

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
NATIONALLY ACCREDITED WITH "A" GRADE BY NAAC
ISO 9001:2015 Certified
TIRUCHIRAPPALLI

PG AND RESEARCH DEPARTMENT OF CHEMISTRY



B.Sc., Chemistry
Syllabus
2023-2024 and Onwards

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
PG AND RESEARCH 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, professional 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	LEARNINGENVIRONMENT 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	ACADEMICEXCELLENCE 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	PROFESSIONALETHICSANDSOCIALRESPONSIBILITY 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	GREENSUSTAINABILITY 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 a rouse interest to pursue higher studies in premium institutions.

PROGRAMMESPECIFICOUTCOMESFOR B.Sc.,CHEMISTRY

PSO NO	Programme Specific Outcomes Students of B.Sc., Chemistry will be able to	POsAd dressed
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 AND RESEARCH DEPARTMENT OF CHEMISTRY

B.Sc. CHEMISTRY

(For the Candidates admitted from the Academic year 2023 - 2024 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)	Pothutamil-I	23ULT1	6	3	3	25	75	100
			Hindi ka Samanya Gyan aur Nibandh	23ULH1						
			Poetry, Grammar and History of Sanskrit Literature	23ULS1						
			Foundation Course: Paper I – French I	23ULF1						
	II	English Language Course - I (ELC)	General English -I	23UE1	6	3	3	25	75	100
	III	Core Course - I (CC)	General Chemistry-I	23UCH1CC1	5	5	3	25	75	100
		Core Practical - I (CP)	Quantitative Inorganic Estimation (Titrimetry) and Inorganic Preparations (P)	23UCH1CC1P	3	3	3	40	60	100
		First Allied Course - I (AC)	Calculus and Fourier Series	22UCH1AC1A	4	3	3	25	75	100
			Biology – I	23UCH1AC1B						
		First Allied Course - II (AC)	Algebra, Analytical Geometry of 3D and Trigonometry	22UCH1AC2A	4	3	3	25	75	100
			Biology (P)	23UCH1AC2BP				40	60	
	IV	Ability Enhancement Compulsory Course - I (AECC)	Value Education	23UGVE	2	2	-	100	-	100
		Total				30	22			
II	I	Language Course - II (LC)	Pothutamil -II	23ULT2	6	3	3	25	75	100
			Hindi Literature & Grammar – II	22ULH2						
			Prose, Grammar and History of Sanskrit Literature	23ULS2						
			Basic French – II	22ULF2						
	II	English Language Course - II (ELC)	General English– II	23UE2	6	3	3	25	75	100

	III	Core Course - II (CC)	Inorganic and Physical Chemistry	23UCH2CC2	5	5	3	25	75	100
		Core Practical - II (CP)	Inorganic Materials of Industrial Importance (P)	23UCH2CC2P	3	3	3	40	60	100
		Core Course - III (CC)	Material Science	23UCH2CC3	2	2	3	25	75	100
		First Allied Course - III (AC)	ODE, Laplace Transforms and Statistics	22UCH2AC3A	4	3	3	25	75	100
			Biology – II	23UCH2AC3B						
		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	22				800
III	I	Language Course - III (LC)	KappiyamumNadagamum	22ULT3	6	3	3	25	75	100
			Hindi Literature & Grammar – III	22ULH3						
			Drama, Grammar and History of Sanskrit Literature	23ULS3						
			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)	Organic and Analytical Chemistry	23UCH3CC4	5	5	3	25	75	100
		Core Practical - III(CP)	Analysis and Preparation of Organic Compounds (P)	22UCH3CC3P	3	3	3	40	60	100
		Second Allied Course - I (AC)	Physics – I	23UCH3AC4	4	3	3	25	75	100
		Second Allied Course - II (AP)	Physics -I (P)	23UCH3AC5P	4	3	3	40	60	100
	IV	Generic Elective Course - I (GEC)	Chemistry in Everyday life	23UCH3GEC1	2	2	3	25	75	100
			Basic Tamil	23ULC3BT1						
			Special Tamil	23ULC3ST1						
		Extra Credit Course	SWAYAM		As per UGC Recommendation					
	Total					30	22			
15 Days INTERNSHIP during Semester Holidays										
IV	I	Language Course - IV	PandaiyaIllakiyamumUraina daiyum	22ULT4	6	3	3	25	75	100

II	(LC)	Hindi Literature and Functional Hindi	22ULH4							
		Drama, History of Drama Literature	22ULS4							
		Intermediate French – II	22ULF4							
	English Language Course - IV (ELC)	Learning Grammar through Literature – II	22UE4	6	3	3	25	75	100	
	III	Core Course - V(CC)	Inorganic and Organic Chemistry	22UCH4CC5	6	5	3	25	75	100
		Core Practical - IV(CP)	Inorganic Qualitative Analysis (P)	22UCH4CC4P	4	4	3	40	60	100
		Second Allied Course - III (AC)	Physics – II	22UCH4AC6	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)		Chemistry of Consumer Products (P)	22UCH4SEC1P	2	2	3	40	60	100	
	Extra Credit Course	SWAYAM	As per UGC Recommendation							
		Total			30	24				800

V	III	Core Course - VI(CC)	Inorganic Chemistry – I	22UCH5CC6	6	5	3	25	75	100
		Core Practical - V(CP)	Physical Chemistry (P)	22UCH5CC5P	3	3	3	40	60	100
		Core Course - VII(CC)	Organic Chemistry – I	22UCH5CC7	6	5	3	25	75	100
		Core Course - VIII(CC)	Physical Chemistry – I	22UCH5CC8	6	5	3	25	75	100
		Discipline Specific Elective - I (DSE)	A. Nuclear and Industrial Chemistry	22UCH5DSE1A	5	3	3	25	75	100
			B. Basics of Nanoscience and Nanotechnology	22UCH5DSE1B						
			Polymer Chemistry	22UCH5DSE1C						
	IV	Ability Enhancement Compulsory Course - IV(AECC)	UGC Jeevan Kaushal - Professional Skills	22UGPS	2	2	-	100	-	100
		Skill Enhancement Course - II (SEC)	Water Analysis (P)	22UCH5SEC2P	2	2	3	40	60	100
		Extra Credit	SWAYAM	As per UGC Recommendation						

		Course		Extra Credit Course						
				Total	30	25				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	4	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	3	4	40	60	100
		Discipline Specific Elective - II (DSE)	A. Analytical Techniques(P)	22UCH6DSE2A P	5	3	3	40	60	100
			B. Cosmetic Chemistry (P)	22UCH6DSE2B P						
			C. Analysis of Herbal Products (P)	22UCH6DSE2C P						
		Project	Project Work	22UCH6PW	5	4	-	-	100	100
	V	Gender Studies	Gender Studies	22UGGS	1	1	-	100	-	100
		Extension activity		22UGEA	0	1	0	-	-	-
				Total	30	25				700
				Grand Total	180	140				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	69	99
	Project Work	1	4	
	Internship	1	2	
	First Allied	3	9	
	Second Allied	3	9	
	DSE	2	6	
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		140

*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:

- The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
- The passing minimum for End Semester Examinations shall be 40% out of 75 marks (i.e. 30 marks)

For Practical:

- The passing minimum for CIA shall be 40% out of 40 marks (i.e. 16 marks)
- 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
23UCH1CC1	GENERAL CHEMISTRY – I	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 basics of organic chemistry 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
CO2	Explain the concepts of atomic structure, chemical bonding, reactive intermediates and different types of titrations.	K2
CO3	Illustrate the knowledge on atomic structure, bonding, MO theory, isomerism, reaction intermediates, solid state and analytical techniques.	K3
CO4	Categorize the quantum numbers, elements, hybridization, stability of intermediates, titrations and acid radicals.	K4
CO5	Interpret the periodic properties, geometry of molecules, bond order 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
CO5	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: Bohr's model of atom - Photoelectric effect - Compton effect - Dual nature of Matter - De Broglie wavelength - Davisson and Germer's experiment - Heisenberg's Uncertainty Principle - Schrodinger equation. Atomic orbital - quantum numbers - Principal, azimuthal, magnetic and spin quantum numbers - 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. Modern periodic table - classification of elements - Trends of periodic properties along the period and group - Electronegativity scale - applications.	17	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	Chemical Bonding - I: Introduction- types - ionic bond - Born Haber cycle - lattice energy - Madelung constant - Fajan's rule - covalent bond - polar and non -polar covalent bonds partial ionic character of covalent bond - percentage of ionic character -coordinate bond - Bond parameters - Factors influencing bond parameters - metallic bond -Electron Sea model - Band theory - Van der Waals force - Hydrogen bonding – types-	13	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

	properties and effects.			
III	Chemical bonding - II: VB theory - postulates - limitation - different types of hybridization - VSEPR theory - shapes of different types of molecules - limitation - MO theory - bonding, antibonding and non - bonding orbitals, bond order, MO diagrams of H ₂ , He ₂ , C ₂ , O ₂ , O ²⁺ , O ²⁻ , O ₂ ²⁻ , N ₂ , NO, HF and CO - magnetic characteristics - comparison of VB and MO theories.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Basics of Organic Compounds: IUPAC nomenclature of compounds - classification - isomerism - types - structural and stereo isomerism - cleavage of bonds: homolytic and heterolytic cleavages reagents and substrates; types of reagents - electrophiles - nucleophiles. Reaction intermediates - generation - properties - structure and stability of carbocation, carbanion, free radicals, carbenes and nitrenes - Electronic effects: Inductive - electromeric - mesomeric (resonance) - hyperconjugation and steric effects - Dipole moment.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
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 concentration - Primary and Secondary standards- Different types of titrations - Acid - Base Titrations, Titrimetric method,	15	CO1, CO2, CO3 CO4	K1, K2, K3, K4

	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 - Difference between ionic and covalent compounds - Do and Don't in the Science Lab	-	CO1, CO2, CO3, CO4	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.. & Sathya Prakash. (2003). Modern Inorganic Chemistry. 2nd ed.; S. Chand and Company. New Delhi.
3. Madan, R.D. (2019). Modern Inorganic Chemistry. 3rd edition. S. Chand & Company Ltd.
4. Bahl, B. S., & Arun Bahl. (2021). Text book of Organic Chemistry. 22nd revised edition. Chand & Company Ltd.
5. Puri, B. R., Sharma, L. R., & Pathania, M. S. (2022). Principles of Physical Chemistry. 48th edition. Shoban Lal Nagin Chand & Co, New Delhi.
6. 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). Textbook of Inorganic Chemistry. 25th revised edition. Sultan Chand & Sons.
2. Huheey, J. E. (1993). Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed .; Addison, Wesley Publishing Company: India.
3. 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

- Dr. P. Pungayee Alias Amirtham
- Dr. P. Thamizhini

Semester I	Internal Marks: 25	External Marks: 75		
COURSE CODE	COURSE TITLE	CATEGORY	Hrs./ Week	CREDITS
23UCH1CC1P	QUANTITATIVE INORGANIC ESTIMATION (TITRIMETRY) AND INORGANIC PREPARATIONS (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.
- To learn the preparations of inorganic compounds.

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	Describe the basic principles involved in volumetric analysis and inorganic preparations.	K1
CO2	Demonstrate the experimental methods of volumetric analysis and estimate the chlorine content in bleaching powder and copper in brass.	K2
CO3	Determine the hardness of water and saponification value of oil.	K3
CO4	Apply volumetric analysis for the estimation of compounds.	K4
CO5	Predict the amount of chemical compounds in a given sample.	K5

Mapping of CO with PO and PSO

COs	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
CO4	2	3	2	1	2	2	3	2	2	1
CO5	2	2	2	3	2	2	2	3	2	2

“1”– Slight (Low) Correlation

“2”– Moderate (Medium) Correlation

“3”– Substantial (High) Correlation

“-” Indicates there is No Correlation.

SYLLABUS

I. Titrimetric Quantitative Analysis:

Calculation of equivalent weight and Preparation of standard solution.

1. Estimation of HCl using NaOH as link and standard oxalic acid solution.
2. Estimation of Na_2CO_3 using HCl as link and standard Na_2CO_3 solution.
3. Estimation of Iron (II) sulphate using KMnO_4 as link and standard Mohr's salt solution. (Permanganometric titration).
4. Estimation of oxalic acid using KMnO_4 as link and standard oxalic acid solution.
5. Estimation of KMnO_4 using thio as link and standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
6. Estimation of copper (II) sulphate using $\text{K}_2\text{Cr}_2\text{O}_7$ solution. (Dichrometric titration)
7. Estimation of Mg (II) ions by EDTA solution. (Complexometric Titration)
8. Estimation of chloride ion in barium chloride solution using standard standard sodium chloride. (Argentometric titration)

II. Applied Experiments:

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

III. Preparation of Inorganic Compounds:

1. Potash alum.
2. Tetraammine copper(II) sulphate.
3. Mohr's salt

Text Books

1. Venkateswaran, V., Veeraswamy R., and 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

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

Web References

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

Pedagogy

Demonstration and Practical Sessions.

Course Designers

- Dr. C. Rajarajeswari
- Dr. S. Devi

FIRST ALLIED COURSE-I (AC) CALCULUS AND FOURIER SERIES
(For B.Sc Physics & Chemistry) (2022-2023 and Onwards)

Semester I	Internal Marks: 25			External Marks: 75
COURSE CODE	COURSE TITLE	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	Integration of Rational algebraic functions– Rule (a)– Rule (b) $\int \frac{lx+m}{ax^2+bx+c} dx$ Integration of the form $\int \frac{x}{ax^2+bx+c} dx$ – 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] $\int \sin^n x dx$ (without proof) and illustrations. $\int \sin^n x \cos^m x dx$	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)–Change of 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	<p>Self-Study for Enrichment : (Not to be included for External examination)</p> <p>Radius of curvature when the curve is in Polar co-ordinates -</p> <p>(i) $\int \frac{dx}{ax^2 + bx + c}$ (ii) $\int \frac{dx}{\sqrt{ax^2 + bx + c}}$</p> <p>(1) $\int \cos^n x dx$ (2) $\int \cos^n dx$ -</p> <p>Integrals in simple cases(Problems Only)- Development in cosine series -Development in sine series.</p>	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

Text Books

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

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. VijayNicole Imprints Private Limited.

2. Vittal, P.R.(2014). Allied Mathematics. Margham Publications.
3. Singaravelu, A.(2003). Differential Calculus and Trigonometry. R Publication.

b 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=w6llnAOX_f8
4. <https://www.youtube.com/watch?v=LMcj8o0ERNE>
5. <https://www.youtube.com/watch?v=GAwOGCyWy0>
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	HOURS/ WEEK	CREDITS
23UCH1AC1B	BIOLOGY - I (FOR CHEMISTRY STUDENTS)	ALLIED	4	3

Course Objectives

- To learn about the classification of plants and general characteristics of plants, fungi and algae.
- To acquire more knowledge about the general characters of bryophytes, gymnosperms and angiosperms with examples.
- To understand the organ structure and function.
- To gain basic knowledge about plant and animal biology

Course Outcome and Cognitive Level Mapping

Upon the successful completion of the course, students will be able to

CO Number	CO Statement	KnowledgeLevel
CO1	Recall and infer the factual and conceptual information required for understanding of Microbes, Plants and Animals.	K1, K2
CO2	Illustrate morphological, anatomical and reproduction of various organisms and appreciate their adaptive strategies.	K2
CO3	Identify and analyse the characteristics and basic needs of living organisms.	K3, K4
CO4	Compare and interpret the relationship between organisms and environment.	K4, K5
CO5	Explain the characteristics of major taxa and compare and contrast their anatomical and physiological characteristics	K4, K5

Mapping of CO with PO and PSOs

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	2	2	3	2	2	2	1
CO2	3	3	2	3	2	3	2	2	2	1
CO3	3	3	2	2	2	3	2	2	2	2
CO4	3	3	3	2	2	2	2	2	2	2
CO5	3	3	3	2	3	1	3	2	3	2

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

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

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
I	Basis of Classification – Bentham and Artificial, Natural Classification of plants. Morphology, Structure and reproduction: Algae - <i>Sargassum</i> as an example and its economic importance; Fungi – Yeasts as an example and its economic importance.	11	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
II	Bryophytes – General characters – <i>Funaria</i> as an example- alternation of generation. Pteridophytes – General characters – <i>Selaginella</i> . Gymnosperm – General Characters – <i>Pinus</i> – Economic uses of gymnosperms. Angiosperms – Monocot flower – <i>Allium cepa</i> . Dicot flower – <i>Nerium oleander</i> .	13	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
III	Organization, movement and secretions of gastrointestinal tract, Respiration – respiratory organs in mammals – morphology –respiratory pigments. Blood and circulation – composition of blood– General organization of circulatory systems.	13	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
IV	Excretion – excretory organs – general organization in man – muscular system – ultra structure of voluntary muscle.	10	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
V	Nervous system – CNS – Autonomic nervous system – Endocrine glands in man	13	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6
VI	Self - Study for Enrichment (Not included for End Semester Examination) Blue Green Algae, Penicillium, Lichens	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5, K6

Text Books

1. Singh, V., Pande, P.C., Jain, D.K. (2021). *A Text Book of Botany*. Rastogi Publications. Meerut.
2. Veer, B. R. (2021). *Parker and Haswell Textbook of Zoology Vertebrates*. 8th edition. Medtech Science Press.
3. Agarwal, V. K. (2018). *Zoology for Degree Students B. Sc. First Year*. S. Chand Publishing.
4. Vashishta, P.C. (2014). *Botany for Degree Students Gymnosperms*. Chand & Company Ltd, Delhi.

5. Chatterjee, C.C. (2004), *Human Physiology Volume I. Medical Allied*. New Central Agency, Kolkata
6. Chatterjee C.C (2004), *Human Physiology Volume II, Medical Allied*. New Central Agency, Kolkata

Reference Books

1. Parihar, N.S. (2012). *An introduction to Embryophyta – Pteridophytes*. Surjeet Publications, Delhi.
2. Alexopoulos, C.J. (2013). *Introduction to Mycology*. Willey Eastern Pvt. Ltd.
3. Coulter, M. J. (2014). *Morphology of Gymnosperms*. Surjeet Publications, Delhi.
4. Pandey, B.P. (1986), *Text Book of Botany (College Botany) Vol I &II*. S. Chand and Co. New Delhi.
5. Best and Taylor. (1992). *The Physiological Basis for Medical Practice*. Saunders Company.
6. Chaudhri, K. (1993). *Concise Medical Physiology*. New Central Book Agency (Parental) Ltd., Calcutta.

Web References

1. <https://www.kobo.com/us/en/ebook/the-algae-world>
2. [http://www.freebookcentre.net/biology-books-download/Fungi-\(PDF-15P\).html](http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html)
3. <http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm>
4. <https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/>
5. <https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf>
6. <https://www.us.elsevierhealth.com/medicine/cell-biology>
7. <https://www.us.elsevierhealth.com/medicine/genetics>
8. <https://www.kobo.com/us/en/ebook/plant-biotechnology-1>

E-Books

1. <https://www.pdfdrive.com/bsc-botany-d34484852.html>
2. <https://www.pdfdrive.com/pteridophytes-gymnosperms-palaeobotany-d56995666.html>
3. <https://www.pdfdrive.com/biology-botany-textbooks-online-e8895584.html>
4. <https://www.pdfdrive.com/biology-botany-higher-secondary-first-year-text-books-online-e2009127.html>
5. <https://www.pdfdrive.com/a-text-book-of-botany-and-pharmacognosy-e158788414.html>
6. <https://www.pdfdrive.com/a-text-book-of-botany-e57877390.html>
7. <https://www.pdfdrive.com/the-basics-of-biology-e107180613.html>

Pedagogy

Power point presentation, Group Discussion, Seminar, Assignment, Animations

Course Designers

1. Dr. R. UMA MAHESWARI
2. Dr. M. KEERTHIGA

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		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UPH1AC2/ 22UCH1AC2	ALGEBRA, ANALYTICAL GEOMETRY OF 3D & TRIGONOMETRY	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 with PO 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 $\cos n$ and $\sin n$ - Expansion of $\tan(A + B + C \dots\dots)$ (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 when n is a positive integer – Expansions of \sin^n when n is a positive integer – Expansions of \sin and \cos in a series of ascending powers of - The expansions of \sin and \cos 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 $\tan^{-1} x$ in terms of powers of x - 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=JavFh5EJHcU>
2. <https://www.youtube.com/watch?v=h5urBuE4Xhg>
3. <https://www.youtube.com/watch?v=59z6eBynJuw>
4. <https://www.youtube.com/watch?v=9DvPvJb2N9g>
5. <https://www.youtube.com/watch?v=HOk2XLeFPDk>
6. <https://www.youtube.com/watch?v=G1C1Z5aTZSO>

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: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS/ WEEK	CREDITS
23UCH1AC2BP	BIOLOGY (P) (FOR CHEMISTRY STUDENTS)	ALLIED	4	3

Course Objectives

- To perform experiments using microscope.
- To study about cells and their morphology by appropriate technique.
- To gain knowledge in morphological identification of plant parts.
- To perform experiments on human blood cells.

Course Outcome and Cognitive Level Mapping

Upon the successful completion of the course, students will be able to

CO Number	CO Statement	Cognitive Level
CO 1	Define and outline the basic instruments involved in Biology	K1, K2
CO 2	Identify and explain the morphology of various parts of plants and animals.	K2, K3
CO 3	Dissect and list the different types of vascular tissues.	K4
CO 4	Compare and contrast the monocot and dicot flower based of T.S section.	K4, K5
CO 5	Determine the various types of cells in living organisms.	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	2	3	2	3	3	1
CO2	3	3	3	3	2	3	2	3	3	1
CO3	3	2	3	3	2	3	2	3	3	1
CO4	3	3	3	3	2	3	2	3	3	3
CO5	3	3	3	3	2	3	3	3	3	2

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

Syllabus

1. Epidermal peel of onion.
2. Squamous epithelium from human cheek cells.
3. Epidermal peel of leaf to observe stomata
4. Xylem and phloem from Cucurbita stem.
5. Identification of Striated muscle fibers (Cockroach).
6. Study of morphological modification of plant parts – Root, stem and leaf.
7. To dissect a dicot flower, construct floral diagram and write floral formula.
8. To dissect a dicot flower, construct floral diagram and write floral formula.
9. Observation of human blood cells.

Reference Books

1. Christopher, G., Krista, C., Delores, B. (2021). *General Biology Laboratory Manual*. 2nd edition. Kendall/Hunt Publishing Co, U.S.
2. Chiyedza, S. (2018). *General Biology Laboratory Manual*. 3rd edition. Kendall/Hunt Publishing Co, U.S.
3. Leslie, A. K. (2018). *Integrating Lecture and Lab: A General Biology Laboratory Manual*. 3rd edition. Cognella, Inc.
4. David, M., James, P., Joy, B. P. (2006). *Laboratory Manual-General Biology*. 5th edition. Brooks/Cole;
5. Subramaniam, N.S. (1996). *Laboratory Manual of Plant Taxonomy*. Vikas Publishing House Pvt. Ltd., New Delhi.
6. Noggle, G.R., Fritz, G.J. (2002). *Introductory Plant Physiology*. Prentice Hall of India, New Delhi.

E-Books

1. <https://www.pdfdrive.com/a-textbook-of-practical-botany-d57965065.html>
2. <https://www.pdfdrive.com/a-text-book-of-practical-botany-2-d156822597.html>
3. <https://www.pdfdrive.com/practical-botany-ii-d46799996.html>
4. <https://www.pdfdrive.com/practical-botany-d158065762.html>

5. <https://www.pdfdrive.com/botanical-illustration-d176078869.html>
6. <https://www.pdfdrive.com/practical-botany-for-advanced-level-and-intermediate-students-d157593255.html>

Web References

1. <https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883>
2. <https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gymnosperms&printsec=frontcover>
3. <https://www.amazon.in/Computational-Phytochemistry-Satyajit-Dey-Sarker-ebook/dp/B07CV96NZJ>
4. <https://medlineplus.gov/genetocs/understanding/basics/cell/>
5. <https://apan.net/meetings/apan45/files/17/17-01-01-01.pdf>
6. http://www.cuteri.eu/microbiologia/manuale_microbiologia_pratica.pdf
7. <https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4>

Pedagogy

Practical Observation and Demo

Course Designers

1. Dr. R. UMA MAHESWARI
2. Dr. M. KEERTHIGA

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
23UCH2CC2	INORGANIC AND PHYSICAL CHEMISTRY	CORE	5	5

Course Objectives

- This course stretches the knowledge about the different techniques involved in metallurgy.
- Discusses about the s and p block elements.
- Provides basic knowledge about solid state and colloidal state of matter.
- Deliberates the basic concepts of gaseous state.

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 the fundamental ideas of metallurgy, s & p block elements, solid, colloidal and gaseous state.	K1
CO2	Summarize the knowledge on symmetry operations, metals, colloids, molecular velocities and refining process.	K2
CO3	Demonstrate the purification process, structure and applications of compounds.	K3
CO4	Categorize the crystals, periodic elements, colloidal state of compounds	K4
CO5	Interpret the metallurgy techniques, properties of periodic elements and colloids, crystal planes and laws of gaseous state.	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
CO5	3	2	3	1	2	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	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 CO5	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 CO5	K1, K2, K3, K4, K5
III	Solid State Crystalline and amorphous solids - isotropy and anisotropy - interfacial angle- symmetry in crystal systems - elements of symmetry - space lattice and unit cell - Bravias lattices - seven crystal systems. Law of rational indices - Miller indices - x-ray diffraction – Bragg's law - derivation of Bragg's equation - representation of planes - space lattice - reciprocal lattice. Bragg's equation - experimental technique- powder method and rotating crystal method.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Colloids Colloids – types of colloids –preparation –purification – dialysis – optical properties – kinetic properties – electrical properties of colloids – gold number – stability of sols – associated colloids – cleansing action of soaps and detergents – emulsions – gels – applications of	12	CO1, CO2, CO3, CO4,	K1, K2, K3, K4,

	colloids.		CO5	K5
V	Gaseous State Kinetic theory of gases - derivation of kinetic gas equation - gaseous laws - type of molecular velocities - average velocity - most probable velocity - RMS velocity-Maxwell's distribution of molecular velocities - effect of temperature on distribution of molecular velocities - Maxwell's distribution of molecular energies – collision diameter- collision number - mean free path - viscosity of gases - calculation of collision diameter - mean free path from viscosity measurement.	18	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	Self-Study for Enrichment (Not to be included for External Examination) Minerals and ores - periodic table- states of matter– vanderwaals equation.	-	CO1, CO2, CO3	K1, K2, K3

TextBooks

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. ShobanLal 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. <https://classnotes.org.in/class12/chemistry12/general-principles-processes-isolation-elements/purification-refining-metal/>
2. <https://www.askiitians.com/iit-jee-s-and-p-block-elements/>
3. <https://byjus.com/jee/solid-state/>
4. <https://byjus.com/jee/colloids>
5. <https://www.embibe.com/exams/gaseous-state/>

Pedagogy

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

Course Designer

Dr. A.Sharmila

Semester II	Internal Marks: 40	External Marks:60		
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
23UCH2CC2P	INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE (P)	CORE PRACTICAL	3	3

Course Objective

- Enable the students to develop the preparative skills in inorganic preparations.
- Enable the students to check the purity of organic compounds by determining the melting or boiling points.
- At the end of the course, the students should be able to plan the experimental projects and execute them.

Course Outcome

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Recall the skills required to carry out professional research and production activities in the field of chemistry.	K1
CO2	Define the various terms such as normality, molality, molarity, equivalent weight and molecular weight.	K1
CO3	Select the specific titric method to estimate the amount of analyte present in the given solution.	K1
CO4	Describe the principles and procedures of various titrimetric methods.	K2
CO5	Prepare solutions of desired concentrations.	K3

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 –

“3” – Substantial (High) Correlation –

“2” – Moderate (Medium) Correlation –

“-” indicates there is no correlation.

Syllabus

I. Preparation of Solutions

Molarity, Molality, Normality solutions and Buffers.

II. Volumetric Analysis

1. Complexometric titrations
 - a. Estimation of Zinc
 - b. Estimation of Magnesium
 - c. Estimation of Calcium
2. Estimation of Barium Chloride by Mohr's method.
3. Estimation of Chloride ions by Volhard's method.

III. Preparation of Inorganic Compounds.

1. Cuprous Chloride
2. Borax
3. Prussian Blue
4. Potassium trioxalatoferrate (III)
5. Trithiourea copper(II) sulphate dihydrate

Text Books

1. Ramanujam, V.V. (1995) Inorganic Semi-micro Qualitative Analysis. Chennai: National,.
2. Vogel, A. I. (1996). Vogel's Qualitative Inorganic Analysis, Revised by Svehla, G. Logman Scientific.

Reference Books

1. V.Venkateswaran, R.veeraswamy & A.R.Kulandaivelu, (1992). Basic Principles of practical chemistry, 3rd Edn,.
2. Gopalan, R., Venkappayya, D., Nagarajan, S. (2004). Engineering Chemistry: Vikas Publications.

Web References

1. <https://davjalandhar.com/dbt/chemistry/SOP%20LabManuals/B.Sc.%20SEM%20L.pdf>
2. <https://www.youtube.com/watch?v=fv6LJ0KAG1U>
3. https://www.youtube.com/watch?v=S2RZ_KyUI9E

Pedagogy

Hands on training, E-Content, Demo

Course Designer

Dr. A.Sharmila

Semester II	Internal Marks: 25		External Marks: 75	
COURSECODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
23UCH2CC3	MATERIAL SCIENCE	CORE	2	2

Course Objective

- To describe the structure of ceramics and magnetic materials.
- To understand the importance of polymer materials.
- To gain knowledge about composites.

Course Outcomes

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Recall conductors, magnetic, polymer, LCD and composite materials.	K1
CO2	Describe the classification of different materials.	K2
CO3	Illustrate the role of energy in various materials.	K3
CO4	Analyze the materials using theoretical concepts.	K4
CO5	Evaluate semiconductors, hysteresis curve, perovskite structure, reinforced composites.	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
CO5	3	3	2	2	3	3	3	2	3	3

“1” – Slight (Low) Correlation

“3” – Substantial (High) Correlation

“2” – Moderate (Medium) 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.	06	CO1, CO2, CO3, CO4, CO5	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.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	Ceramics and Display Devices Classification of ceramics - structure of the ceramics- compounds with Fluorite - Perovskite structure - properties of ceramics- applications - active display devices- Light Emitting Diode (LED) - passive display devices - Liquid Crystal Display (LCD)- applications.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	Polymer Materials Introduction - polymerization mechanism - degree of polymerization - classification of polymers - structure of polymer - fabrication process - properties – applications.	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	Composite Materials Introduction - constitution - classification - particle reinforced – fibre reinforced - fiber glass reinforced - other fiber reinforced - metal matrix fiber - hybrid	06	CO1, CO2, CO3, CO4,	K1, K2, K3, K4,

	composites processing of fiber reinforced -composites - applications of composite materials.		CO5	K5
VI	Self Study for Enrichment (Not to be included for External Examination) Composite interfaces - bonding mechanisms - other interfacial properties - polymer matrix composites - ceramic matrix composites - composite strengths - fibers as reinforcements.	-	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.). Dhanpat Rai & Sons.

ReferenceBooks

- 1.Callister, W.D., & Rethwisch, G.D., (2018). Materials Science and Engineering: An Introduction. (10th ed.). Wiley.
2. Kingery, W.D., Bowen, & H.K., Uhlmann, D.R., (1976). Introduction to Ceramics. (2nded.). Wiley.
3. Sharma, B.K., (1997). Industrial Chemistry. (8th ed.). Goel Publishing.

WebReferences

1. <https://www.uniweimar.de/kunstundgestaltung/wiki/images/Conductors,insulators,semiconductors.pdf>
2. <https://slideplayer.com/slide/13949334/>
3. <https://www.youtube.com/watch?v=WHYfDVxi-Qw>
4. <https://irimee.indianrailways.gov.in/instit/uploads/files/1435551295008-POLYMER-%20L-1.pdf>

Pedagogy

Chalkandtalk,PPT,Discussion, Assignment,Demo, Quiz,Seminar

Course Designer

Dr. P. Thamizhini

ALLIED COURSE – III
(For Chemistry)
ODE, LAPLACE TRANSFORMS AND STATISTICS
(2022-2023 Onwards)

Semester II	Internal Marks: 25		External Marks: 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 CO with PO and PSO

Cos	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: Equations 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 –Rank Correlation (Repeated Ranks)	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
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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 of Mathematical 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	HOURS/WEEK	CREDITS
23UCH2AC3B	BIOLOGY - II	ALLIED	4	3

Course Objectives

- To gain knowledge about the bacterial and viral structure and diseases
- To understand the structure and function of various cell organelles.
- To acquire knowledge on sex linked inheritance in man.
- To understand the basic concepts of molecular biology.
- To study the biotech applications.

Course Outcome and Cognitive Level Mapping

Upon the successful completion of the course, students will be able to

CONo.	CO Statement	Knowledge Level
CO1	Recall and infer the factual and conceptual information required for understanding of microbiology, cell biology, genetics and biotechnology.	K1, K2
CO2	Illustrate basic concepts of various branches of applied biology for sustainable development of mankind.	K2
CO3	Develop and compare the structure and function of cells and explain the Development of various cells.	K3, K4
CO4	Classify the beneficial and harmful effects of organisms and explain the role of organisms in various field of human welfare.	K4, K5
CO5	Elaborate the core concepts and fundamental so f genetic engineering for the human welfare.	K6

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	2	2	1
CO2	3	3	2	3	2	3	2	2	2	1
CO3	3	3	2	2	2	3	2	2	2	2
CO4	3	3	3	2	2	2	2	2	2	2
CO5	3	3	3	2	3	1	3	2	3	2

“1” – Slight (Low) Correlation,

“3” – Substantial (High) Correlation,

“2” – Moderate (Medium) Correlation,

“-” indicates there is no correlation.

**ALLIED
BIOLOGY-II**

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
I	Microbiology: General structure of prokaryotic cell (E. Coli), Morphology of Bacteria: Coccus type: - Micrococcus and Staphylococcus, Bacillus type: - Micro bacillus and Streptobacillus, Spirochetes, and Comma shaped. Bacterial and Viral disease: Pathogenesis, Symptoms, Prevention, And Control-Gonorrhea and AIDS.	12	CO1, CO2, CO4	K1,K2,K3, K4,K5,K6
II	Cell Biology: Structure and functions of the following cell components: Cell membrane, Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis.	11	CO1, CO2, CO3	K1,K2,K3, K4,K5,K6
III	Genetics: Mendelism – Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross.	13	CO3, CO5	K1,K2,K3, K4,K5,K6
IV	Molecular biology Structure and functions of DNA, Structure and functions of RNAs (t RNA, mRNA, and rRNA),DNA Replication and Protein synthesis.	11	CO2, CO5	K1,K2,K3, K4,K5,K6
V	Biotechnology Recombinant DNA -Construction and applications, Stem Cell Culture-Methods and applications, Transgenic animals-Methods and applications and DNA finger printing-Methods and applications	13	CO2, CO3, CO5	K1,K2,K3, K4,K5,K6
VI	Self-Study for Enrichment (Not included for End Semester Examination) Viral disease: COVID, Ultra structure of cell wall, <i>in vitro</i> animal cell culture, DNA as genetic material, Genetically modified organism.	-	CO4, CO5	K1,K2,K3, K4,K5,K6

TextBooks

1. Benjamin A.P. 2020. *Genetics: A Conceptual Approach*. 7th Edition, W H Freeman publisher,
2. Verma, P.S & Agarwal, V.K. (2022). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*. S Chand and Company Ltd.
3. Vishnu Shankar, S. (2021). *Fundamentals of Genetics and Molecular Biology*. Red'shine Publication Pvt. Ltd.
4. Pragya, K. (2020). *Essentials of Genetics*. Dreamtech Press.
5. Rao, K., Krishnamurthy, K.V and Rao, G.S. (1979). *Ancillary Botany*. S. Viswanathan Pvt. Ltd., Madras.

ReferenceBooks

1. Poonam, A. (2022). *Lippincott Illustrated Reviews: Cell and Molecular Biology*. Wolters Kluwer India Pvt Ltd.
2. Harvey, L., Arnold B., Chris, A.K & Monty, K. (2021). *Molecular Cell Biology* Ninth edition. W. H. Freeman
3. Nancy, L.C., Rachel, R.G., Carol, C.G., Gisela, G.S & Cynthia, W. (2020). *Molecular Biology: Principles of Genome Function* 3rd Edition. Oxford University Press.
4. Lieberman. (2020). *BRS Biochemistry, Molecular Biology, and Genetics*. 7th edition. Wolters Kluwer India Pvt Ltd.
5. Jocelyn, E.K., Elliott, S.G & Stephen, T.K. (2017). *Lewin's GENES XII* 12th edition. Jones and Bartlett Publishers, Inc

E-Books

1. <https://www.pdfdrive.com/lewins-genes-xii-e185848559.html>
2. <https://www.pdfdrive.com/introduction-to-genetics-a-molecular-approach-e187102063.html>
3. <https://www.pdfdrive.com/the-cell-a-molecular-approach-e186369576.html>
4. <https://www.pdfdrive.com/genetics-a-conceptual-approach-e186741220.html>
5. <https://www.pdfdrive.com/cell-biology-genetics-molecular-biology-evolution-and-ecology-e157248372.htm>

WebLinks

1. <https://microbenotes.com/category/molecular-biology/>
2. <https://www.easybiologyclass.com/topic-genetics/>
3. <https://ocw.mit.edu/courses/7-03-genetics-fall-2004/pages/lecture-notes/>
4. <http://ndl.iitkgp.ac.in/document/bnZnR2hPaUVqRU9TbFc2Rmp1MVJzN0dyTCs3OGxyRzd aUWpPTzdRV2pBTT0>
5. <http://ndl.iitkgp.ac.in/document/Qkh4R2FGUkRNZjFicFUvWmpzQ2loU1NPaeI6eWpVaXp nNGUwc2liQzZKbUdaczdobHlyeWNpditXM2hpaFNOS1F6dVc4NGltYWZEQ09YbEVlWjJt eIE9PQ>

Pedagogy

Powerpoint presentation, Group Discussion, Seminar, Assignment, Animations

Course Designer

Dr.M.KEERTHIGA

