CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)
NATIONALLY ACCREDITED WITH "A" GRADE BY NAAC
TIRUCHIRAPPALLI

PG AND RESEARCH DEPARTMENT OF CHEMISTRY

B.Sc., Chemistry

Syllabus

2024-2025 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 overallsustainable 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 AND RESEARCH DEPARTMENT OF CHEMISTRY
B.Sc. CHEMISTRY

(For the Candidates admitted from the Academic year 2024 - 2025 and onwards)

Semester	Part	Course	Course Title	Course Code	Inst. Hrs. / Week	Credits	Exam Hrs.	Marks Int.	Marks Ext.	Total
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 & 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**				**700**

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:
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
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, Tritimetric 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 $K_2Cr_2O_7$ solution.
6. Estimation of copper (II) sulphate using $K_2Cr_2O_7$ 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			ExternalMarks: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 themin 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.

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Successive Differentiation:** The nth derivative – Standard results – Method of splitting the fractional expressions into partial fractions - Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the nth derivative of a product(proof not needed) –A completeformal 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 x – Rule $ax2 + bx + c$ (c)-Integration of Irrational functions : Integration of the form $$\int \frac{px+q}{\sqrt{ax^2+bx+c}}dx$$ Integration of the form Integration of the form $$\int \frac{dx}{(x+p)\sqrt{ax^2+bx+c}}$$ $$\int \frac{dx}{a+b\cos x}$$	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. $\int \sin^n x \cos^m dx$	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)-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,

			CO4, CO5	K4
	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) $\int \dfrac{dx}{ax^2+bx+c}$ (ii) $\int \dfrac{dx}{\sqrt{ax^2+bx+c}}$ (1) $\int \cos^n x\, dx$ (2) $\int_0^{\frac{\pi}{2}} \cos^n dx$ 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 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=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**	**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	owledgeLevel
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 - *Sargassum* 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 – *Funaria* as an example- alternation of generation. Pteridophytes – General characters – *Selaginella*. Gymnosperm – General Characters – *Pinus* – Economic uses of gymnosperms. Angiosperms – Monocot flower – *Allium cepa*. Dicot flower – *Nerium oleander*.	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 (Parentral) 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
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		ExternalMarks:75	
COURSECODE	COURSETITLE	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 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 $\cos n$ and $\sin n$ - Expansion of $\tan(A \quad B \quad C ....)$ (omitting examples on formation of equations) –Powers of sines and cosines of θ in terms of functions of multiples of θ – Expansions of $\cos^n$ 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 apoint. (Only problems) - Expansion of tan□ in terms of powers of □ - 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 GammaPublishing house.

2. Pandey, H.D. Khan, M.Q. & Gupta, B.N.(2011). A Text Book of Analytical

Geometry and VectorAnalysis. 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=9DvPvJb2N9g**

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: 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=gy mnosperms&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