Allied Chemistry

Syllabus

AFFILIATED COLLEGES

Program Code:

2025 – 2026 onwards

BHARATHIAR UNIVERSITY

(A State University, Accredited with "A" Grade by NAAC,
Ranked 13thamong Indian Universities by MHRD-NIRF,
World Ranking: Times -801-1000,Shanghai -901-1000, URAP - 982)

Coimbatore - 641 046, Tamil Nadu, India

Allied Chemistry

Course code	1AH	Allied Chemistry - I	L	T	P	C
Allied		Allied I – Paper - I	4		-	3
Pre-requisite		Higher Secondary Level Chemistry	Syllabus Version	2025 - 2026		

Course Objectives:

The main objectives of this course are to:

1. Explain the conducting properties of metals.
2. Outline the reactivity of boron compounds, the principles of bonding, hybridisation and stereochemistry
3. To imbibe the knowledge of silicones, fuel gases, dyes and their industrial applications
4. To inculcate the chemistry behind day to day used items like toiletries, detergents etc
5. Explain the physical chemistry behind the reaction rates and solutions.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the properties metals and their conductivity, the principle behind the synthesis and applications of boron compounds.	K1-K4
2	Understand about silicones fuels gases and their industrial applications. The theory behind colours and dyes, their preparation and dyeing.	K2-K4, K6
3	Understand the bonding and structure of various hydrocarbons and electronic effects. Apperciate the optical properties of compounds and how it determines the compounds nature itself	K1-K4
4	Explain the chemistry behind toiletries and cleaning agents.	K2-K5
5	Understand the kinetics benind chemical reactions and the nature of solutions	K1-K3

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Molecular Orbital Theory and Boron Compounds	12 hours

1. Molecular orbital theory, bonding, antibonding and non-bonding orbitals. Molecular orbitals. MO configuration of H_2, N_2, O_2, F_2. Bond order. Diamagnetism and Paramagnetism.

2. Boron compounds: Structure, preparation, properties and uses of $NaBH_4$, Diborane and Borazole

Unit:2	Industrial and Dye Chemistry	12 hours

1. Industrial Chemistry: Synthesis, properties and uses of silicones. Fuel gases: composition and uses of natural gas, water gas, semi water gas, carbureted water gas, producer gas, oil gas.

2. Dye Chemistry: Terms: Chromophore – auxochrome - bathochromic shift - hypsochromic shift - hyperchromic effect - hypsochromic effect - Dyes: Azo and triphyenyl methane dyes - Preparation of Methyl Orange and Malachite green

Unit:3	Covalent Bonding and Stereoisomerism	12 hours

1. Covalent bond: Orbital overlap – hybridization - geometry of organic molecules- CH_4, C_2H_4, and C_2H_2. Definition with example: Inductive, Electromeric, Mesomeric, hyperconjucative and steric effect.

2. Stereoisomerism: Conditions of optical activity - optical isomerism of lactic acid and tartaric acid - geometrical isomerism of maleic and fumaric acids.		
Unit:4	**Chemistry of Toiletries and Cleaning Agents**	**12 hours**
1. Toiletries: Bath soap – shower gel - water softeners - tooth pastes-ingredients - their characteristic functions-mouth washes-shaving creams-after shave preparations. **2. Cleaning Agents:** Detergents - classification - formulation-cleansing action-optical brightners-bleachers-phenoyls - hand sanitizer.		
Unit:5	**Physical Chemistry: Solutions and Kinetics**	**12 hours**
1. Solutions: Raoult's law - Deviation from ideal behaviour - positive deviation - Negative deviation - Fractional distillation. **2. Kinetics:** Rate - order - molecularity - pseudo first order - determination of order by graphical method - Effect of temperature on the rate - Energy of activation		
	Total Lecture hours	**60 hours**

Text Book(s)	
1	Principles of Inorganic Chemistry, B.R. Puri L.R. Sharma, S.Chand & Co.
2	Inorganic Chemistry, P.L.Soni, Sultan Chand & Sons.
3	Principles of physical chemistry, B.P. Puri, L.R. Sharma and M.S. Phathania, S.Chand & Company
Reference Books	
1	Advanced Organic Chemistry, B.S.Bahl, Arun bahl, S.Chand & Co.,
2	Perfumes, Cosmetics and Soaps, W.A.Poucher (Vol.3), 9th Edition, Springer Science Business Media, 1993.
3	Handbook of Cosmetic Science and Technology, Barel, A.O.; Paye, M.; Maibach, H.I.(2014), CRC Press.
4	Pharmaceutics and Cosmetics, Gupta, P.K.; Gupta, S.K.(2011), Pragati Prakashan
5	Chemical Process Industries, R. Norris Shreve and Joseph A.Brink,Jr.,4 th Edition, McGraw Hill, 1977.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/104/103/104103071/
2	https://www.youtube.com/watch?v=zdmEaXnB-5Q
3	https://www.britannica.com/science/band-theory
4	https://www.chem.purdue.edu/gchelp/solutions/whatis.html
Designed By: Dr. S. Karthikeyan	

Mapping with Programme Outcomes							
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	M	S	M	S	S	S	S
CO2	S	S	S	S	S	M	S
CO3	M	M	S	S	S	M	S
CO4	S	S	S	S	M	M	S
CO5	S	S	M	S	S	M	M

*S-Strong; M-Medium; L-Low

Course code	2AH	Allied Chemistry - II	L	T	P	C
Allied		Allied I – Paper - II	4		-	3
Pre-requisite		Higher Secondary Level Chemistry	Syllabus Version		2025-2026	

Course Objectives:

The main objectives of this course are to:

1. To explain bioinorganic chemistry in biological systems.
2. Appreciate the need for paints and explosives.
3. To understand the role of polymers and rubbers to mankind.
4. Show the importance of fertilizers and the unavoidability of insecticides in agriculture.
5. Explain the electrochemistry and electrical storage.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Appreciate the role of metals in biological system and their therapeutic effects	K1-K3
2	Understand about the importance of paints and the need for explosives as well as the bad face of war.	K2-K5
3	Understand the importance of polymers and rubbers in our day to day life	K1-K4
4	Appreciate the need for fertilizers and insecticides in the Agricultural sector	K2-K5
5	Understand the importance of electrochemistry and energy storage devices	K2-K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Unit:1	Metallurgy and Co-ordination chemistry	12 hours

1. General methods of extraction of metals. Types of ores. Methods of ore dressing. Reduction methods, electrical methods, types of refining Van Arkel Zone refining.

2. Coordination Chemistry. Postulates of Werner. VBT- Hybridation, geometry and magnetic properties of $[Ni(CN)_4]^{2-}$, $[NiCl_4]^{2-}$, $[Fe(CN)_6]^{4-}$, $[Co(NH3)_6]^{3+}$ and $[CoF_6]^{3-}$. Chelation examples – Hemoglobin – Chlorophyll – Applications of EDTA in qualitative and quantitative analysis.

Unit:2	Paints and Explosives	12 hours

1. Paints: classification – constituents – Pigment Volume Concentration – Distemper – Varnishes – Lacquers - Pigments – name and formula of different coloured pigments and their uses – Toners – Nano paints

2. Explosives: classification – characteristics – chemistry of Nitrocellulose – nitroglycerine - gun powder - RDX – mustard gas – phosgene - nerve gas – Screening smokes

Unit:3	Polymers and Rubbers	12 hours

1. Polymers: Preparation, properties and uses of: Poly olefins – Polythene – PTFE – PVC – Polypropylene – Polystyrene

2. Rubbers: Natural and synthetic rubbers: Constitution of natural rubber – Butyl – Buna-N – Neoprene – Thiocol – Polyurethane – Silicone rubbers

Unit:4	Agricultural Chemistry – Fertilizers and Insecticides	12 hours

1. Fertilizers: Classification of fertilizers- Preparation and uses of Urea, DAP, NPK, SSP, TSP and bio-fertilizers (vermicompost, coircompost, panchakavia) – types and advantages of biofertilizers

2. Insecticides: Classification of insecticides – Structure and effects of dinitro phenols, DDT, methoxychlor and BHC – comparison of artificial pesticides and bio-pesticide.

Unit:5	Electrochemisry, Fuel cells and Energy Storage	12 hours

1. Electrochemistry: EMF (Definition) - Daniel cell - Reference electrode - Standard Hydrogen Electrode (SHE) -Saturated Calomel Electrode (SCE). Determination of pH - glass electrodes

2. Fuel cell and Energy storage: Hydrogen - Oxygen fuel cell – Batteries: Lead-storage battery - Batteries of future:Lithium ion batteries.

	Total Lecture hours	60 hours

Text Book(s)

1	Principles of physical chemistry, B.P. Puri, L.R. Sharma and M.S. Phathania, S.Chand & Company
2	Inorganic Chemistry, P.L.Soni, Sultan Chand & Sons.
3	Principles of Inorganic Chemistry, B.R. Puri L.R. Sharma, S.Chand & Co.
4	Engineering Chemistry by Jain and Jain; Dhanpat Rai Publication Co. 2014.

Reference Books

1	Environmental Chemistry, A.K.De, 6th Edition, New Age International, New Delhi, 2006
2	A Text Book of Environmental Chemistry and Pollution Control, S.S. Dara–S. Chand Publication 2012.
3	Chemical Process Industries, R. Norris Shreve and Joseph A.Brink,Jr.,4 th Edition, McGraw Hill, 1977.
4	History of fertilizer chemistry by T.P. Hignett, SPRINGER ,1985

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://onlinecourses.nptel.ac.in/noc19_cy26/preview
2	https://nptel.ac.in/courses/126/105/126105014/
3	https://nptel.ac.in/content/storage2/courses/103107086/module1/lecture1/lecture1.pdf
4	https://nptel.ac.in/content/storage2/courses/108103009/download/M9.pdf
5	https://nptel.ac.in/courses/113105028/
6	https://www.youtube.com/watch?v=no4vRKvKxcU
7	https://www.youtube.com/watch?v=5XKpJ24P-KE

Designed By: Dr. S. Karthikeyan

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	M	M	M	S	S	S
CO2	S	S	S	M	S	M	S
CO3	S	M	S	S	S	S	M
CO4	S	S	S	M	S	M	S
CO5	S	S	M	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code	2PH	Chemistry Practical	L	T	P	C
Allied		Allied Chemistry	-	-	2	3
Pre-requisite		Higher Secondary Level Lab Knowledge	Syllabus Version		2025-2026	

Course Objectives:

The main objectives of this course are to:

1. Inculcate the students how to handle the basic laboratory apparatus and perform tests.
2. Impart the first-hand knowledge and experience on estimation of an ion, acid and base.
3. Provide the student knowledge on analysis of an unknown organic substance using Preliminary and confirmation test.
4. Make the student skilful enough and prepare for a position in an analytical laboratory or a company.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Estimate the amount of ion present in the given solution through volumetric analysis	K1-K6
2	Find the groups/elements and characters present in the given organic substance through qualitative analysis	K1-K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Part I	VOLUMETRIC ANALYSIS	30 hours

1. Estimation of sodium hydroxide using standard sodium carbonate.
2. Estimation of hydrochloric acid- standard oxalic acid.
3. Estimation of oxalic acid- standard sulphuric acid.
4. Estimation of ferrous sulphate- standard Mohr salt solution.
5. Estimation of oxalic acid- standard ferrous sulphate.

Part II	ORGANIC ANALYSIS	30 hours

Systematic Qualitative Analysis of given Organic Substance and Report on the following

1. Detection of Elelments (N, S, Halogens).
2. To distinguish between aliphatic and Aromatic.
3. To distinguish between saturated and unsaturated.
4. Functional group tests for phenols, acids (mono and di), aromatic primary amine, amide, diamide, carbohydrate, Functional groups characterized by confirmatory test.

	Total Practical hours	60 hours

Text Book(s)

1	Basic Principles of Practical Chemistry, Kulandai Velu A.R., Veeraswamy R., Venkateswaran, Sultan Chand & Sons, 2017
2	Practical Chemistry,Pandey D.N., sultan chand publishers, 2018

Reference Books	
1	Vogels Text book of Practical Organic Chemistry, Brian S. Furniss, Antony J. Hannaford, Peter W. G. Smith, Fifth Edition, Bath Press, Great Britan, 1989
2	Vogels Textbook of Quantitative Chemical Analysis, G H Jeffery, J Bassett, J Mendham, R C Denney,Fifth Edition, Bath Press, Great Britan, 1989
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/104/106/104106108/
2	https://www.youtube.com/watch?v=n4esSHxz_J8
3	https://www.toppr.com/guides/chemistry/organic-chemistry/qualitative-analysis-of-organic-compounds/
4	https://www.youtube.com/watch?v=7bmQkQW8bbs
5	https://www.youtube.com/watch?v=wRAo-M8xBHM
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Mapping with Programme Outcomes							
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	S	S	S	M	S	S	S
CO2	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low