufacture cement, sugar, and explosives.
2. To teach people how to recognize materials like chlorine, caustic soda, and sodium chlorate and how to make them.

UNIT- I	**(6 Hours)** **1.1** Cement: Manufacture Wet Process and Dry Process, Types, setting of cement, Reinforced concrete. **1.2** Glass: Types, Composition, manufacture of Optical glass, coloured glasses and lead glass.
UNIT-II	**(6 Hours)** **2.1** Sugar: Cane Sugar manufacture, Recovery of sugar from molasses, Sugar estimation. **2.2** Paints & Varnishes: Primary constituents of paints, dispersion medium (solvent), binder, Pigments, Oil based paints, latex paints baked on paints (alkydresins), formulation of paints and varnishes, Requirements of a good paint.
UNIT - III	**(6 Hours)** **3.1** Chemical Explosives: Origin of explosive, preparation and chemistry of lead azide, nitrocellulose, TNT, Dynamite, Cordite and gunpowder introduction to rocket propellants. **3.2** Leather Industry: Curing, Preservation and tanning of hides and skins. Treatment of tannery effluents.
UNIT -IV	**(6 Hours)** **4.1** Petroleum: Origin, Refining, Cracking, Reforming, Knocking and Octane number, LPG, Synthetic petrol and Bio - diesel. **4.2** Fuel Gases: Large scale production, Storage, Hazards and uses of coal gas, Water gas, Producer gas and Oil gas.
UNIT - V	**(6 Hours)** **5.1** Electrochemical Industries: Production of materials like chlorine, caustic soda and sodium chlorate. **5.2** Electrolytic refining of aluminium, Electro - Oxidation and electro - reduction process with examples, Solar cells and fuel cells.

TEXT BOOK

1. B.N.Chakrabarty, Industrial Chemistry, Oxford & IBH Publishing co, New Delhi, 1981.

Books Recommended:

1. B.K.Sharma, Industrial Chemistry, Goel Publishing House, Meerut.
2. P.P.Singh, T.M.Joseph, R.G.Dhavale, College Industrial Chemistry, Himalaya Publishing House, Bombay, 4th Ed., 1983.

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Course outcomes

CO1	Manufacturing of various types of fuels, cements and glass, can be understood after learning this Industrial Chemistry Paper for 3rd B.Sc., students.
CO2	Manufacturing of various types of Sugars and paints can be understood after learning this Industrial Chemistry Paper for 3rd B.Sc., students.
CO3	To analyze efficiently for the management of Tannery effluent contamination.
CO4	To learn the preparation of explosives, caustic soda and sodium chlorate and their applications.
CO5	Understand the concept of refining of aluminium, solar and fuel cell.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	4	4	3	3	3	4	**3.3**
CO2	3	3	3	3	4	4	3	3	3	4	**3.3**
CO3	3	3	4	3	4	4	3	3	3	4	**3.4**
CO4	4	3	3	3	4	3	3	3	3	4	**3.3**
CO5	3	3	4	3	4	3	3	3	3	4	**3.3**
Mean overall score											**3.32**

Result: The Score for this course is 3.32 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Dr. T.DEEPA

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 4	COURSE CODE: U21CH5S2

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - V SEMESTER – SKILL BASED ELECTIVE - II

(For the candidates admitted from the year 2021-2022 onwards)

SPECTROSCOPY - I

Course Educational Objectives:

1. To disseminate information about the electromagnetic spectrum and molecular spectroscopy.
2. To impart the knowledge of UV / V - is and IR Spectroscopy.
3. To impart knowledge of proton - NMR and ESR.

UNIT- I	1.1 Definition of spectroscopy - Electromagnetic radiation, Electromagnetic spectrum, atomic and molecular spectroscopy (tranlational, rotational, vibrational and electronic) units.
UNIT-II	**UV**- Visible spectroscopy - absorptions laws (Lambert's and Beer's Law) - theory of Electronic transition - **IR-** Introduction - molecular vibrations - vibrational frequency - number of fundamental vibrations - factors influencing vibrational frequencies - selection rules.
UNIT - III	**3.1** IR instrumentation - finger print region - application of IR spectra (Hydro carbon, Aromatic hydro carbons, Halogen compounds, Alcohol, Aldehyde and Ketones, Amine, Amide, Acid, Esters, ϕ-NO_2compounds)
UNIT -IV	**1HNMR Spectroscopy** NMR Spectroscopy - principle of nuclear magnetic resonance - basic instrumentation - number of signals - chemical shift. Interpretation of NMR spectra of simple organic compounds such as Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethylamine, Ethyl Bromide, Toluene and ethyl alchol .
UNIT - V	**ESR spectroscopy** E.S.R. Spectroscopy - condition - theory of esr spectra - hyperfine splitting - esr spectra of simple radicals CH3, CD3, Naphthalene radical ions only.

TEXT BOOKS

1. C.N.Banwell, Fundamentals of molecular spectroscopy, McGraw Hill, New York, 1966.
2. R.Chang "Basic Principles of Spectroscopy".
3. William Kemp, Organic Spectroscopy, ELBS II Edition, Spectroscopy of organic compounds.
4. P.S.Kalsi, Organic Spectroscopy, Wiley Eastern Ltd, Madras.

Books Recommended:

1. G.Herzberg, "Atomic Spectra and Atomic Structure".
2. William Kemp, Organic Spectroscopy, ELBS II Edition, Spectroscopy of organic compounds.
3. P.S.Kalsi, Organic Spectroscopy, Wiley Eastern Ltd, Madras.
4. G.Herzberg, "Molecular Spectra and Molecular Structure I. Spectra of Diatomic Molecules"
5. G.Herzberg, "Molecular Spectra and Molecular Structure II. Infrared and Raman Spectra of Polyatomic Molecules".
6. G.Herzberg, "Molecular Spectra and Molecular Structure III. Electronic Spectra and Electronic Structure of Polyatomic Molecules".
7. G.M.Barrow, "Introduction to Molecular Spectroscopy"
8. J.G.Calvert and J. N. Pitts, Jr., "Photochemistry"
9. H.B.Dunford, "Elements of Diatomic Molecular Spectra"
10. R.N.Dixon, "Spectroscopy and Structure"
11. K.V.Raman "Spectroscopy and mathematics of Quantum Chemistry" in Print.

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Course outcomes

CO1	The fundamental knowledge of spectroscopy can be understood after learning this Spectroscopy-I Paper for 3rd B.Sc., learners.
CO2	To understand the essence and interpretation of UV/Vis Spectrum.
CO3	To understand the essence and interpretation of IR Spectrum.
CO4	After reviewing this Spectroscopy-II Paper for 3rd B.Sc., students, one can understand the basic principles, instrumentation and interpretation of proton - NMR.
CO5	To understand the essence and interpretation of ESR Spectrum.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	4	3	3	3	4	3	3	4	3	4	3.4
CO2	4	4	4	3	3	3	3	4	3	4	3.5
CO3	4	4	4	3	3	3	3	4	3	4	3.5
CO4	4	4	4	3	4	3	3	4	3	4	3.5
CO5	4	4	4	3	4	3	3	4	3	4	3.5
Mean overall score											**3.48**

Result: The Score for this course is 3.48 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Mrs. J.KARTHIKEYANI

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 4	COURSE CODE: U21CH5S3

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - V SEMESTER - SKILL BASED ELECTIVE - III

(For the candidates admitted from the year 2021-2022 onwards)

AGRICULTURAL CHEMISTRY

Course Educational Objectives:

1. To impart knowledge about the soil chemistry.
2. To impart the knowledge of fertilizers and manures for plant growth.
3. To study the concept of pesticides.

UNIT - I	**Soil science** Introduction - Definition of soils - Function of soil. Physical properties, structural and types of soil - Hygroscopic water - water holding capacity - Important of soil heat - Factors controlling soil temperature. Chemical properties of soils - soil colloids - theories of nutrient supply - carbon cycle - nitrogen cycle - Reclamation.
UNIT - II	**Fertilizers** Definition - classification of fertilizers. Different types, manufacturing process and properties of NPK fertilizers. Effect of phosphorus on plant growth and development micronutrients - their functions in plants.
UNIT - III	**Manures** Introduction - farm - Yark manure composition - handling and storage practices compost making - fertilizer industry in India.
UNIT - IV	**Plants Protection chemicals** Pesticides: - Introduction - classification of pesticides outlines of general methods of preparation and applications. Insecticides: - Insect killer & repellents, arsenicals, inorganic and organic pesticides.
UNIT - V	Fungicides - sulphur compounds - copper compounds - mercerized copper oxychloride (MCO) - mercury compounds. Herbicides - classification - inorganic and organic herbicides - Acaricides - fenson - parathion - azobenzene - malathion.

TEXT BOOK

Thomas Anderson, Elements of Agriculture Chemistry, 1860.

Books Recommended:

1. Garrison Sposito, the Chemistry of Soils, 2008 by Oxford University Press, Inc.
2. Stevenson FJ & Cole MA. 1999. Cycles of Soil: Carbon, Nitrogen, Phosphorus, Sulphur, Micronutrients. John Wiley &Sons.
3. Tisdale SL, Nelson SL, Beaton JD & Havlin JL. 1999. Soil Fertility and Fertilizers. 5th Ed. Prentice Hall of India.

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Course outcomes

CO1	To apply the knowledge of soil chemistry for healthy soil.
CO2	To understand different types of Fertilizers.
CO3	To understand to concept of manures.
CO4	To understand the classification and uses of pesticides.
CO5	To understand the classification and uses of fungicides and Herbicides.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**4**	**3**	**4**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3.2**
CO2	**3**	**4**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.2**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3.0**
CO4	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.2**
CO5	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.2**
Mean overall score											**3.2**

Result: The Score for this course is 3.2 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Dr. P.MUTHUKUMAR

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 4	COURSE CODE: U21CH6C10P

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - VI SEMESTER - CORE COURSE - X

(For the candidates admitted from the year 2021-2022 onwards)

PRACTICAL - III - PHYSICAL CHEMISTRY

Course Educational Objectives:

1. To impart the knowledge of students to find out the molecular weight of unknown samples by Rast method.
2. Students can find out rate constant of a substance by conducting ester hydrolysis.
3. Students impart knowledge to determine transition temperature of unknown compounds.

Distribution Law:

a) Partition coefficient of Iodine between carbon tetrachloride and water.

b) Equilibrium constant of the reactions.

$$I_2 + I^- \rightleftharpoons I_3$$

Kinetics studies:

Acid catalysed hydrolysis of an ester (Methyl acetate or Ethyl acetate).

Molecular weight determination:

Rast's method: Naphthalene, m-dinitrobenzene and diphenyl as solvents.

Heterogeneous equilibrium:

a) Critical solution temperature of phenol - water system - effect of impurity on C.S.T (2% NaCl or 2% succinic acid solutions).

b) Simple eutectic system: Naphthalene - Biphenyl, Napthalene Diphernylamine.

c) Determination of transition temperature: Sodium acetate. Sodium thiosulphate. $SrCl_2.6H_2O$ & $MnCl_2.4H_2O$.

Electro Chemistry:

a) **Conductivity** : 1) Cellconstant

2) Equivalent conductivity

3) Conductometrictitrations

b) **Potentiometry**: Potentiometrictitrations.

Marks:

Int. Asst.	**40**
Practical	**60**
Total	**100**

Reference Book:

1. Practical Physical Chemistry by B.Viswanathan and P.S.Raghavan.

Course outcomes

CO1	After completion of Physical Chemistry Practical one can know and understand the preparation for each experiment by using Labmanual.
CO2	One can understand how to find out unknown concentration of NaCL in a given sample.
CO3	By doing Ester Hydrolysis experiment one can arrive the rateconstant
CO4	By completion of Rast Method one can calculate the molecular weight of the given unknown samples.
CO5	One can determine the transition temperature of unknown compound by conducting Transition temperature experiment

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**4**	**4**	**3**	**4**	**3**	**3**	**4**	**3**	**3**	**3.4**
CO2	**3**	**4**	**4**	**3**	**4**	**3**	**3**	**4**	**3**	**3**	**3.4**
CO3	**3**	**4**	**4**	**3**	**4**	**3**	**3**	**4**	**3**	**3**	**3.4**
CO4	**3**	**4**	**4**	**3**	**4**	**3**	**3**	**4**	**3**	**3**	**3.4**
CO5	**3**	**4**	**4**	**3**	**4**	**3**	**3**	**4**	**3**	**3**	**3.4**
Mean overall score											**3.4**

Result: The Score for this course is 3.4 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 5	COURSE CODE: U21CH6C11P

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - VI SEMESTER - CORE COURSE - XI

(For the candidates admitted from the year 2021-2022 onwards)

PRACTICAL - IV - GRAVIMETRIC ANALYSIS AND ORGANIC PREPARATION AND PHYSICAL CONSTANTS

Course Educational Objectives:

1. Students impart knowledge on how to prepare organic compounds.
2. Students can impart knowledge on how to quantify inorganic compound.

GRAVIMETRIC ANALYSIS

1. Estimation of calcium as calciumoxalate.
2. Estimation of barium as bariumsulphate.
3. Estimation of barium as bariumchromate.
4. Estimation of lead as lead sulphate.
5. Estimation of lead as lead chromate.
6. Estimation of nickel as nickel dimethyl glyoxime complex.

ORGANIC COMPOUND PREPARATION AND PHYSICAL CONSTANT

1. **Preparation** i. p - Bromo acetanilide from Acetanilide (Bromination)
   ii. β - Naphthol benzoate from β- Naphthol (Benzoylation)
2. Determination of melting and boiling points of simple organic compounds.

Marks:

Int. Asst.	**40**
Practical	**60**
Total	**100**

Reference Book:

1. Practical Chemistry by A.I.Vogels

Course outcomes

CO1	Apply Organic procedure to synthesis organic compound.
CO2	Apply Gravimetric principle to estimate the inorganic compound.

Course Outcome (COs)	Programme Outcomes (POs)					Programme Specific Outcome (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	4	3	4	4	4	3	3	4	3	4	3.6
CO2	4	3	4	4	4	3	3	4	3	4	3.6
Mean overall score											**3.6**

Result: The Score for this course is 3.6 (High Relationship)

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 5	COURSE CODE: U21CH6C12

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - VI SEMESTER - CORE COURSE - XII

(For the candidates admitted from the year 2021-2022 onwards)

INORGANIC CHEMISTRY – II

Course Educational Objectives:

1. To impart knowledge of nuclear chemistry, magic numbers and nuclear transformation Understanding the composition of atoms in a cubic lattice.
2. To teach students about acids and bases, as well as non-aqueous solvents and their classifications.

UNIT- I	**NUCLEAR CHEMISTRY** 1.1 Introduction - Composition of nucleus and nuclear forces. Nuclear stability - n/p ratio, mass defect, binding energy, packing fraction and magic numbers, shell and drop models. 1.2 Isotopes - detection and separation. Isotopic constitution of elements and whole number rule. Isobars, isotones and isomers.
UNIT-II	**RADIOACTIVITY AND NUCLEAR TRANSFORMATIONS** 2.1 Radioactivity - discovery, detection and measurements (Wilson cloud chamber). Disintegration theory - modes of decay - Group displacement law - Rate of disintegration - Half life and average life - Radioactive series. 2.2 Nuclear transformation - use of projectiles - nuclear reaction - fission and fusion. Nuclear reactors. Applications of radio isotopes - Carbon dating - Radioactive waste disposal. 2.3 Radiolysis of water and hydrated electron.
UNIT - III	**METALLICSTATE** 3.1 Packing of atoms in metal (BCP, CCP, FCC, and HCP). 3.2 Theories of metallic bonding - electron gas, Pauling and band theories. 3.3 Structure of alloys - substitutional and interstitial solid solution - Hume Rothery ratios.
UNIT - IV	**SOME SPECIAL CLASSES OF COMPOUNDS** 4.1 Clathrates - examples and structures. Interstitial compounds and non - stoichiometric compounds. 4.2 Metal alkyls, Co-ordination polymers and phosphonitrilic polymers. 4.3 Silicates - classification into discrete anions, one, two and three dimensional structures with typical examples composition, properties and uses of beryl, talc, mica, zeolites and ultramarines.
UNIT - V	**ACIDS AND BASES** 5.1 Lewis concept - Classification of Lewis acids - Lux Flood concept - Hard-Soft acid base concept and its applications. 5.2 Non- aqueous solvents - Classification of solvents - Neutralization reaction and solvolysis in liquid ammonia - Metal - ammonia solutions. 5.3 Neutralisation, solvolysis and redox reactions in liquid sulphur dioxide - Acid - base, precipitation and solvolysis reactions in acetic acid as solvent.

TEXT BOOK

1. R.D.Madan, "Modern Inorganic Chemistry".

Books Recommended:

1. P.L.Soni, Mohan Katyal, "Text book of Inorganic Chemitry", 20th revised edn., Chand,1992.
2. Esmarch S.Gilreath, "Fundamental concepts of Inorganic Chemistry", International students edn. McGaw - Hill Kogakusha Ltd., 1958.
3. Gurdeep Chatwal, "Co-ordination Chemistry", First edn., Himalaya Publishing House,1992.
4. B.R.Puri and L.R.Sharma, "Principles of Inorganic Chemistry", Shoban Lal Nagin Chand and Co., 1989.
5. O.P.Agarwal: "Chemistry of Natural Products" Volume 1 &2.
6. S.Glasstone, "Source Book on Atomic Energy", 3rd edn, Affiliated East West Press, 1967.

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

Course outcomes

CO1	Understand the basic concept of Nuclear Chemistry.
CO2	After learning this Inorganic Chemistry-II Paper for 3rd B.Sc., students, the detailed Understanding of nuclear reactions and radiolysis can be known.
CO3	Understanding the composition of atoms in a cubic lattice.
CO4	To think about clathrates, alkyl metals and various forms of silicates.
CO5	Understand the acid-base concept.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	4	4	3	3	3	3	3.2
CO2	4	3	3	3	3	3	3	3	3	4	3.2
CO3	4	4	4	3	3	3	3	4	3	3	3.4
CO4	3	3	3	3	3	3	3	3	3	3	3.0
CO5	4	3	3	3	3	4	3	3	3	3	3.2
Mean overall score											**3.2**

Result: The Score for this course is 3.2 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Dr. P.SIVAJEYANTHI

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 5	COURSE CODE: U21CH6C13

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - VI SEMESTER - CORE COURSE - XIII

(For the candidates admitted from the year 2021-2022 onwards)

ORGANIC CHEMISTRY - II

Course Educational Objectives:

1. The aim is to teach students how to analyze phenolic compounds, amino acids, proteins, and carbohydrates.
2. In order to impart information, students would be able to analyze natural products and molecular rearrangements.

UNIT- I	**PHENOLS, NITRO COMPOUNDS AND AMINES** 1.1 Cresols di and trihydric phenols, α and β naphthols - Preparation and properties. 1.2 Conversion of nitrobenzene to ortho, para, and Meta dintitrobenzene. Relative basic characters of Aliphatic and Aromatic amines. 1.3 Diazomethane and diazoacetic ester- preparation, structure and their synthetic uses. 1.4 Sulphanalic acid, Sulphanilamide, Saccharin, Chloramine - T Preparation anduses.
UNIT-II	**AMINO ACIDS AND PROTEINS** 2.1 Classification of amino acids. Essential and non- essential amino acids. 2.2 Preparation of L - Amino acids properties and reactions. Zwitter ions isoelectric points, peptide synthesis, structure determination of poly peptides. End group analysis. 2.3 Proteins - classification based on physical and chemical properties and based on physiological function primary and secondary structures of proteins. Helical and sheet structures (elementary treatment only) denaturation of proteins. 2.4 Type of nucleic acids - DNA and RNA biological functions only.
UNIT - III	**CARBOHYDRATES** 3.1 Mutarotation and its mechanism, cyclic structure, pyranose and furanose forms of glucose and fructose. Epimerization, chain lengthening and chain shortening of aldoses. Inter conversion of aldoses and ketoses. Haworth, Fisher and chair conformations of glucose. 3.2 Di and polysaccharides - reaction and structure of maltose, lactose, Sucrose, starch and cellulose.
UNIT -IV	**NATURAL PRODUCTS** 4.1 Structural elucidations of menthol and α Terpinol. 4.2 Alkaloids - general methods of isolation and structural determination of piperine and nicotine. 4.3 Vitamins - thiamine, riboflavin, pyridoxine and ascorbic acids occurrence and biological importance only.
UNIT - V	**MOLECULAR REARRANGEMENT** 5.1 Pinacol - pinacolone rearrangement - Beckmann, Benzidine, Hoffmann, Curtius, benzylic acid rearrangement. Claisen (sigmatropic rearrangement) and para Claisen rearrangements. Cope and Oxycope rearrangements, Fries rearrangement. (Mechanism only).

TEXT BOOK

1. P.L.Soni, and H.M.Chawala, "Text Book of Organic Chemistry", 27th edn. Sultan Chand 1997.

Books Recommended:

1. V.S.Parmar and H.M.Chawala, "Principles of Reaction Mechanism in Organic Chemistry o" , 2nd Edn., Sultan Chand1978.
2. Subash Chandra Rastogi, Satiskumar Agarwala AshokSharma, "Chemistry of Natural Products" Vol.I & Vol. II Edition! 974-75. Jai Prakash Nath & Co. Leading Educational Publishers.
3. Ernest L.Eliel "Stereo chemistry of Carbon Chemistry", 19th Reprint 1995 Tata McGraw Hill Publishing company Ltd.
4. M.K.Jain "Organic Chemistry", 12th Edn., Shoban Lal Nagin Chand and Co.

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

Course outcomes

CO1	The preparation and properties of phenols and nitro compounds can be understood after examining this Organic Chemistry - II Paper for 3rd B.Sc., students.
CO2	The preparation and properties of Aminoacids and nitro proteins can be understood after examining this Organic Chemistry - II Paper for 3rd B.Sc., students.
CO3	The preparation and properties of carbohydrates can be understood after examining this Organic Chemistry - II Paper for 3rd B.Sc., students.
CO4	Understand the concept of natural Product.
CO5	Studying the mechanistic approach of molecular rearrangements of organic compounds and to evaluate the structural elucidation of natural products.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	4	3	3	3	3	4	3	3	3	3	3.2
CO2	4	3	3	3	3	4	3	3	3	3	3.2
CO3	4	3	3	3	3	4	3	3	3	3	3.2
CO4	4	3	3	3	3	4	3	3	3	3	3.2
CO5	4	4	4	3	3	4	3	3	3	3	3.4
Mean overall score											**3.24**

Result: The Score for this course is 3.24 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Dr. K.BALASUBRAMANI

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 5	COURSE CODE: U21CH6E2

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - VI SEMESTER - ELECTIVE COURSE - II

(For the candidates admitted from the year 2021-2022 onwards)

ANALYTICAL CHEMISTRY

Course Educational Objectives:

1. To impart knowledge of error correction and estimation methods for glucose and phenols.
2. To pass on information to put the principles of various chromatography techniques into practice.

UNIT- I	**1.1 DATAANALYSIS** Errors in chemical analysis, Classification of errors, Determine errors, Instrumental errors, Personal errors, constant errors and proportional errors - Correction of determinate errors Random errors, Precision, Accuracy and rejection of data questioned. Significant figures, Mean deviation and standard deviation. Curve fitting. Method of least squares. **1.2 ORGANIC ESTIMATIONS** Principles and methods to estimate glucose, ascorbic acid, Phenol. Aniline - Iodine value, Saponification value R.M. value and Acetyl value.
UNIT - II	**CHROMATOGRAPHY** **2.1** Principles involved in adsorption, Partition and ion exchange, paper, Thin Layer, Column, Gas Liquid chromatography. Electro - phoresis - Applications. 2.2 Desiccants, Vacuum drying, Distillation, fractional Distillation, Stem Distillation, Azeotropic Distillation, Crystallisation and Sublimation - Principles and Techniques.
UNIT - III	**THERMOANALYTICAL METHODS** **3.1** Principles involved in thermo gravimetric analysis and differential thermal analysis - instrumentation. Characteristics of TGA ($CaC_2O_4 . H_2O$, $CuSO_4 . 5H_2O$ and DTA curves - ($CaC_2O_4 . H_2O$) factors affecting TGA and DTA curves. **3.2** Thermometric Titration of HCI VsNaOH. **3.3 ANALYTICAL ELECTRO CHEMISTRY** Electrolytic Separation. Principles of electrodeposition. Electro - Gravimetry (Estimation of Copper and Silver).
UNIT - IV	**COLORIMETRIC ANALYSIS** **4.1** Laws of Colorimetry - Nessler's and Photo electric colorimetric method - operation and applications. Estimation of Ni, Cu and Fe. **4.2** Basic principles of flame photometry - Atomic absorption - Spectrophotometry – Estimation of Na, K and Ca.
UNIT - V	**ELECTRO ANALYTICAL METHOD** **5.1** Polarography - principle, concentration polarization, dropping mercury electrode (DME) - Advantages and disadvantages - migration, residual, limiting and diffusion current - use of supporting electrolytes - Illkovic equation (derivation not required) significance - Half wave potential ($E_{1/2}$) - polarography an analytical tool in qualitative and quantitative analysis. **5.2** Polarimeter - principle - specific rotation - instrumentation - applications.

TEXT BOOK

1. A.I.Vogel, Text Book of Quantitative Inorganic Analysis Longman (1984).

Books Recommended:

1. R.Gopalan, P.S.Subramaniam and K.R.Rengarajan: "Elements of Analytical Chemistry", "sultanch and & Sons, New Delhi (1995).
2. B.K.Sharma: Instrumental Methods of Chemical Analysis, Goel Publishing House, Meerut (1999).
3. S.M.Khopkar: Basic Concepts of Analytical Chemistry, New Age International (P) Limited, New Delhi (1998).
4. Gurdeep Chatwal, Sham Anand: Instrumental Methods of Chemical Analysis, Himalaya Publishing House, Mumbai (1998).
5. R.A.Day and A.L.Underwood: Quantitative Analysis", Prentice Hall of India, New Delhi (1998).
6. D.A.Skoog & D.M.West: Fundamentals of Analytical Chemistry W.B. Saunders, New York (1982).
7. K.V.Raman: Computers in Chemistry Tata MC Graw Hill Co., New Delhi (1993).
8. B.G.Gottfried: BASIC Programming Mc Graw Hill International Ltd., (1980).
9. B.R.Gottfried: C Language Programming Mc Graw Hill International Ltd., (1987).
10. E.Balagurusamy: C Language Tata MC Graw Hill Co., New Delhi (1997).

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

Course outcomes

CO1	The instrumental and personnel errors in the quantitative determination of organic and inorganic compounds can be analyzed after reviewing this Analytical Chemistry Paper for 3rd B.Sc., students.
CO2	To practice the principles of chromatography techniques of varied incarnations.
CO3	To grasp the techniques and procedures in the laboratory.
CO4	To learn the principle of thermal analysis.
CO5	To learn the working principles of Electro - analytical techniques.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**4**	**4**	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3.4**
CO2	**4**	**4**	**4**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3.3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3.0**
CO4	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.2**
CO5	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.2**
Mean overall score											**3.22**

Result: The Score for this course is 3.22 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Dr. T.DEEPA

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 4	COURSE CODE: U21CH6E3

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - VI SEMESTER - ELECTIVE COURSE - III

(For the candidates admitted from the year 2021-2022 onwards)

PHYSICAL CHEMISTRY – II

Course Educational Objectives:

1. To impart information by studying the derivation and description of Arrhenius' equation. ARRT and Lindemann's Concept is two concepts that need to be understood.
2. Understanding and learning the kinetics of photochemistry in the photophysical mechanism and quantum yield.

UNIT - I	**ELECTRICAL CONDUCTANCE** **1.1** Elementary treatment of Debye - Huckel Onsager equation for strong electrolytes. Evidence for ionic atmosphere. The conductance at high field (Wein effect) and high frequencies (Debye - Falkenhagen effect). Transport number and Hittorf's rule - determination by Hittorf's method and moving boundary method. **1.2** Determination of K_a of acids. Determination of solubility product of a sparingly soluble salt. Conductometric titrations.
UNIT - II	**2.1** Electromotive force of a cell and its measurements. Applications of Gibbs Helmholtz equation, concentration and E.M.F. Nernst equation. **2.2** Types of reversible electrodes - Gas/metal ion, metal/metal ion, metal/insoluble Salt/anion and Redox electrodes. Electro reactions. Standard hydrogen electrode - reference electrodes - standard electrode potentials - Sign conventions - Electro chemicals series and its significance. **2.3** Concentration cells with and without transport. Liquid junction potential. Application of concentration cells - Valency of ions, solubility product and activity co - efficient, potentiometric titrations. Determination of pH using hydrogen, quinhydrone and glass electrodes.
UNIT - III	**3.1** Derivation of rate constant of a second order reaction - when the reactants are taken at different initial concentrations-when the reactants are taken at the same initial concentrations - Determination of the rate constant of a II order reaction - Derivation of rate constant of a third order reaction - when the reactants are taken at the same initial concentrations. Derivation of half - life periods for second and third order reactions having equal initial concentration of reactants. **3.2** Effect of temperature on reaction rates - Derivation of Arrhenius equation - concept of activation energy - determination of Arrhenius frequency factor and energy of activation.
UNIT - IV	**4.1** Collision theory of reaction rates-Derivation of rate constant of a bimolecular reaction from collision theory-Failures of CT. **4.2** Lindemann theory of Unimolecular reactions. **4.3** Theory of Absolute Reaction Rates - Thermodynamic derivation of rate constant for a bimolecular reaction based on ARRT comparison between ARRT and CT. Significance of free energy of activation and entropy of activation. **4.4** Kinetics of complex reactions of first order opposing, consecutive and parallel reactions - examples.
UNIT - V	**5. Photochemistry** **5.1** Consequences of light absorption - The Jablonski diagramnon radiative transitions - Radiativetransitions - Grotthus - Draper law - The Stark Einstein law of photochemical equivalence - Quantum efficiency (quantum yield). **5.2** Energy transfer in photochemical reactions photosensitisaiton - Photosynthesis in plants - Chemiluminescence - fluorescence and phosphorescence - lasers - uses of lasers. **5.3** Photochemical reactions - Kinetics of hydrogen - bromine reaction - decomposition of HI - Photolysis of aldehydes and ketones (Mechanism only).

TEXT BOOK

1. "Principles of physical chemistry", B.R.Puri & Sharma.

Books Recommended:

1. R.P.Varma & Pradeep . "Physical Chemistry"
2. Dr.S.Jain & S.P.Jakkar, "Physical Chemistry, principles & problems", Tata McGraw Hill, New Delhi, 1990.
3. Glasstone S., Lewis d., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd.
4. Atkins P.W., Physical Chemistry, (5^{th} edition) Oxford University Press (1994).

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

Course outcomes

CO1	The principle of electrical conductance and electrolytic conductance for strong and weak electrolytes can be improved after learning this Physical Chemistry - II Paper for 3rd B.Sc., students. Learning and how to measure the transport number.
CO2	To evaluate a cell's EMF and reversible electrode forms and concentration cells. To determine the rate constant for different types of order of a reaction.
CO3	To study the derivation and definition of the equation of Arrhenius. Understanding ARRT and Lindemann's Concept.
CO4	To understand and to learn the kinetics of photochemistry in the photophysical process and quantum yield.
CO5	To apply the Debye Huckle Onsagar equation to find out the conductance at infinite dilution for strong electrolyte.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**4**	**3**	**4**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.3**
CO2	**4**	**4**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.3**
CO3	**4**	**4**	**4**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.3**
CO4	**4**	**3**	**4**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3.2**
CO5	**4**	**4**	**4**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.3**
Mean overall score											**3.28**

Result: The Score for this course is 3.28 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER: Dr. M.VISHNUDEVAN

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT:	COURSE CODE: U21CH1A1 / U21CH3A1

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - I & III - SEMESTER - FIRST AND SECOND ALLIED COURSE - I

(For the candidates admitted from the year 2021-2022 onwards)

(FOR BOTANY, PHYSICS, ZOOLOGY AND N & D MAJORS)

ALLIED CHEMISTRY - I

Course Educational Objective:

1. To disseminate information about radioactivity, water treatment, and polymers.

UNIT - I	**(15hours)** **1.1 Volumetric Analysis :** Standard Solution - Primary and Secondary Standards - Types of titrimetric reactions - reactions - redox- precipitation - EDTA titrations. **1.2** Laboratory **Hygiene and Safety:** Storage and handling of corrosive, flammable, explosive, toxic, carcinogenic and poisonous Chemicals. **1.3** Simple first aid procedure for Accidents: Acid in eye, alkali in eye, acid burns, alkali burns, poisoning, inhalation of gases, cut by glasses and heat burns.
UNIT - II	**(15hours)** **2.1 Water:** Soft water - Temporary and permanent handness of water Treatment of water for municipal purpose - Softening of water - Definition - Softening by Zeolite Process. **2.2 Atomic Structure:** Rutherford's Nuclear Atom - Bohr's Model of the atom - Bohr Sommerfeld theory - Distribution of electrons - Paulis Exclusion Principle - Hund's Rule of maximum Multiplicity - Aufbau Principle.
UNIT - III	**(15hours)** **3.1** Radioactivity - Definition - types of radioactive rays - Nuclear energy - mass defect - binding energy - magic Numbers - Nuclear fission - Nuclear fusion - difference between Nuclear fission and fusion - Nuclear power plant. **3.2** Isotopes, Isobars and Isotones.
UNIT -IV	**(15hours)** **4.1** Classification and Nomenclature of organic of Compounds classification of organic compounds - functional groups - homologous series. **4.2** IUPAC System of nomenclature of simple and complex aliphatic compounds.
UNIT - V	**(15hours)** **5.1** Polymerisation - Introduction - Preparation of Polymers - addition polymers (Polyethylene, PVC and Teflon) - Condensation polymers (nylon - 6,6 and terylene) **5.2** Synthetic rubbers (BUNA, Butyl rubber and SBR) Thermoplastic and thermosetting Plastics.

Books Recommended:

1. R.Gopalan, P.S.Subramanian, K.Rengarajan - Elements of Analytical Chemistry Sultan chand & Sons New Delhi-2.
2. B.K.Sharma "Industrial Chemistry" GOEL Publishing House Meerut.
3. P.L.Soniand Mohan Katyal "Text Book of inorganic Chemistry 20th Received Edition, Sultan Chand 1992.
4. U.N.Dash - Nuclear Chemistry Sultan Chand & Sons New Delhi - 2.
5. I.L.Finar - Organic Chemistry. The fundamental Principles ELBS English Lan.
6. P.L.Soni H.M.Chawla "Text Book of organic chemistry sultan chand and sons New Delhi - 2.
7. B.S.Bahl and Arun Bahl 'Advanced Organice chemistry S.Chand and Co New Delhi.

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

Course outcomes

CO1	To understand the volumetric concept to estimate the unknown substance.
CO2	Understand the concept of hardness of water and water treatment.
CO3	To understand the concept of radioactivity.
CO4	To follow the procedure of nomenclature of organic compounds.
CO5	To study the preparation of polymers.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	4	3	3	3	3	4	3	3	3	3	3.2
CO2	4	3	3	3	3	4	3	3	3	3	3.2
CO3	4	3	3	3	3	4	3	3	3	3	3.2
CO4	4	4	3	3	3	4	3	3	3	3	3.3
CO5	4	3	3	3	3	4	3	3	3	3	3.2
Mean overall score											**3.22**

Result: The Score for this course is 3.22 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER:

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 4	COURSE CODE: U21CH2A2P / U21CH4A2P

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - II AND IV - SEMESTER - FIRST ALLIED COURSE - I

(For the candidates admitted from the year 2021-2022 onwards)

(FOR BOTANY, PHYSICS, ZOOLOGY AND N&D MAJORS)

ALLIED CHEMISTRY - II PRACTICAL

Course Educational Objectives:

1. To impart knowledge of students to estimate the acid and base of a substance through volumetric Method.
2. Students learn how to identify the functional group of an organic compound.

1. **Acidimetry and alkalimetry**
   a) Strong acid Versus Strong Base b) Weak acid Versus Strong base.
   c) Determination of hardness of water
2. **Permangnometry**
   a) Estimation of ferrous sulphate using KMnO4
   b) Estimation of oxalic acid using KMnO4
3. **Iodometry**
   a) Estimation of copper using thiosulphate b) Estimation of $K_2Cr_2O_7$
   b) Estimation of KMnO4 using thiosulphate

II ORGANIC ANALUSIS

A study of reactions of the following organic compounds:

1. Carbohydate
2. Amide
3. Aldehyde
4. Acid
5. Amine
6. Phenol

The students may be trained to perform the specific reactions like.

Test for element (nitrogen only) Aliphatic or aromatic,

Saturated or unsaturated and functional group present and record their observation.

Course outcomes

CO1	Students can apply the volumetric procedure to estimate the unknown substance.
CO2	Students can apply qualitative organic compound procedure to find out functional group.

Course Outcome (COs)	Programme Outcomes (POs)					Programme Specific Outcome (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	4	4	3	3	4	3	3	3	3	3.3
CO2	3	4	4	3	3	4	3	3	3	3	3.3
Mean overall score											**3.3**

Result: The Score for this course is 3.3 (High Relationship)

COURSE DESIGNER:

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 3	COURSE CODE: U21CH2A3 / U21CH4A3

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., CHEMISTRY - II & IV- SEMESTER - FIRST AND SECOND ALLIED COURSE - III

(For the candidates admitted from the year 2021-2022 onwards)

(FOR BOTANY, ZOOLOGY, PHYSICS AND MAJORS)
ALLIED CHEMISTRY - III

Course Educational Objectives:

1. Impart knowledge on basic concepts of bonding and MOT.
2. Impart knowledge of co - ordination compounds and aromaticity.

UNIT- I	**(15hours)** **1.1 Molecular Orbital theory:** Basic concepts of M.O. theory - Bonding and antibonding orbitals - Bond order - Application of M.O. theory to H_2, He_2, N_2, O_2 and F_2 molecules. **1.2 Compounds of Sulphur:** Preparation, Properties, uses and structures of per acids of sulphur and sodium thio sulphate.
UNIT-II	**(15hours)** **Co-Ordination Chemistry:** Nomenclature of Monomuclear complexes - Werner, Sidgwick theories Chelation - Application and structure of EDTA - Biological role of haemoglobin and chlorophyll (Elementaryidea)
UNIT - III	**(15hours)** **3.1 Electron displacement Effect:** Inductive Effect - Definition - Relative strengths of aliphatic mono carboxylic acids and aliphatic amines. **3.2 Stereoisomerism:** Optical isomerism - Optical activity - Chirality - Lactic and tartaric Acids - racemic mixture - resolution. Geometrical isomerism - Maleic and fumaric acids.
UNIT -IV	**(15hours)** **4.1 Aromatic Hydrocarbons:** Structure, Stability, Resonance and aromaticity of benzene. Electrophilic substitution reactions in benzene with mechanism - nitration, sulphonation, halogenation. Naphthalene - isolation, synthesis and properties. **4.2 Organic halogen Compounds:** Chemistry of Chloroform, Carbon tetra chloride, DDT, BHC and Freon -1, 2.
UNIT - V	**(15hours)** **5.1 Surface Chemistry:** Emulsions, Gels - Definition, Preparation, Properties and applications. **5.2** Chromatography - Column, paper and thin layer chromatography. **5.3** Catalysis - types, Mechanisms and industrial applications.

Text Books:

1. P.L.Soni and Mohan katyal "Text Book of Inorganic Chemistry" 20th Revised Edition, Sultan Chand1992.
2. R.B.Puri and L.R.Sharma "Principles of Inorganic Chemistry" Sultan Chand1989.
3. R.D.Madan "Modern inorganic Chemistry" S.Chand and Co. Pvt. Ltd., 1987 New Delhi.
4. P.L.Soni "Text Book of Inorganic Chemistry", Sultan Chand and Co., New Delhi.
5. B.S.Bahl and Arun Bahl 'Advanced Organic Chemistry' S.Chand and New Delhi.
6. B.R.Puri, L.R.Sharma amdmadan S.Pathania 'Principles of Physical Chemistry' Shoban Lal Nagin Chand and Co., Delhi.
7. P.L.Soni "Text Book of Physical Chemistry" Sultan Chand and Co., New Delhi.

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Course outcomes

CO1	Students can grasp the concept of Molecular orbital theory.
CO2	Students can understand the theory of co - ordination chemistry.
CO3	Students can understand the concept of Electron displacement effect.
CO4	Students can understand the concept of Aromaticity.
CO5	Students can understand the concept of Chromatography and catalysis

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.2**
CO2	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.2**
CO3	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.2**
CO4	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.2**
CO5	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.2**
Mean overall score											**3.22**

Result: The Score for this course is 3.22 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER:

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**

NUMBER OF CREDIT: 2	COURSE CODE: U21CH4N2

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005

B.Sc., PHYSICS - IV SEMESTER - NON - CORE ELECTIVE - II

(For the candidates admitted from the year 2021-2022 onwards)

WATER POLLUTION AND TREATMENT - II

Course Educational Objectives:

1. To impart knowledge of harmful effects of water contaminants.
2. To learn the different types of hardness of water.
3. To learn How to treat the hard water into soft water by using Zeolite process.

UNIT - I	**(6 hours)** Water pollution - Definition types of water pollution - Sources of water pollution - Sewage and domestic waste - their harmful effects - Brief idea about sewage treatment - ISO parameters for drinking water.
UNIT - II	**(6 hours)** Hardens of water and its types - disadvantages of hard water - softening - Zeolite process - Ion - Exchange process - water borne diseases like cholera, typhoid - stone formation - causes and remedies.
UNIT - III	**(6 hours)** Chemical analysis of water - hardness (Ca and Mg) using EDTA method. Total solids, dissolved oxygen, BOD, COD and TDS.
UNIT - IV	**(6 hours)** Origin, Characteristics. Effects and treatment of effluents from tannery and distillery industries.
UNIT - V	**(6 hours)** Characteristics of effluents from processing industry. Primary treatment - secondary treatment - Oxidation ponds and anaerobic digestion, Tertiary treatment - evaporation, reverse osmosis.

TEXT BOOKS

1. **Water pollution:** Modeling, measuring and prediction Editor: L.C. Wrobel and C. ABrebbia
2. Environmental chemistry by AK De, 8th edition, New age international publisher.
3. A Text book of Environmental Chemistry and Pollution control by Dr.S.S. Dara and Dr. D.D. Mishra.

Reference Books

1. Environmental Science by Kaushik and Kaushik
2. Water pollution and Management by CK Varshney, New age international (P) Ltd. Publishers.

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Course outcomes

CO1	To understand the permissible limit of drinking water using different standards.
CO2	To grasp the water treatment process for conditioning of water.
CO3	To accustom the importance of BOD, COD and TDS.
CO4	To analyse the effective treatment of effluents.
CO5	To understand the characteristic of effluents.

Nature of Course			
Knowledge and skill		Employability oriented	
Skill oriented		Entrepreneurship oriented	

Course Outcome (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcome (PSOs)**					**Mean Score of (Cos)**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.2**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3.0**
CO3	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.2**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3.0**
CO5	**4**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3.2**
Mean overall score											**3.12**

Result: The Score for this course is 3.12 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High

COURSE DESIGNER:

CHAIRMAN - BOS **CONTROLLER OF EXAMINATIONS**