CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

NATIONALLY ACCREDITED WITH "A" GRADE BY NAAC

ISO 9001:2015 Certified

TIRUCHIRAPPALLI

PG DEPARTMENT OF CHEMISTRY

B.Sc., Chemistry

Syllabus

2022-2023 and Onwards

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
PG DEPARTMENT OF CHEMISTRY

VISION

- To progress into a centre of superiority in Chemistry that will blend state-of-the-art practices in professional teaching in a communally enriching way, with the holistic progress of the students as its prime emphasis.

MISSION

- To produce graduates committed to integrity, professionalism and lifelong learning by widening their knowledge horizons in range and depth.
- To awaken the young minds and discover talents to achieve personal academic potential by creating an environment that promotes frequent interactions, independent thought, innovations, modern technologies and increased opportunities.
- To enhance the quality through basic and applied research frameworks, and encourage the students to take part in entrance and competitive examinations for higher studies and career.
- To enhance services to the community and build partnerships with the industry.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	**LEARNING ENVIRONMENT** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
PEO2	**ACADEMIC EXCELLENCE** To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY** To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY** To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES FOR B.Sc., Mathematics, B.Sc., Physics, B.Sc., Chemistry PROGRAMME

PO No.	**Programme Outcome** **On completion of B.Sc., Mathematics, B.Sc., Physics, B.Sc. Chemistry Programme, the students will be able to**
PO1	**Domain knowledge**: Analyze, design and develop solutions by applying firm fundamental concepts of basic sciences and expertise in discipline.
PO2	**Problem solving:** Ability to think rationally, analyse and solve problems adequately with practical knowledge to assess the environmental issues
PO3	**Creative thinking and Team Work**: Develop prudent decision-making skills and mobility to work in teams to solve multifaceted problems.
PO4	**Employability:** Self-study acclimatize them to observe effective interactive practices for practical learning enabling them to be a successful science graduate.
PO5	**Life Long Learning**: Assure consistent improvement in the performance and arouse interest to pursue higher studies in premium institutions.

PROGRAMME SPECIFIC OUTCOMES FOR B.Sc., CHEMISTRY

PSO NO	Programme Specific Outcomes Students of B.Sc., Chemistry will be able to	POs Addressed
PSO1	Afford a firm foundation in Chemistry that stresses scientific reasoning, analytical problem solving with a molecular perspective	PO1 PO2
PSO2	Acquire knowledge in theoretical and practical tools to exemplify entirely in the working environment.	PO4 PO5
PSO3	Inculcate scientific temperament and create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community.	PO3 PO4
PSO4	Scale up of chemical process after designing, optimization and analysis for developing products required for society.	PO4
PSO5	Expand the knowledge available opportunities related to chemistry in the government services through public service commission particularly in the field of food safety, health inspector, pharmacist etc.	PO4 PO5

Cauvery College for Women (Autonomous)
PG Department of Chemistry
B.Sc., Chemistry
(For the Candidates admitted from the Academic year 2022-2023 and onwards)

Semester	Part	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam			Total
							Hrs.	Marks		
								Int	Ext	
I	I	Language Course-I (LC)	Ikkala Illakkiyam	22ULT1	6	3	3	25	75	100
			Hindi Literature & Grammar – I	22ULH1						
			History of Popular Tales Literature and Sanskrit Story	22ULS1						
			Basic French – I	22ULF1						
	II	English Language Course- I(ELC)	Functional English for Effective Communication – I	22UE1	6	3	3	25	75	100
	III	Core Course – I(CC)	General Chemistry	22UCH1CC1	5	5	3	25	75	100
		Core Practical - I (CP)	General Chemistry (P)	22UCH1CC1P	3	3	3	40	60	100
		First Allied Course- I (AC)	A. Calculus and Fourier Series	22UCH1AC1A	4	3	3	25	75	100
			B. Biochemistry – I	22UCH1AC1B						
		First Allied Course- II (AC)	A. Algebra, Analytical Geometry of 3D and Trigonometry	22UCH1AC2A	4	3	3	25	75	100
			B. Biochemistry (P)	22UCH1AC2BP				40	60	
	IV	Ability Enhancement Compulsory Course-I (AECC)	UGC Jeevan Kaushal- Universal Human Values	22UGVE	2	2	-	100	-	100
	Total				**30**	**22**				**700**
II	I	Language Course-II(LC)	Idaikala Illakiyamum Puthinamum	22ULT2	5	3	3	25	75	100
			Hindi Literature & Grammar – II	22ULH2						
			Poetry Textual Grammar and Alankara	22ULS2						
			Basic French – II	22ULF2						
	II	English Language Course- II(ELC)	Functional English for Effective Communication – II	22UE2	6	3	3	25	75	100
	III	Core Course – II (CC)	Inorganic and Physical Chemistry	22UCH2CC2	5	5	3	25	75	100
		Core Practical - II (CP)	Preparation and Analysis of Industrial Compounds (P)	22UCH2CC2P	3	3	3	40	60	100
		Core Course -III (CC)	Material Science	22UCH2CC3	3	3	3	25	75	100
		First Allied Course – III (AC)	ODE, Laplace Transforms and Statistics	22UCH2AC3A	4	3	3	25	75	100
			Biochemistry – II	22UCH2AC3B						

		Ability Enhancement Compulsory Course-II (AECC)	Environmental Studies	22UGEVS	2	2	-	100	-	100
	IV	Ability Enhancement Compulsory Course-III (AECC)	Innovation and Entrepreneurship	22UGIE	2	1	-	100	-	100
	Extra Credit Course		SWAYAM		As per UGC Recommendation					
	Total				**30**	**23**				**800**
III	I	Language Course-III (LC)	Kappiyamum Nadagamum	22ULT3	5	3	3	25	75	100
			Hindi Literature & Grammar – III	22ULH3						
			Poetry Textual Grammar and Vakyarchana	22ULS3						
			Intermediate French - I	22ULF3						
	II	English Language Course-III(ELC)	Learning Grammar through Literature – I	22UE3	6	3	3	25	75	100
	III	Core Course– IV (CC)	Inorganic and Analytical Chemistry	22UCH3CC4	6	6	3	25	75	100
		Core Practical - III(CP)	Inorganic Qualitative Analysis (P)	22UCH3CC3P	3	3	3	40	60	100
		Second Allied Course-I (AC)	Physics – I	22UCH3AC4	4	3	3	25	75	100
		Second Allied Course- II (AP)	Physics (P)	22UCH3AC4P	4	3	3	40	60	100
	IV	Generic Elective Course- I (GEC)	Chemistry in Everyday life	22UCH3GEC1	2	2	3	25	75	100
			Basic Tamil	22ULC3BT1						
			Special Tamil	22ULC3ST1						
		Extra Credit Course	SWAYAM	As per UGC Recommendation						
		Total			**30**	**23**				**700**

15 Days INTERNSHIP during Semester Holidays

IV	I	Language Course - IV (LC)	Pandaiya Illakiyamum Urainadaiyum	22ULT4	6	3	3	25	75	100
			Hindi Literature and Functional Hindi	22ULH4						
			Drama, History of Drama Literature	22ULS4						
			Intermediate French - II	22ULF4						
	II	English Language Course – IV (ELC)	Learning Grammar through Literature – II	22UE4	6	3	3	25	75	100
	III	Core Course – V(CC)	Organic and Physical Chemistry	22UCH4CC5	6	6	3	25	75	100
		Core Practical - IV(CP)	Analysis and Preparation of Organic Compounds (P)	22UCH4CC4P	4	4	3	40	60	100
		Second Allied Course- III (AC)	Physics – II	22UCH4AC5	4	3	3	25	75	100
		Internship	Internship	22UCH4INT	-	2	-	-	-	100
	IV	Generic Elective Course- II (GEC)	Food Adulterants and Health Care	22UCH4GEC2	2	2	3	25	75	100
			Basic Tamil	22ULC4BT2						

			Special Tamil	22ULC4ST2						
		Skill Enhancement Course – I (SEC)	Food Chemistry (P)	22UCH4SEC1P	2	2	3	40	60	100
	Extra Credit Course		SWAYAM		As per UGC Recommendation					
		Total			**30**	**25**				**800**
V	III	Core Course – VI(CC)	Inorganic Chemistry - I	22UCH5CC6	6	6	3	25	75	100
		Core Practical – V(CP)	Physical Chemistry Practical	22UCH5CC5P	3	3	3	40	60	100
		Core Course - VII(CC)	Organic Chemistry - I	22UCH5CC7	6	6	3	25	75	100
		Core Course – VIII(CC)	Physical Chemistry - I	22UCH5CC8	6	6	3	25	75	100
		Discipline Specific Elective – I (DSE)	A. Nuclear and Industrial Chemistry	22UCH5DSE1A	5	4	3	25	75	100
			B. Basics of Nanoscience and Nanotechnology	22UCH5DSE1B						
			C. Dairy Chemistry	22UCH5DSE1C						
	IV	Ability Enhancement Compulsory Course-IV(AECC)	UGC Jeevan Kaushal - Professional Skills	22UGPS	2	2	-	100	-	100
		Skill Enhancement Course – II (SEC)	Chemistry of onsumer Products (P)	22UCH5SEC2P	2	2	3	40	60	100
	Extra Credit Course		SWAYAM		As per UGC Recommendation					
		Total			**30**	**29**				**700**
VI	III	Core Course – IX(CC)	Organic Chemistry - II	22UCH6CC9	5	5	3	25	75	100
		Core Course –X (CC)	Physical Chemistry - II	22UCH6CC10	5	5	3	25	75	100
		Core Course –XI (CC)	Cyber Security	22UGCS	5	4	3	25	75	100
		Core Practical – VI (CP)	Gravimetric Analysis and Physical Parameter (P)	22UCH6CC6P	4	4	3	40	60	100
		Discipline Specific Elective – II (DSE)	A. Analytical Techniques(P)	22UCH6DSE2AP	5	4	3	40	60	100
			B. CosmeticChemistry (P)	22UCH6DSE2BP						
			C. Analysis of Herbal Products (P)	22UCH6DSE2CP						
		Project	Project Work	22UCH6PW	5	4	-	-	100	100
	V	Gender Studies	Gender Studies	22UGGS	1	1	-	-	-	100
		Extension activity		22UGEA	0	1	0	-	-	-
		Total			**30**	**28**				**700**
				Grand Total	**180**	**150**				**4400**

Courses & Credits for UG Science Programmes

Part	Course	No. of Courses	Credits	Total Credits
I	Tamil/ Other Language	4	12	12
II	English	4	12	12
III	Core (Theory & Practical)	17	77	109
	Project Work	1	4	
	Internship	1	2	
	First Allied	3	9	
	Second Allied	3	9	
	DSE	2	8	
IV	GEC	2	4	15
	SEC	2	4	
	AECC-I -Universal Human Values	1	2	
	AECC-II-Environmental Studies	1	2	
	AECC-III-Innovation and Entrepreneurship	1	1	
	AECC-IV Professional Skills	1	2	
V	Gender Studies	1	1	02
	Extension Activities	–	1	
		44		**150**

*For BSc Mathematics & BCA

The Internal and external marks for theory and practical papers are as follows:

Subject	Internal Marks	External Marks
Theory	25	75
Practical	40	60

For Theory:

a) The passing minimum for CIA shall be40%out of 25 marks (i.e. 10marks)

b) The passing minimum for End Semester Examinations shall be 40% out of 75 marks (i.e.30 marks)

For Practical:

a) The passing minimum for CIA shall be 40% out of 40 marks (i.e. 16marks)

b) The passing minimum for End Semester Examinations shall be 40% out of 60 marks (i.e .24 marks)

Internal Component (Theory)

Component	Marks
Library	05
Assignment & Seminar	10
CIA -I	05
CIA-II	05
Total	**25**

Internal Component (Practical)

Component	Marks
Observation	05
Record	10
Continual performance	10
Model	15
Total	**40**

Question Paper Pattern

Answer all the questions
PART A (20X1=20)

Answer all the questions
PART B (5X5=25)

Answer any three questions
PART C (3X10=30)

Semester I	Internal Marks: 25	External Marks: 75		
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
22UCH1CC1	**GENERAL CHEMISTRY**	**CORE**	**5**	**5**

Course Objectives

- The course reviews the structure of the atom, which is a necessary pre-requisite in understanding the nature of chemical bonding in compounds.
- It discusses the periodicity in properties with reference to the s and p block, which is necessary in understanding their group chemistry.
- It provides basic knowledge about ionic, covalent, metallic bonding and reactive intermediates.
- To understand the crystal structures of ionic compounds and the theoretical aspects of volumetric and qualitative inorganic analysis

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recognize and report the fundamental principles of various field of chemistry	K1&K2
CO2	Illustrate the knowledge on atomic structure, bonding, isomerism, reaction intermediates, solid state and analytical techniques.	K3
CO3	Categorize the quantum numbers, elements, hybridization, stability of intermediates, crystal structure, titrations and acid radicals.	K4
CO4	Interpret the periodic properties, geometry of molecules and electronic displacement effects	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2	3	2	1	3	2
CO2	3	2	1	2	2	3	3	1	1	2
CO3	3	2	2	3	3	3	3	2	2	3
CO4	3	1	2	3	2	3	3	2	1	2

"1" – Slight (Low) Correlation
"2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation
"-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Atomic Structure and Periodic Properties:** Atomic orbitals, quantum, numbers - Principal, azimuthal, magnetic and spin quantum numbers and their significance. Principles governing the occupancy of electrons in various quantum levels-Pauli's exclusion- principle, Hund's rule, Aufbau Principle, (n+l) rule, stability of half-filled and fully filled orbitals. - Classification as s, p, d & f block elements - variation of periodic properties along period and group - Electronegativity scale - Pauling's scale, Allred and Rochow's scale - Mulliken's scale -variation of metallic characters - Factors influencing the periodic properties.	15	CO1, CO2,CO3 , CO4	K1, K2, K3, K4, K5
II	**Chemical Bonding-I:** Chemical Bond- definition - types of chemical bond - Illustration. Intermolecular forces - dipole - dipole interaction, induced dipole-induced dipole interaction. Hybridisation - Bond length - Bond energy- Bond angle - factors influencing BL, BE and BA. VB Theory - sp, sp^2, sp^3 hybridisation - geometry of NH_3, H_2O, ClF_3, IF_3. VSEPR theory - Molecular Orbital Theory - Homonuclear (H_2, He_2, O_2, O_2^+, O_2^-, N_2, F_2) and Heteronuclear molecules (CO, NO, HF).	15	CO1, CO2,CO3 , CO4	K1, K2, K3, K4, K5
III	**Basics of Organic Compounds:** IUPAC nomenclature of compounds- classification – isomerism - types - structural and stereo isomerism - cleavage of bonds: homolytic and heterolytic cleavages – Inductive- electromeric – mesomeric (resonance)- hyperconjugation and steric effects. Reaction intermediates- carbocation, carbanion, free radicals, carbenes and nitrenes – generation- properties - structure and stability.	15	CO1, CO2,CO3 , CO4	K1, K2, K3, K4, K5
IV	**Structure of Solids:** Crystal Structure - open and closed packed structures – covalent network- ionic and molecular structure - packing of ions in ccp and hcp - radius ratio - coordination number in ionic crystals - crystal structures-sodium chloride, zinc blende, wurtzite, rutile, cesium chloride, fluorite (unit cell diagrams). Crystal defects - Schottky and Frenkel defects.	15	CO1, CO2,CO3	K1, K2, K3, K4
V	**Analytical Methods-I:** Storage and handling of chemicals - handling of acids, ethers, toxic and poisonous chemicals and first aid procedure - Volumetric analysis - methods of expressing	15	CO1, CO2,CO3	K1, K2, K3, K4

	concentration - Primary and Secondary standards- Different types of titrations – Acid - Base Titrations, Tritimetric method, Iodimetry method - Iodometry Method, Complexometric Titration and Precipitation Titration. Qualitative Inorganic Analysis - Dry Test - Flame Test - Interfering acid radicals - Eliminating of Interfering acid radicals.			
VI	**Self-Study for Enrichment** **(Not to be included for External Examination)** Electronic configuration of polyelectronic atoms, Calculation of screening constant and effective nuclear charge - Lewis electron dot structure - Oxidation State and valency of element - Comparison of reactive intermediates based on their stability - Difference between ionic and covalent crystals - Do and Don't in the Science Lab	-	**CO1,CO2 ,CO3**	**K1, K2, K3, K4**

Text Books

1. Puri, B. R., Sharma, L. R. & Kalia, K. K. (2018). Principles of Inorganic Chemistry. 33rd edition. Shoban Lal Nagin Chand & Co., New Delhi.
2. Madan, R.D. (2019). Modern Inorganic Chemistry. 3rd edition. S. Chand & Company Ltd.
3. Bahl, B. S. & Arun Bahl (2021). Text book of Organic Chemistry, 22nd revised edition. S. Chand & Company Ltd.
4. Puri, B. R., Sharma, L. R. & Pathania, M. S. (2022). Principles of Physical Chemistry. 48th edition. Shoban Lal Nagin Chand & Co, New Delhi.
5. Gopalan, R., Subramanian, P. S. & Rengarajan, K. (2003). Elements of Analytical Chemistry. 2nd edition. Sultan Chand & Sons,

Reference Books

1. Soni, P. L. & Mohan Katyal. (2017). Text book of Inorganic Chemistry. 25th revised edition. Sultan Chand & Sons.
2. Vogel, A. I. (2000). Text Book of Quantitative Inorganic analysis including Elementary Instrumental Analysis. The English Language Book Society.

Web References

1. https://www.thoughtco.com/definition-of-quantum-number-604629
2. https://www.chemie-biologie.uni-siegen.de/ac/lehre/part1_solid_state.pdf
3. https://testbook.com/learn/chemistry-vsepr-theory/

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designers

1. Dr. P. Pungayee Alias Amirtham
2. Ms. A. Sharmila

Semester I	Internal Marks: 40			External Marks: 60
COURSECODE	**COURSETITLE**	**CATEGORY**	**Hrs/Week**	**CREDITS**
22UCH1CC1P	**GENERAL CHEMISTRY(P)**	**CORE**	**3**	**3**

Course Objectives

- To learn the techniques of titrimetric analyses.
- To know the estimation of several cations and anions and to know the estimation of total hardness of water.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statements On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recall the basic principles of volumetric analysis	K1
CO2	Demonstrate the experimental methods of volumetric analysis and to estimate the chlorine content in bleaching powder and copper in brass	K2
CO3	Determine the hardness of water and saponification value of oil	K3

Mapping of CO with PO and PSO

CO	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3	-	2	3	3	2
CO2	2	2	2	3	2	3	3	3	3	2
CO3	2	3	3	1	2	2	3	3	2	1

"1"–Slight(Low) Correlation "2"–Moderate(Medium)Correlation
"3"–Substantial(High) Correlation "-"indicates there is no correlation.

Syllabus

I Titrimetric Quantitative Analysis

1. Estimation of HCl using NaOH as link and standard oxalic acid solution
2. Estimation of Na2CO3using HCl as link and standard Na2CO3solution
3. Estimation of oxalic acid using KMnO4 as link and standard oxalic acid solution
4. Estimation of Iron(II) sulphate using KMnO4 as link and standard Mohr's salt solution
5. Estimation of KMnO4 using thio as link and standard K2Cr2O7solution.
6. Estimation of copper(II) sulphate using K2Cr2O7solution
7. Estimation of Mg(II) by EDTA solution
8. Estimation of Ca(II) by EDTA solution
9. Estimation of chloride ion

II. Applied Experiments

1. Estimation of total hardness of water
2. Estimation of bleaching powder
3. Estimation of saponification value of an oil
4. Estimation of copper in brass

Text Books

1. Venkateswaran,V. &Veeraswamy, R.& Kuandaivelu. (1997). Basic Principles of Practical Chemistry. 2nd edition. New Delhi, Sultan Chand & Sons.
2. Bassett,J. (1985). Text Book of Quantitative Inorganic Analysis. 4th edition. ELBS Longman.

Reference Book

1. Vogel A. I. (2000) Text book of quantitative inorganic analysis. The English language book Society.

Web References

1. https://www.youtube.com/watch?v=wh6-cYjNNiA
2. https://chemlab.truman.edu/files/2015/07/edta.pdf
3. https://www.slideshare.net/mithilfaldesai/estimation-of-feii-ions-by-titrating-against-k2-cr2o7-using-internal-indicator
4. https://byjus.com/chemistry/titration-of-oxalic-acid-with-kmno4/
5. http://www.titrations.info/EDTA-titration-calcium
6. https://www.youtube.com/watch?v=qmVQs6Q7tso

Pedagogy

Demonstration and Practical sessions

Course Designer

- Dr. C. Rajarajeswari

FIRST ALLIED COURSE-I (AC)

CALCULUS AND FOURIER SERIES

(For B.Sc Physics & Chemistry)

(2022-2023 and Onwards)

Semester I	Internal Marks: 25		ExternalMarks:75	
COURSECODE	**COURSETITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
22UPH1AC1/ 22UCH1AC1	**CALCULUS AND FOURIER SERIES**	**ALLIED**	**4**	**3**

Course Objective

- Explore the students with mathematical methods formatted for their major concepts and train them in basic Integrations.
- Analyze mathematical statements and expressions.
- Evaluate the fundamental concepts of Differentiation and Integration.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Explain the concepts of Calculus and Fourier series	K1,K2
CO2	Classify the problem models in the respective area.	K3
CO3	Solve various types of problems in the corresponding stream.	K3
CO4	Identify the properties of solutions in the core area.	K3
CO5	Discover the applications of Calculus and Fourier series.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	3	2	2	2	2
CO2	3	2	2	2	2	3	2	2	2	2
CO3	3	2	2	2	2	3	2	2	2	2
CO4	3	2	2	2	2	3	2	2	2	2
CO5	3	2	2	2	2	3	2	2	2	2

"1" – Slight (Low) Correlation ¬ "2" – Moderate (Medium) Correlation ¬
"3" – Substantial (High) Correlation ¬ "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Successive Differentiation:** The n^{th} derivative – Standard results – Method of splitting the fractional expressions into partial fractions - Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the n^{th} derivative of a product(proof not needed) –A complete formal proof by induction (proof not needed) - Curvature-Circle, radius and center of curvature - Cartesian formula for the radius of curvature–Simple problems in all these.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	**Evaluation of integrals:** Integration of Rational algebraic functions– Rule (a)– Rule (b) Integration of the form $\int \frac{lx+m}{ax^2+bx+c}dx$ – Rule (c)- Integration of Irrational functions : Integration of the form $\int \frac{px+q}{\sqrt{ax^2+bx+c}}dx$ –Integration of the form $\int \frac{dx}{(x+p)\sqrt{ax^2+bx+c}}$ - Integration of the form $\int \frac{dx}{a+b\cos x}$.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	**Reduction Formula:** Properties of definite integrals –Reduction formula (when n is a positive integer) for 1] $\int e^{ax}x^n dx$ 2] $\int x^n \cos ax dx$ 3] $\int \sin^n x dx$ 4] $\int_0^{\frac{\pi}{2}} \sin^n x \cos^m dx$ (without proof) and illustrations.	13	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	**Double and Triple Integrals:** Definition of the double integral-Evaluation of Double integral(Problems Only)-Changeof order and evaluation of the double integral (Problems only).	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	**Fourier Series:** Definition of Fourier Series – Finding the Fourier	10	CO1, CO2, CO3,	K1, K2, K3,

	Coefficients for a given periodic function with period 2π - Even and Odd functions–Half range Fourier series.		CO4, CO5	K4
VI	Self-Study for Enrichment : (Not to be included for External examination) Radius of curvature when the curve is in Polar co-ordinates - (i) $\int \frac{dx}{ax^2+bx+c}$ (ii) $\int \frac{dx}{\sqrt{ax^2+bx+c}}$ - (1) $\int \cos^n x dx$ (2) $\int_0^{\frac{\pi}{2}} cos^n\, dx$ -Triple Integrals in simple cases(Problems Only)- Development in cosine series - Development in sine series.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

1. Narayanan, S & Manichavasagam Pillai, T.K. (2015). *Calculus Volume I*.S. Viswanathan Pvt Limited.
2. Narayanan, S & Manichavasagam Pillai, T.K. (2015). *Calculus Volume II.* S. Viswanathan Pvt Limited.
3. Narayanan, S & Manichavasagam Pillai, T.K. (2015).*Calculus Volume III.* S. Viswanathan Pvt Limited.

UNIT–I Chapter 3:Sections 1.1 to 1.6,2.1,2.2[1]
Chapter 10:Sections 2.1 to 2.3 [1]
UNIT-II Chapter 1:Sections 7.1,7.3,7.4,8(CASE II, CASE V), 9 [2]
UNIT-III Chapter 1:Sections 11,13.1 to 13.5 [2]
UNIT-IV Chapter 5:Sections 2.1,2.2,4 [2]
UNIT-V Chapter 6:Sections 1to 4[3]

Reference Books

1. Sankarappan, S. Arulmozhi,G. (2006). Vector Calculus, Fourier series and Fourier Transforms. Vijay Nicole Imprints Private Limited.
2. Vittal, P.R.(2014). Allied Mathematics. Margham Publications.
3. Singaravelu, A.(2003). Differential Calculus and Trigonometry. R Publication.

Web Links

1. **https://www.youtube.com/watch?v=tBtF3Lr-VLk&t=64s**
2. **https://www.youtube.com/watch?v=Z4oSGuAZrZM**
3. **https://www.youtube.com/watch?v=w6llnAQX_f8**
4. **https://www.youtube.com/watch?v=LMcj8o0ERNE**
5. **https://www.youtube.com/watch?v=_GAwQGCyWy0**
6. **https://www.youtube.com/watch?v=9X3gqehcFII**

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designers

1. Dr. P. Saranya
2. Ms. L. Mahalakshmi
3. Ms. P. Geethanjali

Semester I	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hrs/Week**	**CREDITS**
22UCH1AC1B	**BIOCHEMISTRY-I**	**ALLIED**	**4**	**3**

Course Objectives

- To describe the chemistry of carbohydrates, proteins and lipids.
- To understand the importance of biomolecules in living organisms.
- To gain knowledge about the diseases occurring due to alterations in the levels of biomolecules.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recall the basic concepts and understand the structure, functions of the biomolecules in living organisms	K1&K2
CO2	Apply the concepts to illustrate the role of biomolecules in various metabolic pathways	K3
CO3	Analyze the results of routine biochemical analysis using theoretical concepts	K4
CO4	Evaluate the dimensions of diseases associated with the metabolic disorders	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	2	2	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	3	3	2	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Carbohydrates:** Definition of carbohydrate - Digestion and absorption of Glucose - Fate of glucose after absorption (preliminary idea). Intermediary metabolism of carbohydrates -glycogenesis, glycogenolysis, glycolysis, gluconeogenesis. Regulation of blood sugar - normal range - Hypoglycaemia and Hyperglycaemia - glucose tolerance tests - Diabetic Mellitus - Types and symptoms - glycosuria.	**13**	**CO1, CO2, CO3, CO4**	**K1, K2, K3, K4, K5**
II	**Proteins**: Proteins - Definition - Peptide bond formation - classification of proteins based on its physical properties - structure of proteins: primary structure - secondary structure - tertiary structure - denaturation. Absorption- metabolic pool - general pathway of protein metabolism- in born errors of amino acid metabolism - Phenylketonuria, Alkaptonuria (Black urine syndrome) and albinism.	**13**	**CO1, CO2, CO3, CO4**	**K1, K2, K3, K4, K5**
III	**Lipids:** Definition – lipids - oxidation of fatty acids - β-oxidation cycle of saturated fatty acids. Ketogenesis, Ketosis – Ketolysis - role of liver in fat metabolism - Cholesterol – absorption - factors influencing absorption. Lipid profile – cholesterol – Triglycerides- lipoproteins - HDL and LDL. Fatty liver - Inborn errors of lipid metabolism.	**12**	**CO1, CO2, CO3, CO4**	**K1, K2, K3, K4, K5**
IV	**Enzymes:** Definition- classification- examples - Glucose oxidase - mechanism of enzyme action- Factors influencing enzyme action. Digestive enzymes and their action - salivary digestion - gastric digestion - pancreatic and intestinal digestion- Thyroxine - agents interfering with the synthesis of thyroid hormone - Diseases associated with abnormal metabolism of thyroxin.	**12**	**CO1, CO2, CO3, CO4**	**K1, K2, K3, K4, K5**
V	**Blood and Bile Pigments:** Blood - functions of plasma proteins - blood groups and Rh factor - coagulation of blood mechanism. Haemoglobin - structure and properties of Hb – metabolism -Bile pigments - examples - Types of Jaundice (preliminary idea).	**10**	**CO1, CO2, CO3, CO4**	**K1, K2, K3, K4, K5**
VI	**Self-Study for Enrichment** **be included for External Examination)** Structure and classification of carbohydrates - Categories of amino acids - Types and functions of lipids - Properties and uses of enzymes - Properties and examples of bile pigments.	**-**	**CO1**	**K1, K2**

Text Books

1. Ambika, S. (2012). Fundamentals of Biochemistry for Medical Students. (7th ed.). Iippincott Williams & Wilkins.
2. Fatima, D., Nallasingam, K., Narayanan, L. M., Arumugam, N., Meyyan, R. P., &Prasanna Kumar, S. (2019). Biochemistry. (7th ed.). Saras Publication.
3. Jain, J. L., Jain, S., &Jain, N. (2016). Fundamentals of Biochemistry.(Revised ed.). S Chand & Co Ltd.

Reference Books

1. Annie Ragland, & Arumugam, N. (2015). Biochemistry and Biophysics. (3rd ed.). Saras Publication.
2. Nelson,D. L., & Cox. M. M. (2017). Lehninger Principles of Biochemistry. (7thed.). WH Freeman.
3. Voet, D., Pratt,C. W., &Voet, J. G. (2012). Principles of Biochemistry. (4th ed.). John Wiley & Sons.
4. Berg, J. M., Stryer, L., Tymoczko, J., & Gatto, G. (2019). Biochemistry. (9th ed.). WH Freeman.
5. Mathews, C. K., Van Holde, K. E., & Ahern, K. G. (2000). Biochemistry. (3rd ed.). Pearson.

Web References

1. https://www.biologie.ens.fr/~mthomas/L3/intro_biologie/2-sucres-lipides-acides-nucleiques.pdf
2. https://bio.libretexts.org/@go/page/1861
3. https://bio.libretexts.org/@go/page/16827
4. https://bio.libretexts.org/@go/page/16101
5. https://bio.libretexts.org/@go/page/16828

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designer

1. Dr. S. Saranya

FIRST ALLIED COURSE-II (AC)

ALGEBRA, ANALYTICAL GEOMETRY OF 3D & TRIGONOMETRY

(For B.Sc Physics & Chemistry)

(2022-2023 and Onwards)

Semester I	Internal Marks: 25		ExternalMarks:75	
COURSECODE	**COURSETITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
22UPH1AC2/ 22UCH1AC2	**ALGEBRA, ANALYTICAL GEOMETRY OF 3D & TRIGONOMETRYs**	**ALLIED**	**4**	**3**

Course Objective

- Analyze the mathematical methods formatted for their major concepts.
- Evaluate the problems in Algebra and Trigonometry.
- Explain the basics of Three-Dimensional geometry.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Explain various notions in Algebra, Analytical Geometry of 3D& Trigonometry.	K1,K2
CO2	Identify the problem models.	K3
CO3	Apply the concepts of Algebra, Analytical Geometry of 3D& Trigonometry.	K3
CO4	Solve the given problems in the respective stream.	K3
CO5	Analyze the applications of the core area.	K4

Mapping of CO withPO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	3	2	3	2	2	2	2
CO2	2	2	2	3	2	3	2	2	2	2
CO3	2	2	2	3	2	3	2	2	2	2
CO4	2	2	2	3	2	3	2	2	2	2
CO5	2	2	2	3	2	3	2	2	2	2

“1” – Slight (Low) Correlation ¬ “2” – Moderate (Medium) Correlation ¬
“3” – Substantial (High) Correlation ¬ “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Series Expansion:** Application of Binomial Theorem to summation of series – Approximate values – Summation of series by Exponential series - Summation of series by Logarithmic series (Formulae only).	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
II	**Matrices:** Matrix-Special types of Matrices –Scalar multiplication of a matrix-Equality of matrices-Addition of matrices-Subtraction of matrices- Symmetric matrix-Skew symmetric matrix-Hermitian and Skew Hermitian matrix –Multiplication of matrix – Inverse matrix-Inner product-Solution of simultaneous equations-Rank of a matrix-Elementary transformation of a matrix-A system of *m* homogeneous linear equations in *n* unknowns-Linear dependence and independence of vectors-System of non-homogeneous linear equations - Eigen values and Eigenvectors.(Applications only)	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
III	**Three Dimensional Geometry:** The Sphere – Definition- The equation of a sphere when the center and radius are given-The equation of a sphere to find its center and radius- The length of the Tangent Plane from a point to the sphere – The Plane Section of a sphere – Equation of a circle on a sphere – Intersection of two spheres in a circle.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
IV	**Expansion of Trigonometric functions:** Expansions of $\cos n\theta$ and $\sin n\theta$ - Expansion of $\tan(A+B+C+....)$ (omitting examples on formation of equations) –Powers of sines and cosines of θ in terms of functions of multiples of θ – Expansions of $\cos^n\theta$ when n is a positive integer – Expansions of $\sin^n\theta$ when n is a positive integer – Expansions of $\sin\theta$ and $\cos\theta$ in a series of ascending powers of θ - The expansions of $\sin\theta$ and $\cos\theta$ to find the limits of certain expressions.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.

V	**Hyperbolic functions:** Hyperbolic functions – Relation between hyperbolic functions – Relations between hyperbolic functions and circular functions - Inverse hyperbolic functions.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.
VI	Self-Study for Enrichment : (Not to be included for External examination) Series which can be summed up by the Logarithmic series - Simple applications of Matrices- The equation of the tangent plane to the sphere at a point. (Only problems) - Expansion of $\tan\theta$ in terms of powers of θ - Separation of real and imaginary parts of tanh(x+iy).	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4.

Text Books

1. Manichavasagam Pillai, T.K. Natarajan,T.& Ganapathy, K.S.(2015). *Algebra, Volume I*.S. Viswanathan Pvt Limited.
2. Manichavasagam Pillai, T.K. (2015). *Algebra, Volume II.* S.Viswanathan Pvt Limited.
3. Manichavasagam Pillai, T.K. &Natarajan,T. (2016). *A Text book of Analytical Geometry Part-II 3D.* New Gamma Publishers.
4. Manichavasagam Pillai, T.K. & Narayanan,S.(2013). *Trigonometry.* S. Viswanathan Pvt Limited.

UNIT–I Chapter 3:Sections 10,14[1]
Chapter 4:Sections 3,7,9 [1]

UNIT-II Chapter 2:Sections 1 to 16 [2]

UNIT-III Chapter 4:Sections 1-5,6,6.1,7,8 [3]

UNIT-IV Chapter 3:Sections 1 to 4, 4.1,5,5.1[4]

UNIT-V Chapter 4:Sections 1,2,2.1 to 2.3[4]

Reference Books

1. Arumugam,S. Issac,A. (2017). Analytical Geometry 3D and Vector calculus. New Gamma Publishing house.
2. Pandey, H.D. Khan, M.Q. & Gupta, B.N.(2011). A Text Book of Analytical Geometry and Vector Analysis. Wisdom Press.
3. Singaravelu, A. (2003). Differential Calculus and Trigonometry. R Publication.

Web Links

1. **https://www.youtube.com/watch?v=JayFh5EJHcU**
2. **https://www.youtube.com/watch?v=h5urBuE4Xhg**
3. **https://www.youtube.com/watch?v=59z6eBynJuw**
4. **https://www.youtube.com/watch?v=9DyPyJb2N9g**
5. **https://www.youtube.com/watch?v=HOk2XLeFPDk**
6. **https://www.youtube.com/watch?v=G1C1Z5aTZSQ**

Pedagogy

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

Course Designers

1. Dr. P. Saranya
2. Dr. L. Mahalakshmi
3. Ms. P. Geethanjali

Semester I	Internal Marks: 40		External Marks: 60	
COURSE CODE	**COURSETITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
22UCH1AC2BP	**BIOCHEMISTRY(P)**	**ALLIED**	**4**	**3**

Course Objective

- To expertise the student for analysis of any biological sample for identification of its chemical composition

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Identify and classify the given compounds of carbohydrates, amino acids and lipids based on the characteristic reactions	K1&K2
CO2	Prepare and isolate the biomolecules present in food products	K3
CO3	Estimate the amount of carbohydrate and protein present in the given solution	K4
CO4	Assess the quality and quantity of biomolecules by analytical methods	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	2	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	2	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation
"2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation
"-" indicates there is no correlation.

Syllabus

I QUALITATIVE ANALYSIS

(i) Preparation

1. Preparation of buffers (acidic, neutral and alkaline) and determination of pH.
2. Preparation of osazones.

(ii) Qualitative Identification

3. Qualitative identification of carbohydrates
    - Monosaccharides : Pentose, Glucose, Fructose, Mannose
    - Disaccharides : Sucrose. Maltose, Lactose
    - Polysaccharides : Starch, Dextrin and Glycogen
4. Qualitative identification of amino acids
    - Aliphatic : Histidine, Arginine, &Proline
    - Aromatic : Tyrosine, Tryptophan, Phenylalanine
    - Sulphur containing amino acids: Cystein, Cystine & Methionine
5. Qualitative identification of lipids - solubility, saponification, acrolein test, Salkowski test, Lieberman-Burchard test.

(iii) Isolation

6. Isolation of casein from milk.
7. Isolation of egg albumin from egg white.
8. Isolation of starch from potato.

II QUANTITATIVE ANALYSIS

1. Estimation of glucose.
2. Estimation of protein.

III DEMONSTRATION

1. Blood group test

Text Books

1. Rajan, S., & Selvi Christy. R. (2018). Experimental Procedures in Life Sciences. CBS Publishers & Distributors.
2. Gnanpragasam, N. S., & Ramamurthy. G. (2013). Organic Chemistry Lab Manual. Viswanathan, S., Printers & Publishers.

Reference Books

1. Zubay, C. (1986). Biochemistry. Addison Wesley.
2. Wood, W. B. (1981). Biochemistry- A problem Approach. Addison Wesley.

Web References

1. http://nec.edu.np/Publications/Chemistry_LAB_Manual/Experiment%204.pdf
2. https://microbenotes.com/osazone-test/
3. https://www.mlsu.ac.in/econtents/1616_Biochemical%20Tests%20of%20Carbohydrate,%20protein,%

20lipids%20and%20salivary%20amylase.pdf

4. https://vlab.amrita.edu/?sub=2&brch=191&sim=692&cnt=2
5. https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/files/2%20ESTIMATION%20OF%20PROTEIN%20BY%20LOWRY.pdf

Pedagogy

Demonstration and practical sessions

Course Designer

1. Dr. S. Saranya

Semester II	Internal Marks: 25	External Marks: 75		
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
22UCH2CC2	**INORGANIC AND PHYSICAL CHEMISTRY**	**CORE**	**5**	**5**

Course Objectives

- The course reviews the chemical bonding, which is a necessary pre-requisite in understanding the nature of chemical bonding existing in compounds.
- Discusses about the sand p block elements.
- Provides basic knowledge about liquid and colloidal state of matter.
- Deliberates the basic concepts of thermochemistry.
- Stretches the knowledge about the different techniques involved in metallurgy.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recognize and account the fundamental ideas of bonding, s, p block elements, thermochemistry, metallurgy and colloidal state	K1&K2
CO2	Exemplify the knowledge on bonding, periodic elements, liquids, colloids, enthalpies and refining process	K3
CO3	Categorize the types of bonding, s block elements, liquid and colloidal state of compounds and their properties.	K4
CO4	Interpret the percent ionic character, dipole moment, Hess's law and techniques used in metallurgy.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2	3	2	1	3	2
CO2	3	2	1	2	2	3	3	1	1	2
CO3	3	2	2	3	3	3	3	2	2	3
CO4	3	1	2	3	2	3	3	2	1	2

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	Cos	COGNITIVE LEVEL
I	**Chemical Bonding – II** Ionic Bond – Lattice Energy- Born-Haber Cycle- polarity in covalent bonds – covalent character of Ionic bond - Fajan's rule - effects of Polarisation- percent ionic character- electronegativity difference. Dipole moment and structure of molecules- Hydrogen bonding - properties, types and consequences.	15	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
II	**s and p- Block Elements** s- block elements: General characteristics, comparative study of alkali and alkaline earth metals - oxides. Diagonal relationship between Li and Mg, Be and Al. p-Block Elements: General characteristic of groups 13-17, Boron and its compounds-Boric acid- Borax - Boron nitride - Boron trihalide – diborane - compounds of silicon - silicates, silicones and $SiCl_4$.	15	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
III	**Metallurgy** Introduction to Transition metals-Metallurgy-various steps in metallurgy – grinding -pulverizing - concentration (ore dressing)-hand picking - gravity separation - froth floatation, electromagnetic separation, chemical separation - calcinations and roasting - smelting, alumino thermic process- purification of metals - zone refining- vapour phase and electrolytic refining.	15	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
IV	**Liquid and colloidal State**: Liquid State - physical properties of liquids – vapour pressure- surface tension- viscosity - refraction- their determination. Liquid Crystals - classification of thermotropic liquid crystals – Smectic - Nematric -Cholesteric Liquid	15	CO1, CO2, CO3	K1, K2, K3, K4

	Crystals- Disc-shaped Liquid Crystals- Polymer Liquid Crystals. Colloids – types of colloidal solutions – classification – preparation – purification – properties – determination of size of particles – gels and their applications –application of colloids.			
V	**Thermochemistry** Change of internal energy in chemical reaction-change of enthalpy in chemical reaction-enthalpy of reaction at constant volume and constant pressure- enthalpy of neutralization- enthalpy of dissociation- enthalpy of formation-enthalpies of compounds-enthalpies of formation of ions- Kirchoff's equation-Hesse's law and its application	**15**	**CO1, CO2, CO3**	**K1, K2, K3, K4**
VI	**Self-Study for Enrichment** **(Not to be included for External Examination)** Bond characteristics- periodic table-general properties of states of matter- exothermic- endothermic changes - free energy change in chemical reactions- minerals and ores.	**-**	**CO1, CO2, CO3**	**K1, K2, K3, K4**

Text Books

1. Puri, B. R., Sharma, L. R.& Kalia, K. K. (2018).Principles of Inorganic Chemistry. Shoban Lal Nagin Chand & Co., 33rd edition, New Delhi,.
2. Madan, R.D. (2019). Modern Inorganic Chemistry. 3rd edition, S. Chand & Company Ltd,
3. J. D. Lee, (2014). New Concise Inorganic Chemistry‖,5th edition, Oxford Publishers.
4. Puri, B.R., Sharma, L.R. &Pathania, M.S. (2022). Principles of Physical Chemistry. Shoban Lal 48th edition. Nagin Chand & Co, New Delhi.

Reference Books

1. Soni, P.L.& Mohan Katyal. (2017). Text book of Inorganic Chemistry. 25th revised edition, Sultan Chand & Sons.
2. Peter Atkins, Julio de Paula, and James Keeler, (2017).Atkins' Physical Chemistry‖, 11th Edition, Oxford University Press, UK.

Web Reference

1. Chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_(Inorganic_Chemistry).
2. https://www.chemie-biologie.uni-siegen.de/ac/lehre/part1_liquid_state.pdf
3. https://byjus.com/jee/colloids

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designers

1. Dr. K. Uma Sivakami

Semester II	Internal Marks: 40		External Marks: 60	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
22UCH2CC2P	**PREPARATION AND ANALYSIS OF INDUSTRIAL COMPOUNDS (P)**	**CORE PRACTICAL**	**3**	**3**

Course Objectives

- Learn to the diverse roles of inorganic materials in the industry
- Gain knowledge on fertilizers.
- Explain the principle, working and applications of volumetric analysis.
- Perform quantitative analytical methods by titrations.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Provide graduates with the skills, information and learning tools required to carry out professional research, and development and production activities in the field of chemistry.	K1
CO2	Explain the suitability of fertilizers for different kinds of crops and soil.	K2
CO3	Prepare students for professional participation in Chemical industries so as to adapt themselves to jobs which are problem solving	K3
CO4	Infer the students to be result-oriented in the chemical, biochemical and applied technological fields.	K4
CO5	Apply the concept of volumetric analysis in industrial analysis	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	2	3	3	3	3
CO2	2	2	2	2	2	2	2	3	2	2
CO3	3	2	2	2	2	2	2	2	2	2
CO4	3	2	3	2	2	3	2	2	2	3
CO5	2	3	2	3	3	3	2	2	3	3

"1" – Slight (Low) Correlation ¬ "2" – Moderate (Medium) Correlation ¬
"3" – Substantial (High) Correlation ¬ "-" indicates there is no correlation.

Syllabus

Quantitative Analysis

1. Analysis of sodium bicarbonate present in a commercial sample of soda mint tablet.
2. Determination of total alkali content of a commercial detergent.
3. Determination of free acidity in ammonium sulphate fertilizer.
4. Estimation of phosphoric acid in superphosphate fertilizer.
5. Estimation of calcium in chalk – Permanganometry
6. Estimation of citric acid in orange or lemon

Qualitative Analysis

1. Limit test for sulphate, chloride, barium, iron and magnesium ions.
2. Assay of inorganic compounds
3. Purity checking of compounds

Preparation

1. Preparation of Ferric alum
2. Preparation of Potash alum
3. Preparation of Mohr's salt
4. Preparation of tetrammine copper (II) sulphate
5. Preparation of soap
6. Preparation of Talcum powder
7. Preparation of Caprolactam.

Text Books

1. Svehla, G. (1996). Vogel's Qualitative Inorganic Analysis: Prentice Hall.
2. Satinder, K. Juneja ., Dr. Aran, K. (2020). Inorganic Materials of Industrial Importance: S Vinesh & Co.

Reference Books

1. Kingery, W. D., Bowen H. K.; Uhlmann, D. R. (1976). Introduction to Ceramics, Wiley Publishers: New Delhi.
2. Gopalan, R., Venkappayya, D., Nagarajan, S. (2004). Engineering Chemistry: Vikas Publications.

Web References

1. https://eusalt.com/_library/_files/EuSalt_AS007-2005_Potassium_-_Sodium_Tetraphenylborate_Volumetric_Method.pdf
2. http://wwwchem.uwimona.edu.jm/lab_manuals/c10expt3.html
3. https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2016112814
4. https://www.google.com/search?q=Determination+of+free+acidity+in+ammonium+sulphate+fertilizer.
5. https://www.researchgate.net/publication/344350736_Determination_of_alkali_content_total_fatty_matter_in_cleansing_agents
6. https://www.tifr.res.in/~pkjoshi/articles/sodamint.pdf

Pedagogy

Table Work

Course Designers

1. Dr. P. Pungayee Alias Amirtham
2. Dr. G. Sivasankari.

Semester II	Internal Marks: 25		ExternalMarks:75	
COURSECODE	**COURSETITLE**	**CATEGORY**	**Hrs / Week**	**CREDITS**
22UCH2CC3	**MATERIAL SCIENCE**	**CORE**	**3**	**3**

Course Objective

- To describe the structure of ceramics and magnetic materials.
- To understand the importance of energy storage materials.
- To gain knowledge about the fuel cell power plant.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recall the basic concepts of magnetic, conductors and understand the energy storage materials.	K1&K2
CO2	Apply the concepts to illustrate the role of energy in various materials.	K3
CO3	Analyze the results of different materials using theoretical concepts.	K4
CO4	Evaluate the applications of magnetic, semiconductors, LED, batteries and fuel cell power plant.	K5

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	3	3	2	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Conductors and Insulators:** Introduction - semiconductors - classification of semiconductors - intrinsic and extrinsic - n-type and p-type - crystal structure and bonding in Si and Ge - elemental and compound semiconductors - applications - Insulators.	9	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
II	**Magnetic Materials:** Magnetic dipole - dipole moment - magnetic field strength - magnetic susceptibility - diamagnetic - paramagnetic - ferromagnetic - curie temperature - hysteresis curve - antiferromagnetic - ferrimagnetic - hard and soft magnetic materials - properties - examples - applications.	9	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
III	**Ceramics and Display Devices:** Classification of ceramics - structure of the ceramics- compounds with NaCl, Fluorite and Perovskite structure - properties of ceramics- applications - active display devices- Light Emitting Diode (LED) - passive display devices - Liquid Crystal Display (LCD)- applications.	9	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
IV	**Materials for Energy Storage:** Batteries – primary and secondary batteries - lithium-lead acid batteries - nickel cadmium batteries - advanced batteries - super capacitors for energy storage - role of carbon nanomaterials as electrodes in batteries and super capacitors.	9	CO1, CO2, CO3, CO4	K1, K2, K3, K4, K5
V	**Fuel cells:** Introduction - difference between batteries and fuel cells - components of fuel cells - principle of working of fuel cell - performance characteristics of fuel cells - efficiency of fuel cell - fuel cell power	9	CO1, CO2, CO3,	K1, K2, K3, K4, K5

	plant - fuel processor - fuel cell power section - power conditioner - Advantages and disadvantages of fuel cell power plant.		**CO4**	
VI	**Self Study for Enrichment** **(Not to be included for External Examination)** Bonding in metals and semi-conductors - reason for ferromagnetic spin alignment are contrasted with superconducting spin pairing - ceramic processing - fuel cell stack – hydrogen production and storage.	-	**CO1**	**K1, K2**

Text Books

1. Rajendran, V. & Marikani, A. (2009). Materials Science. (9th ed.). Tata McGraw-Hill Publishing Company Limited.
2. VanVlack, L. H., (1975). Elements of materials science and engineering. (6th ed.). Addison-Wesley.
3. Jain, P.C., & Jain, M., (2013). Engineering Chemistry. (6th ed.). DhanpatRai &Sons.

Reference Books

1. Callister, W.D., & Rethwisch, G.D., (2018). Materials Science and Engineering: An Introduction. (10th ed.). Wiley.

2. Kingery, W.D., Bowen, & H.K., Ulhmann, D.R., (1976). Introduction to Ceramics. (2nded.). Wiley.

3. Sharma, B.K., (1997). Industrial Chemistry. (8th ed.). Goel Publishing.

Web References

1. https://www.britannica.com/science/semiconductor
2. https://advancedmagnetsource.com/2018/09/03/types-magnetic-materials/
3. https://mse.umd.edu/about/what-is-mse/ceramics
4. https://www.european-mrs.com/battery-and-energy-storage-devices-materials-eco-design-emrs
5. https://georgiasouthern.libguides.com/c.php?g=943952&p=6804654

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designer

1. Ms. P. Thamizhini

ALLIED COURSE – III

(For Chemistry)

ODE, LAPLACE TRANSFORMS AND STATISTICS

(2022-2023 Onwards)

Semester II	Internal Marks: 25		ExternalMarks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hrs /Week**	**CREDITS**
22UCH2AC3A	**ODE,LAPLACE TRANSFORMS AND STATISTICS**	**ALLIED**	**4**	**3**

Course Objective

- **Explain** the basics of Ordinary Differential Equations.
- **Explore** the mathematical methods formatted for major concepts.
- **Emphasize** them in the field of Statistics.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Knowledge Level
CO1	Explain various notions in ODE,Laplace transforms & Statistics.	**K1,K2**
CO2	Classify the problem models in the respective area.	**K3**
CO3	Identify the properties of solutions in the core area.	**K3**
CO4	Solve various types of problems in the corresponding stream.	**K3**
CO5	Analyze the applications of the core area.	**K4**

Mapping of COwithPO and PSO

os	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	2	2	2	2	3	2	3	3
CO2	3	2	2	2	2	2	3	2	3	3
CO3	3	2	2	2	2	2	3	2	3	3
CO4	3	2	2	2	2	2	3	2	3	3
CO5	3	2	2	2	2	2	3	2	3	3

“1” – Slight (Low) Correlation ¬ “2” – Moderate (Medium) Correlation ¬

“3” – Substantial (High) Correlation ¬ “-” indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Ordinary Differential Equations:** Eqautions of the first order but of higher degree – Type A:Equations solvable for $\frac{dy}{dx}$ - Type B:Equations solvable for y - Equations solvable for x -Clairaut's Form (simple cases only). **Linear equations with constant coefficients:** Definitions – The operator D- Complementary function of a linear equation with constant co-efficients - Particular integral: General method of finding P.I- Special methods for finding P.I.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	**Laplace Transforms:** Laplace Transforms – Definition -Sufficient conditions for the existence of Laplace transform-Basic results-Laplace transform of periodic functions-Some general theorems-Evaluation of integrals using Laplace transform.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	**Inverse Laplace Transform:** The Inverse Transform –Modification of results obtained in finding Laplace transforms to get the inverse transforms of functions- Laplace Transforms to solve ordinary differential equations with constant co-efficients.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	**Measures of Central Tendency:** **Arithmetic Mean -– Median –- Mode -– Geometric Mean -– Harmonic Mean. (Simple Problems Only)** Measures of Dispersion: Standard Deviation (Simple Problems Only)	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	**Correlation:** **Introduction–Meaning of Correlation–Scatter Diagram Karl Pearson's Co-efficient of Correlation – Rank Correlation (Derivations not needed and Simple Problems Only).** Linear Regression: **Introduction–Linear Regression–Regression Coefficients–Properties of Regression Coefficients(Derivations not needed and Simple Problems Only)**	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

VI	**Self -Study for Enrichment:** **(Not included for End Semester Examination)** Equations that do not contain x and y for explicitly- Piecewise continuity- Laplace Transforms to solve ordinary differential equations with variable co-efficients - Range-Quartile Deviation–RankCorrelation(RepeatedRanks)	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Book

1. Narayanan. S**,** Manicavachagam Pillai. T. K. (2016).*Differential Equations and its applications.*S. Viswanathan Pvt Limited.
2. Gupta. S. C, Kapoor. V. K. (2014). *Fundamentals of Mathematical Statistics.* Sultan Chand & Sons,New Delhi.

Chapters and Sections

UNIT-I Chapter 4: Sections 1-3 [1] Chapter 5: Sections 1-4 [1]

UNIT-II Chapter 9: Sections 1-5 [1]

UNIT-III Chapter 9: Sections 6-8 [1]

UNIT- IV Chapter 2:Sections 2.5-2.9,2.13(2.13.4 Only) [2]

UNIT- V Chapter 10: Sections 10.1 to 10.4 and 10.7.1[2]
Chapter 11: Sections 11.1 to 11.2(11.2.1 and 11.2.2 only)[2]

Reference Books

1. Narayanan. S, Manicavachagam Pillai. T.K. (2003).*Calculus, Vol. III.* S.Viswanathan Pvt Limited.
2. Pillai Bagavathi. R. S. N. (2019).*Statistics Theory and Practice.* S Chand and Company Limited.
3. Gupta. S.C. &Kapoor. V.K.(2004). *Elements ofMathematical Statistics*. Sultan Chand & Sons, New Delhi.

Web References

1. https://www.youtube.com/watch?v=OM01KTc0_9w
2. https://www.youtube.com/watch?v=dCVBZbebl8Y
3. https://www.youtube.com/watch?v=Y8GXpS31CGI
4. https://www.youtube.com/watch?v=IVJjm5FE4x8
5. https://www.youtube.com/watch?v=YGObRCEZiC8
6. https://www.youtube.com/watch?v=dLJp6DrPArk
7. https://www.youtube.com/watch?v=nk2CQITm_eo
8. https://rcub.ac.in/econtent/ug/bcom/sem4/Business%20Statistics%20Unit%204%20Correlation%20and%20Regression.pdf

Pedagogy

Power point presentation, Group Discussion, Seminar, Assignment.

Course Designer

1. Dr. P. Geethanjali

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**Hrs/Week**	**CREDITS**
22UCH2AC3B	**BIOCHEMISTRY-II**	**ALLIED**	**4**	**3**

Course Objectives

- To gain knowledge about the various analytical techniques in separation and isolation of cells and tissues for studying their functional abnormalities.
- To understand the principles and methodologies involved in biochemical analysis.
- To acquire knowledge on nutritional importance of proteins, carbohydrates, lipids, vitamins and minerals in diet.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recall and understand the basic tools and techniques involved in the analysis of biomolecules and describe the metabolic abnormalities and importance of nutrients in diet.	K1&K2
CO2	Apply various methodologies to analyze biomolecules.	K3
CO3	Investigate the biomolecules using various bio-analytical techniques.	K4

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation.

Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Basic Techniques in Biochemistry:** Purification – centrifugation – filtration – dialysis - homogenization – adsorption – absorption- partition - centrifuge- types of rotors & application - density gradient centrifugation, sedimentation - sedimentation coefficient- electrophoresis – types.	**15**	**CO1, CO2, CO3**	**K1, K2, K3, K4**
II	**Analytical Techniques in Biochemistry:** Concept of buffer – preparation- Henderson-Hasselbach equation - working principle of a pH meter. Microscopy: Light microscopy-phase contrast - electron microscope and fluorescent microscope-principle - instrumentation and their applications. UV-visible and fluorescence spectroscopy-principle and instrumentation. Determination of absorption maxima and molar extinction coefficient (of a relevant organic molecule).	**15**	**CO1, CO2, CO3**	**K1, K2, K3, K4**
III	**Clinical Biochemistry:** Collection of blood – Anticoagulant - preservation - Estimation of Hb - PCV, WBC, RBC - Platelets - ESR. Clotting time - bleeding time - normal value - clinical interpretation. Urine Analysis: Composition – collection – preservation - gross examination - interfering factors - chemical examination - Ketone bodies in urine - bile pigments – hematuria - uric acid - microscopic examination of the urinary sediment.	**15**	**CO1, CO2, CO3**	**K1, K2, K3, K4**

IV	**Nutritional Biochemistry:** Definition of food and Nutrition - balanced diet. basic five food groups - calorific values of foods - determination by bomb calorimeter - BMR and factors affecting - energy requirements - recommended dietary allowance (RDA) for children - adults - pregnant and lactating women - sources of complete and incomplete proteins. Biological value of proteins.	**15**	**CO1, CO2, CO3**	**K1, K2, K3, K4**
V	**Metabolic and Lifestyle Disorders:** Obesity - eating disorders like anorexia, nervosa and bullemia. Diabetes mellitus as metabolic syndrome - relationship with hypertension, obesity, hypothyroidism and stress. Cardio vascular disorders - Irritable bowel syndrome- influence of diet - stress and environment on the condition.	**15**	**CO1, CO2, CO3**	**K1, K2, K3, K4**
VI	**Self Study for Enrichment** **(Not to be included for External Examination)** Types of buffer- Significance of sugar in urine- Specific dynamic action of foods-Types of life style disorder.	-	**CO1**	**K1, K2**

Text Books

1. Swaminathan, M. (2014). Advanced Text Book on Food & Nutrition. (2nd ed.). The Bangalore Press.
2. Chatterjea, M. N., & Rana Shinde. (2012). Textbook of Medical Biochemistry, (8th ed.). Jaypee Brothers Medical Publishers.
3. Plummer, D. T. (1998). An Introduction to Practical Biochemistry. (3rd ed.). Tata McGraw Hill Education Pvt. Ltd.
4. Srilakshmi. B. (2019). Dietetics. (8th ed.). New Age International, New Delhi.

5. Ambika, S. (2012). Fundamentals of Biochemistry for Medical Students. (7th ed.). Iippincott Williams & Wilkins.

6. Jain, J. L., Jain, S., &Jain, N. (2016). Fundamentals of Biochemistry. (Revised ed.). S Chand & Co Ltd.

Reference Books

1. Upadhyay, Upadhyay & Nath (2020). Biophysical Chemistry - Principles and Techniques. (4th ed.). Himalaya Publishing House.

2. Annie Ragland, & Arumugam, N. (2015). Biochemistry and Biophysics. (3rd ed.). Saras Publication.

3. Nelson, D. L., & Cox. M. M. (2017). Lehninger Principles of Biochemistry. (7thed.). WH Freeman.

4. Voet, D.,Pratt, C. W., & Voet, J. G. (2012). Principles of Biochemistry. (4th ed.). John Wiley & Sons.

Web References

1. https://nptel.ac.in/courses/102103044
2. https://nptel.ac.in/courses/102103044
3. https://pubmed.ncbi.nlm.nih.gov/27881259/
4. https://www.nhs.uk/conditions/metabolic-syndrome/
5. https://www.upstate.edu/gch/pdf/services/ibd-read-lab-results.pdf

Pedagogy

Chalk and talk, PPT, Discussion, Assignment, Demo, Quiz, Seminar

Course Designer

1. Dr. S. Saranya