DEPARTMENT OF CHEMISTRY

COURSE STRUCTURE & SYLLABI
(For the students admitted from year 2023-2024 onwards)

Programme : B.Sc. Chemistry

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JAMAL MOHAMED COLLEGE (AUTONOMOUS)
Accredited with A++ Grade by NAAC (4th Cycle) with CGPA 3.69 out of 4.0
(Affiliated to Bharathidasan University)
TIRUCHIRAPPALLI – 620 020

B.Sc. CHEMISTRY (WITH ALLIED MATHEMATICS)

Sem	Course Code	Part	Course Category	Course Title	Ins. Hrs/ Week	Credit	Marks		Total
							CIA	ESE	
I	23U1LT1/LA1/ LF1/LH1/LU1	I	Language - I		6	3	25	75	100
	23UCN1LE1	II	English - I	English for Communication - I	6	3	25	75	100
	23UCH1CC1	III	Core - I	Inorganic, Organic and Physical Chemistry - I	5	5	25	75	100
	23UCH1CC2P		Core - II	Volumetric Estimation and Flame Photometric Identification of Metals - Practical	3	3	20	80	100
	23UPH1AC1		Allied - I	Fundamentals of Physics	5	4	25	75	100
	23UPH1AC2P		Allied - II	Properties of Matter - Practical	3	2	20	80	100
	23UCN1AE1	IV	AECC - I	Value Education	2	2	-	100	100
				Total	**30**	**22**			**700**
II	23U2LT2/LA2/LF2/ LH2/LU2	I	Language - II		6	3	25	75	100
	23UCN2LE2	II	English - II	English for Communication - II	6	3	25	75	100
	23UCH2CC3	III	Core - III	Inorganic, Organic and Physical Chemistry - II	6	6	25	75	100
	23UCH2CC4P		Core - IV	Industrial Chemistry - Practical	3	3	20	80	100
	23UPH2AC3		Allied - III	Essentials of Physics	4	4	25	75	100
	23UPH2AC4P		Allied - IV	Optical, Thermal and Electricity - Practical	3	2	20	80	100
	23UCN2SS	IV	Soft Skills Development	Soft Skills Development	2	2	-	100	100
	23UCN2CO	V	Community Outreach	JAMCROP	-	@	-	-	@
	23U2BT1/ 23U2AT1		Basic Tamil - I/ Advanced Tamil - I	எழுத்தும் இலக்கியமும் அறிமுகம் - I/ தமிழ் இலக்கியமும் வரலாறும் - I	-	-	-	100#	-
	@Only grades will be given			**Total**	**30**	**23**			**700**
III	23U3LT3/LA3/LF3/ LH3/LU3	I	Language - III		6	3	25	75	100
	23UCN3LE3	II	English - III	English for Communication - III	6	3	25	75	100
	23UCH3CC5	III	Core - V	Inorganic, Organic and Physical Chemistry - III	4	4	25	75	100
	23UCH3CC6P		Core - VI	Analysis of Domestic Products and Food Samples - Practical	3	3	20	80	100
	23UMA3AC5:3		Allied - V	Calculus	4	3	25	75	100
	23UMA3AC6:3		Allied - VI	Algebra and Trigonometry	3	3	25	75	100
	23UCH3GE1	IV	Generic Elective - I		2	2	-	100	100
	23UCN3AE2		AECC - II	Environmental Studies	2	2	-	100	100
				Total	**30**	**23**			**800**
IV	23U4LT4/LA4/LF4/ LH4/LU4	I	Language - IV		6	3	25	75	100
	23UCN4LE4	II	English - IV	English for Communication – IV	6	3	25	75	100
	23UCH4CC7	III	Core - VII	Inorganic, Organic and Physical Chemistry - IV	5	5	25	75	100
	23UCH4CC8P		Core - VIII	Semimicro Qualitative Analysis of Inorganic Salt Mixture - Practical	3	3	20	80	100
	23UMA4AC7:3		Allied - VII	Differential Equations	4	3	25	75	100
	23UMA4AC8:3		Allied - VIII	Statistics and Vector Calculus	4	3	25	75	100
	23UCH4GE2	IV	Generic Elective - II		2	2	-	100	100
	23UCN4EL		Experiential Learning	Internship	-	2	-	100	100
	23UCN4EA	V	Extension Activities	NCC, NSS, etc.,	-	1	-	-	-
	23U4BT2/ 23U4AT2		Basic Tamil - II/ Advanced Tamil - II	எழுத்தும் இலக்கியமும் அறிமுகம் - II/ தமிழ் இலக்கியமும் வரலாறும் - II	-	-	-	100#	-
				Total	**30**	**25**			**800**
V	23UCH5CC9	III	Core - IX	p-Block elements and Nuclear Chemistry	6	6	25	75	100
	23UCH5CC10		Core - X	Oxygen, Nitrogen and Sulphur Containing Organic Compounds and Name Reactions	6	6	25	75	100
	23UCH5CC11		Core - XI	Thermodynamics and Solutions	6	6	25	75	100
	23UCH5CC12P		Core - XII	Physical Chemistry Electrical - Practical	3	3	20	80	100
	23UCH5DE1AP/BP		Discipline Specific Elective - I		5	4	20	80	100
	23UCH5SE1	IV	Skill Enhancement Course - I	Analytical Chemistry	2	1	-	100	100
	23UCH5SE2		Skill Enhancement Course - II	Clinical Chemistry	2	1	-	100	100
	23UCH5EC1		Extra Credit Course - I*	Online Course	-	*	-	-	-
				Total	**30**	**27**			**700**
VI	23UCH6CC13	III	Core - XIII	Coordination Complexes and Chemistry of Lanthanides and Actinides	6	6	25	75	100
	23UCH6CC14		Core - XIV	Electrochemistry, Molecular Spectroscopy and Group Theory	6	6	25	75	100
	23UCH6CC15P		Core - XV	Organic Analysis and Insilico Studies - Practical	5	5	20	80	100
	23UCH6PW		Project Work	Project Work	3	2	25	75	100
	23UCH6DE2A/B		Discipline Specific Elective - II		5	4	25	75	100
	23UCH6DE3AP/BP		Discipline Specific Elective - III		4	4	20	80	100
	23UCN6AE3	IV	AECC - III	Gender Studies	1	1	-	100	100
	23UCH6EC2		Extra Credit Course - II*	Online Course	-	*	-	-	-
	23UCHECA		Extra Credit Course for all**	Online Course	-	**	-	-	-
	***Programme Specific Online Course for Advanced Learners** ****Any Online Course for Enhancing Additional Skills**			**Total**	**30**	**28**			**700**
				Grand Total		**148**			**4400**

B.Sc. CHEMISTRY (WITH ALLIED BOTANY)

Sem	Course Code	Part	Course Category	Course Title	Ins. Hrs/ Week	Credit	Marks		Total
							CIA	ESE	
I	23U1LT1/LA1/LF1/ LH1/LU1	I	Language - I		6	3	25	75	100
	23UCN1LE1	II	English - I	English for Communication - I	6	3	25	75	100
	23UCH1CC1	III	Core - I	Inorganic, Organic and Physical Chemistry - I	5	5	25	75	100
	23UCH1CC2P		Core - II	Volumetric Estimation and Flame Photometric Identification of Metals - Practical	3	3	20	80	100
	23UPH1AC1		Allied - I	Fundamentals of Physics	5	4	25	75	100
	23UPH1AC2P		Allied - II	Properties of Matter- Practical	3	2	20	80	100
	23UCN1AE1	IV	AECC - I	Value Education	2	2	-	100	100
				Total	**30**	**22**			**700**
II	23U2LT2/LA2/LF2/ LH2/LU2	I	Language - II		6	3	25	75	100
	23UCN2LE2	II	English - II	English for Communication - II	6	3	25	75	100
	23UCH2CC3	III	Core - III	Inorganic, Organic and Physical Chemistry - II	6	6	25	75	100
	23UCH2CC4P		Core - IV	Industrial Chemistry - Practical	3	3	20	80	100
	23UPH2AC3		Allied - III	Essentials of Physics	4	4	25	75	100
	23UPH2AC4P		Allied - IV	Optical, Thermal and Electricity-Practical	3	2	20	80	100
	23UCN2SS	IV	Soft Skills Development	Soft Skills Development	2	2	-	100	100
	23UCN2CO	V	Community Outreach	JAMCROP	-	@	-	-	@
	23U2BT1/ 23U2AT1		Basic Tamil - I/ Advanced Tamil - I	எழுத்தும் இலக்கியமும் அறிமுகம் - I/ தமிழ் இலக்கியமும் வரலாறும் - I	-	-	-	100#	-
	@Only grades will be given			**Total**	**30**	**23**			**700**
III	23U3LT3/LA3/LF3/ LH3/LU3	I	Language - III		6	3	25	75	100
	23UCN3LE3	II	English - III	English for Communication - III	6	3	25	75	100
	23UCH3CC5	III	Core - V	Inorganic, Organic and Physical Chemistry - III	4	4	25	75	100
	23UCH3CC6P		Core - VI	Analysis of Domestic Products and Food Samples - Practical	3	3	20	80	100
	23UBO3AC5		Allied - V	Applied Botany – I	4	4	25	75	100
	23UBO3AC6P		Allied - VI	Laboratory Course for Applied Botany - I - Practical	3	2	20	80	100
	23UCH3GE1	IV	Generic Elective - I		2	2	-	100	100
	23UCN3AE2		AECC - II	Environmental Studies	2	2	-	100	100
				Total	**30**	**23**			**800**
IV	23U4LT4/LA4/LF4/ LH4/LU4	I	Language - IV		6	3	25	75	100
	23UCN4LE4	II	English - IV	English for Communication – IV	6	3	25	75	100
	23UCH4CC7	III	Core - VII	Inorganic, Organic and Physical Chemistry - IV	5	5	25	75	100
	23UCH4CC8P		Core - VIII	Semimicro Qualitative Analysis of Inorganic Salt Mixture - Practical	3	3	20	80	100
	23UBO4AC7		Allied - VII	Applied Botany - II	5	4	25	75	100
	23UBO4AC8P		Allied - VIII	Laboratory Course for Applied Botany - II - Practical	3	2	20	80	100
	23UCH4GE2	IV	Generic Elective - II		2	2	-	100	100
	23UCN4EL		Experiential Learning	Internship	-	2	-	100	100
	23UCN4EA	V	Extension Activities	NCC, NSS, etc.,	-	1	-	-	-
	23U4BT2/ 23U4AT2		Basic Tamil - II/ Advanced Tamil - II	எழுத்தும் இலக்கியமும் அறிமுகம் - II/ தமிழ் இலக்கியமும் வரலாறும் - II	-	-	-	100#	-
				Total	**30**	**25**			**800**
V	23UCH5CC9	III	Core - IX	p-Block elements and Nuclear Chemistry	6	6	25	75	100
	23UCH5CC10		Core - X	Oxygen, Nitrogen and Sulphur Containing Organic Compounds and Name Reactions	6	6	25	75	100
	23UCH5CC11		Core - XI	Thermodynamics and Solutions	6	6	25	75	100
	23UCH5CC12P		Core - XII	Physical Chemistry Electrical - Practical	3	3	20	80	100
	23UCH5DE1AP/BP		Discipline Specific Elective - I		5	4	20	80	100
	23UCH5SE1	IV	Skill Enhancement Course - I	Analytical Chemistry	2	1	-	100	100
	23UCH5SE2		Skill Enhancement Course - II	Clinical Chemistry	2	1	-	100	100
	23UCH5EC1		Extra Credit Course - I*	Online Course	-	*	-	-	-
				Total	**30**	**27**			**700**
VI	23UCH6CC13	III	Core - XIII	Coordination Complexes and Chemistry of Lanthanides and Actinides	6	6	25	75	100
	23UCH6CC14		Core - XIV	Electrochemistry, Molecular Spectroscopy and Group Theory	6	6	25	75	100
	23UCH6CC15P		Core - XV	Organic Analysis and Insilico Studies - Practical	5	5	20	80	100
	23UCH6PW		Project Work	Project Work	3	2	25	75	100
	23UCH6DE2A/B		Discipline Specific Elective - II		5	4	25	75	100
	23UCH6DE3AP/BP		Discipline Specific Elective - III		4	4	20	80	100
	23UCN6AE3	IV	AECC - III	Gender Studies	1	1	-	100	100
	23UCH6EC2		Extra Credit Course - II*	Online Course	-	*	-	-	-
	23UCHECA		Extra Credit Course for all**	Online Course	-	**	-	-	-
	Programme Specific Online Course for Advanced Learners** * Any Online Course for Enhancing Additional Skills**			**Total**	**30**	**28**			**700**
				Grand Total		**148**			**4400**

GENERIC ELECTIVE COURSES

Semester	Course Code	Course Title
III	23UCH3GE1	Food and Nutrition
IV	23UCH4GE2	Chemistry in Everyday Life

 # Self-Study Course – Basic and Advanced Tamil
(Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

Semester	Course Code	Course Title
II	23U2BT1	Basic Tamil – I (எழுத்தும் இலக்கியமும் அறிமுகம் - I)
	23U2AT1	Advanced Tamil – I (தமிழ் இலக்கியமும் வரலாறும் - I)
IV	23U4BT2	Basic Tamil – II (எழுத்தும் இலக்கியமும் அறிமுகம் - II)
	23U4AT2	Advanced Tamil – II (தமிழ் இலக்கியமும் வரலாறும் - II)

Mandatory

Basic Tamil Course - I and II are offered for the students who have not studied Tamil Language in their schools and college.

Advanced Tamil Course - I and II are offered for those who have studied Tamil Language in their schools but have opted for other languages under Part - I.

ALLIED CHEMISTRY FOR B.Sc. PHYSICS

Semester	Course Code	COURSE	Course Title
I	23UCH1AC1:1	Allied - I	Inorganic, Organic and Physical Chemistry - I
	23UCH1AC2P	Allied - II	Volumetric Estimations - Practical
II	23UCH2AC3:1	Allied - III	Inorganic, Organic and Physical Chemistry - II
	23UCH2AC4P	Allied - IV	Organic Analysis - Practical

ALLIED CHEMISTRY FOR B.Sc. BOTANY & ZOOLOGY

Semester	Course Code	COURSE	Course Title
I	23UCH1AC1:2	Allied - I	Inorganic, Organic and Physical Chemistry - I
	23UCH1AC2P	Allied - II	Volumetric Estimations - Practical
II	23UCH2AC3:2	Allied - III	Inorganic, Organic and Physical Chemistry - II
	23UCH2AC4P	Allied - IV	Organic Analysis - Practical

DISCIPLINE SPECIFIC ELECTIVES

Semester	Course Code	Course Title
V	23UCH5DE1AP	Gravimetric Estimation and Spectrophotometric study of Metal Complexes - Practical
	23UCH5DE1BP	Quantitative Analysis of metal ions by Photometric Method - Practical
VI	23UCH6DE2A	Stereochemistry, Molecular Rearrangements and Natural Products
	23UCH6DE2B	Essentials of Bioinorganic Chemistry
	23UCH6DE3AP	Physical Chemistry Non-Electrical - Practical
	23UCH6DE3BP	Advanced Physical Chemistry - Practical

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCH1CC1	Core-I	5	5	25	75	100
Course Title	Inorganic, Organic and Physical Chemistry-I						

SYLLABUS		
Unit	**Contents**	**Hours**
I	**ATOMIC STRUCTURE AND PERIODIC PROPERTIES** **1.1 Structure of atom:** Plank's quantum theory of radiation, Photoelectric effect, Bohr's theory, De Broglie equation, Heisenberg's Uncertainty Principle, Energy spectrum of Hydrogen atom, Shapes of s, p, d and f orbital, Quantum numbers, Rules for filling the orbitals with electrons –Pauli's exclusion principle, Slater's rule, Hund's rule, Aufbau Principle. Stability of completely and half-filled subshells; degeneracy of orbitals. *Periodic Table - Long form of periodic table*, Classification of elements. **1.2 Periodic properties**: Atomic, ionic radii, covalent, metallic and van der Waals radii. Ionic radii - determination of the radii of Na^+ and F^- in NaF crystal by Pauling's method - Factors influencing magnitude of ionic radii–Periodic trend. Ionization energy - periodic variation, factors influencing ionization energy, Electron affinity - periodic variation. Electronegativity– Periodic variation, Mullikan's scale and its calculation. Metallic to non-metallic character along a period, relative reactivity, reducing power and basic character of elements.	**15**
II	**QUALITATIVE AND QUANTITATIVE ANALYSIS** **2.1 Qualitative Analysis:** Solubility, solubility product and common ion effect– Definition, applications in semi-micro qualitative analysis. Identification of anions: Nitrate - Brown ring test; Chloride - chromyl chloride test; Borate - ethyl borate test; Phosphate, arsenate-ammonium molybdate test; Carbonate, sulphate, chromate– reaction with HCl. Interfering anions– elimination of fluoride, oxalate, borate and phosphate. Cations: Group separation, identification of cations-Lead, copper, manganese, nickel, cobalt, barium, calcium, magnesium and ammonium. **2.2 Volumetric Analysis:** Primary and secondary standards, preparation of standard solutions – Normality, Molarity, mole percentage, parts per million, equivalent weight calculation for acids, bases and metal salts in different medium, equivalence point and end point. Types of titrations: acid-base, redox, precipitation, iodimetry, iodometry and complexometric (EDTA) titrations, *theory of indicators*, phenolphthalein, methyl orange and Eriochrome Black–T.	**15**

III	**3.1 Nomenclature of Organic Compounds** Rules of IUPAC system of Nomenclature - General procedure for IUPAC names of alkanes, alkenes and alkynes with branched chains and functional groups (-OH, -COOH, -CHO,- C=O, -NH_2 and Halogens)and its application. **3.2 Structure of Organic Molecules** Orbital structure of atom - electron configuration, shapes and orientation of orbitals, bond length, bond angle and bond energy - Types of covalent bonds sigma and pi bonds -Hybridization- sp^3, sp^2 and sp hybridization of carbon - Lewis and Line - Bond structure-Formal charge - Electro negativity – Definition - Polar and non-polar molecules (H_2O, CO_2, CH_3Cl, CCl_4) - Resonance Concept - Rules governing Resonance - *Use of Arrows*.	**15**
IV	**ORGANICREACTION MECHANISMS** **4.1 Electronic Effect:**Inductive, Electromeric, Mesomeric effects, hyper conjugation, Steric effect -Definition, Factors influencing and applications. Energy requirements of organic reactions–Energy of activation, *transition state*, intermediates using energy profile diagram. **4.2 Reactive Intermediates :** Homolytic and Heterolytic fissions - carbonium ions, carbanions, free radicals and carbenes – formation, structure, stability and reactions. Classification of reagents–Electrophilic and Nucleophilic-Types of organic reactions–substitution, addition, elimination, rearrangement and radical.	**15**
V	**GASEOUS STATE** **5.1 Gas Laws:** Kinetic theory of gases, Kinetic equation of gases, Derivation of various gas laws from Kinetic gas equation. Molecular velocities – Root Mean Square velocity, *Average Velocity* and Mean Velocity (calculations). Boltzmann, Einstein, Maxwell's law of distribution of molecular velocities. **5.2 Expansivity and compressibility**-Boyle temperature, Mean free path, Collision diameter, Collision number, Collision frequency. Heat capacity of gases-Determination of heat capacity ratio and Degree of freedom of gaseous molecules. **5.3 Real gases and ideal gases**- Deviation of real gases from the ideal behavior, derivation of van der Waals equation for real gases, significance of van der Waals constants. Critical phenomenon and Calculation of critical constants. (Simple problems using van der Waals equation)	**15**
VI	**Current Trends (For CIA only)** Recent discoveries in Periodic elements-Niholium, Moscovium, Tennessin and Oganesson – atomic number, atomic weight and discoverer.	

……. Self Study

Text Books:

1. B.R.Puri and L.R.Sharma, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., New Delhi, 55th Edition, 2020
2. P. L.Soni, Text Book of Inorganic Chemistry, S. Chand & Co., NewDelhi, Revised Edition, 2017
3. P.K. Mani and A.O.Thomas, Text book For Practical Chemistry for B.Sc. Main Students, Xavier press,Cannanore, 1stEdition, 2006
4. P. L.Soni and H.M.Chawla, Text Book of Organic Chemistry, Sulthan and Chand company, New Delhi, 28thEdition, 1999
5. B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical Chemistry, Vishal Publications, Jalandhar, 48th Edition, 2019

Reference Books:

1. R. D. Madan, Modern Inorganic Chemistry, S.Chand & Co., New Delhi, 2ndReprint, 1987
2. B. R. Puri, L.R.Sharma and K.C.Kalia, Principles of Inorganic Chemistry, Vishal Publications, Jalandhar, NewPaper back Edition, 2020
3. M. K. Jain, Organic Chemistry, Sulthan and Chand Company, NewDelhi, 12th Edition, 2003
4. Bahl and Arun Bahl, Advanced Organic Chemistry, Sulthan and Chand Company, New Delhi, 19thEdition, 2005
5. R. L. Madan and G.D.Tuli, Simplified Course in Physical Chemistry, S.Chand & Co., NewDelhi, 5th Revised and Enlarged Edition, 2009

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc23_cy25/preview
2. https://nptel.ac.in/content/syllabus_pdf/104101121.pdf
3. https://www.vedantu.com/chemistry/qualitative-chemical-analysis
4. https://en.wikipedia.org/wiki/IUPAC_nomenclature_of_organic_chemistry

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Describe the structure of atoms and periodic properties.	**K1**
CO2	Identify anions and cations of the salt and electronic effects of various groups.	**K2**
CO3	Calculate different concentration solutions and apply IUPAC nomenclature for organic compounds.	**K3**
CO4	Evaluate molecular velocities	**K4**
CO5	Defend the stability of reactive intermediates and half and completely filled sub-shells.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	3	3	2	3	1	3	2	3	3	2.5
CO2	3	3	2	1	2	3	2	1	1	1	1.9
CO3	2	1	2	1	3	2	2	1	2	3	1.9
CO4	3	2	1	1	2	3	2	1	1	1	1.7
CO5	3	1	1	1	1	3	2	1	1	1	1.5
Mean Overall Score											1.9
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Mohamed Rabeek

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCH1CC2P	Core-II	3	3	20	80	100

Course Title	Volumetric Estimation and Flame Photometric Identification of Metals - Practical

Contents	Hours
Volumetric Estimation 1. Estimation of oxalic acid ($FeSO_4$ Vs $KMnO_4$ Vs $H_2C_2O_4$). 2. Estimation of ferrous sulphate ($H_2C_2O_4$ Vs $KMnO_4$ Vs $FeSO_4$). 3. Estimation of hydrochloric acid ($H_2C_2O_4$ Vs NaOH Vs HCl). 4. Estimation of $K_2Cr_2O_7$ (Std. $K_2Cr_2O_7$ Vs $Na_2S_2O_3$ Vs $K_2Cr_2O_7$). 5. Estimation of Mg (II) by EDTA ($MgSO_4$ Vs EDTA Vs $MgSO_4$) **II. Flame photometric Estimation** 1. Estimation of sodium ion 2. Estimation of potassium ion 3. Estimation of calcium ion **Scheme of valuation** **I. Volumetric Estimation - 35 marks** Procedure writing - 05 marks 1-2 % error - 30 marks 2-3 % error - 25 marks 3-4 % error - 20 marks 4% error - 15 marks **II. Spectrophotometric Estimation- 35 marks** Procedure writing - 05 marks 1-2 % error - 30 marks 2-3 % error - 25 marks 3-4 % error - 20 marks 4 % error - 10 marks	**45**

Text Books:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 2019, 2nd Edition.
2. K. B. Baliga et al., College Analytical Chemistry, Himalaya Publishing House, 2011, 19th Edition.
3. J. Merdharn, R.C. Denney, J.D. Barnes, M. Yhomas, Vogels's Textbook of Quantitative Chemical Analysis, Pearson Education Limited, New Delhi, 2006, 6th Edition.

Reference Books:

1. Henry W. Schimpf, Essentials of Volumetric Analysis, New York John Wiley Sons, London, 1917, 3rd Edition.
2. R.C. Mukarjee, Modern Approach to Chemical Calculations, Bharati Bhawan Publishers, New Delhi, 2008, 2nd Edition.
3. Boris Balitsky, Laboratory Exercise in General Chemistry, MIR Publishers, Moscow, 1968, 2nd Edition.

Web Resources:

1.https://nitsri.ac.in/Department/Civil%20Engineering/CWE301_WATER_QUALITY_AND_ENVIRONMENT_Flame_Photometry.pdf

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the principles of volumetric technique	**K1**
CO2	Estimate the quantity of chemical substance present in a solution	**K2**
CO3	Explain the principle of flame photometric method	**K3**
CO4	Calculate the weight required for preparing different concentrated solutions	**K4**
CO5	Apply the flame photometric method to analyze the metal ion from soil samples and water samples	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	2	0	3	3	2	2	1	**2.4**
CO2	3	3	3	2	1	3	3	2	1	0	**1.9**
CO3	3	3	3	2	1	3	2	2	1	1	**1.9**
CO4	3	3	3	2	1	3	1	2	1	1	**2.0**
CO5	3	3	3	2	1	3	1	2	1	1	**2.0**
Mean Overall Score											**2.0**
Correlation											**Medium**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Syed Abuthahir

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UPH1AC1	Allied – I	5	4	25	75	100

Course Title	FUNDAMENTALS OF PHYSICS

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Elasticity:** Hooke's law – Young's modulus, Rigidity modulus & Bulk modulus – Expression for bending moment - determination of Young's modulus by non-uniform bending (Pin and Microscope) - surface tension:- definition –determination of surface tension by drop weight method –Viscosity: co-efficient of viscosity –determination of co-efficient of viscosity by burette method (variable pressure head) – *comparison of viscosities*	**15**
II	**Mechanics:** Newton's law of gravitation –Kepler's laws of planetary motion–gravitation contstant-determination of 'G' by Boy's method- friction- laws of friction – centre of gravity - centre of gravity of solid cone and solid hemisphere – meta center – meta centric height – *determination of the metacentric height of a ship*	**15**
III	**Sound:** Simple harmonic motion (SHM) –equation of simple harmonic motion – composition of two SHM's in a straight line – composition of two SHM's at right angles to each other – Lissajou's figures (Basic concept only) –ultrasonic – properties – production by piezo-electric method- *applications of ultrasonics*– reverberation and reverberation time-conditions for a good auditorium	**15**
IV	**Heat:** Newton's law of cooling -determination of specific heat capacity of a liquid by cooling – thermal conductivity – co-efficient of thermal conductivity – determination of thermal conductivity of a bad conductor by Lee's disc method – solar constant – * determination of solar constant by Angstrom's Pyrheliometer*-temperature of the sun	**15**
V	**Diffusion and Osmosis:** **Diffusion**: Diffusion of liquids – Graham's laws of diffusion in liquids –*Ficks' law of diffusion* – analogy between liquid diffusion and heat conduction – experimental determination of coefficient of diffusion. **Osmosis:** osmosis and osmotic pressure – laws of osmotic pressure -experimental determination of osmotic pressure (Berkeley and Hartley method)	**15**

……. Self Study

Text Book(s):

1. R. Murugesan, Properties of matter, S.Chand& Co, reprint (2022)
Unit – I: Sec: 1.1,1.2,1.15.1.21, 3.1, 3.17, 2.1, 2.5, 2.7
Unit – III: 11.1 , 11.2, 12.1,12.2, 12.4, 11.9, 11.10,11.16, 11.17, 11.21
Unit – II: Sec: 6.1-6.3, 22.1-22.3, 20.1- 20.3
2. R. Murugesan, Properties of matter, S.Chand& Co, 4th Edition, 2005
Unit – V: Sec: 2.21, 8.1- 8.28
3. Brijlal&Subramaniam, Heat & thermodynamics, S.Chand Publications, 7th Edition, 2008.
Unit – IV: Sec: 4.1- 5.5

Reference Book(s):
1. BrijLal&Subramaniam,Properties of Matter, S.Chand Publications, 4th edition, 2008. 2. MathurD.S, Elements of Properties of Matter ,Eleventh edition, Shyamlal Charitable Trust, New Delhi, 1993.
Web Resource(s):
1. https://www.askiitians.com/physics/mechanics/surface-tension.aspx 2. https://www.esaral.com/oscillations-class-11-simple-harmonic-motion-notes 3. https://www.adda247.com/teaching-jobs-exam/heat-and-temperature/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	understand the basic principles of certain physical properties of the materials around us	**K2**
CO2	Applications of different constants associated with different materials	**K3**
CO3	analyze viscosity, surface tension, diffusion, osmosis, properties of liquid	**K4**
CO4	analyze the centre of gravity of various objects	**K4**
CO5	interpret the physical properties of new materials	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**2**	3	**3**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	2.5
CO2	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**1**	**1**	**2**	2.2
CO3	**3**	**1**	**3**	**1**	**3**	**2**	**2**	**2**	**2**	**3**	2.2
CO4	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**1**	**3**	2.6
CO5	**1**	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**2**	**2**	2.2
										Mean Overall Score	**2.34**
										Correlation	**MEDIUM**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. C. Hariharan

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UPH1AC2P	ALLIED –II	3	2	20	80	100

Course Title	PROPERTIES OF MATTER – PRACTICAL

List of Experiments:

1. Young's Modulus – Non Uniform bending (Scale &Telescope)
2. Surface tension and interfacial surface tension by drop weight method.
3. Potentiometer – Low range voltmeter calibration
4. Air wedge – Thickness of a thin wire.
5. Comparison of viscosities by capillary flow method.
6. AND, OR and NOT logic gates using discrete components .

Books for reference:
1. M.N. Srinivasan,S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , reprint 2010.
2. C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition,2007.

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall the basic principles of properties of matter and understand the concepts of bending behaviour beams	**K2**
CO2	Make practical skills essential for experimentation.	**K3**
CO3	Apply experimental approaches to correlate with physics theory to develop practical understanding.	**K3**
CO4	Analyze themselves the concept of heat, optics and acoustics	**K4**
CO5	evaluate the ideas required for their higher studies	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	2	2	2	1	2	2	2	2.2
CO2	2	3	2	3	2	2	2	2	3	2	2.3
CO3	2	2	2	3	3	2	3	3	2	2	2.4
CO4	2	1	2	2	2	2	2	3	2	2	2.0
CO5	2	3	3	2	3	3	2	1	2	2	2.3
Mean Overall Score											**2.22**
Correlation											**Medium**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Abbas Manthiri

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCN1AE1	AECC – I	2	2	-	100	100

Course Title	Value Education for Men

SYLLABUS		
Unit	**Contents**	**Hours**
I	**VALUES IN LIFE:** Purpose and philosophy of life – Need for values –five fold moral culture. Values: truth, loyalty, integrity, humility, trustworthy, considerate, not being greedy, clean habits, punctuality, kindness, gratitude, patience, respect and character building.	6
II	**PERSONAL WELLBEING**: Social responsibility - taming a healthy mind and body – personal hygiene - Balanced diet – meditation – yoga - positive thinking – introspection - a passion for Nature- Win-win strategy.	6
III	**ROLE OF MEN IN FAMILY**: As a responsible student – committed employee - loyal husband - dedicated father – fatherhood- sacrificing human – considerate true friend.	6
IV	**MAN A SOCIAL BEING**: A friendly neighbour - living a life with definite motives – emotions and moral desire- uncompromising will power- puberty- secondary sexual characters- marriage: Purpose – marital life- Harmony with spouse- fidelity towards spouse.	6
V	**PROFESSIONAL VALUES**: More of a giver than a taker - being compassionate – patriotism - respecting culture - dependence on God – avoiding worry- professional ethics.	6

Hours of Teaching: 5 Hours and Hours of Activity: 25 Hours

Textbook(s):

1. Value Education for health, Happiness and harmony, the world community service centre, Vethathri Publications
2. N. Venkataiah, Value Education, APH Publishing Corporation, New Delhi, 1998
3. K.R. Lakshminarayanan and M. Umamageshwari, Value Education, Nalnilam Publication, Chennai.

Web References:

1. https://www.slideshare.net/humandakakayilongranger/values-education-35866000
2. https://www.ananda.org/blog/5-secrets-to-a-harmonious-marriage/
3. https://www.un.org/esa/socdev/family/docs/men-in-families

Activity:

- Assignment on Values (not less than 20 Pages)
- Multiple Choice Questions and Quiz
- Elocution - (Manners and good Habits for 3 to 5 minutes)
- Field Visit
- Debating - Current issues
- Essay writing: Proper use of e-gadgets, Ethics, Cyber ethics, Social media, etc.,
- Case Study / Album Making / Poster Presentation / Documentary- Celebrating National Days, Drug abuse & illicit trafficking, Independence Day, Secularism, Teachers Day, National Youth Awakening Day, Father's Day / Mother's Day and etc.,

EVALUATION COMPONENT: TOTAL: 100 MARKS

Component I:

Documentary (or) Poster Presentation (or) Elocution - 25 marks

Component II:

Quiz (or) Multiple choice questions Test - 25 marks

Component III:

Album Making (or) Case Study on a topic (or) Field visit - 25 marks

Component IV:

Assignment (or) Essay Writing (or) Debating - 25 marks

Course Coordinator: Dr. M. Purushothaman

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCN1AE1	AECC - I	2	2	-	100	100

Course Title	Value Education for Women

SYLLABUS		
Unit	**Contents**	**Hours**
I	**VALUES IN LIFE:** Purpose and philosophy of life – Need for values –five fold moral culture - Imbibing values: truth, loyalty, integrity, humility, trustworthy, considerate, not being greedy, clean habits, punctuality, kindness, gratitude, patience, respect and character building.	6
II	**FAMILY**: Nuclear – cluster – significance - social functions - changing trend - role of women in family - obedient daughter - purposeful youth- dedicated wife - caring mother.	6
III	**PUBERTY**: Need of knowledge of menstruation- menstrual symptoms – handling – menstrual disorder - maintaining good personal hygiene - motherhood- Stages of pregnancy- post pregnancy care.	6
IV	**MARRIAGE**: Types of marriage - purpose of marriage- love and infatuation – need for marital preparation - pre and post marital counselling - conflicts in marital life - divorce single parenthood.	6
V	**HARMONY WITH SPOUSE**: Husband and wife relationship - fidelity towards spouse-relationship among the family members. Tenets of bride for healthy family – kindness, respect, patience, care, love.	6

Hours of Teaching: 5 hours and Hours of Activity: 25 hours

Textbook(s):

1. Value Education for health, Happiness and harmony, the world community service centre, Vethathri Publications
2. N. Venkataiah, Value Education, APH Publishing Corporation, New Delhi, 1998
3. Betty, Carten and Meg Goldric, The Changing family life style - A Framework for Family Therapy, 2nd Edition, 2000.
4. Marie, Madearentas, Family Life Education, CREST-Centre for research education service training for family promotion, Bangalore, 1999.

Web References:

1. https://www.slideshare.net/humandakakayilongranger/values-education-35866000
2. https://www.ananda.org/blog/5-secrets-to-a-harmonious-marriage/
3. https://www.nap.edu/read/2225/chapter/14

Activity:

- Assignment on Values (not less than 20 Pages)
- Multiple Choice Questions and Quiz
- Elocution - (Manners and good Habits for 3 to 5 minutes)
- Field Visit
- Debating - Current issues
- Essay writing: Proper use of e-gadgets, Ethics, Cyber ethics, Social media, etc.,
- Case Study / Album Making / Poster Presentation / Documentary- Celebrating National Days, Drug abuse & illicit trafficking, Independence Day, Secularism, Teachers Day, National Youth Awakening Day, Father's Day / Mother's Day and etc.,

EVALUATION COMPONENT: TOTAL: 100 MARKS

Component I:

Documentary (or) Poster Presentation (or) Elocution - 25 marks

Component II:

Quiz (or) Multiple choice questions Test - 25 marks

Component III:

Album Making (or) Case Study on a topic (or) Field visit - 25 marks

Component IV:

Assignment (or) Essay Writing (or) Debating - 25 marks

Course Coordinator: Dr. M. Purushothaman

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UCH2CC3	Core-III	6	6	25	75	100

Course Title	Inorganic, Organic and Physical Chemistry- II

SYLLABUS

Unit	Contents	Hours
I	**CHEMICALBONDING-I** **1.1 Ionic Bond:** Electronic theory of valency, Properties of ionic compounds, Variable Electrovalence, Inert Pair effect, Lattice energy – Born Haber cycle – application, factors affecting lattice energy, solubility and solvation energy. Radius ratio rule (ZnS, NaCl). **1.2 Covalent Bond:** Valence Bond concept, *types of over lapping of orbitals (ss, pp, sp)* sigma and pi–bonds: Polarity of bonds–ion polarization–degree of ionic character; Significance of dipole moment of polar molecules– Fajan's Rules –Applications. **1.3 Molecular Orbital Theory:** LCAO method, Bonding and anti–bonding MO, mixing of orbitals, bond order, relationship between bond order, bond stability, bond length. MO diagrams of H_2, He_2, N_2, O_2, O_2^+, O_2^- CO, HF and NO – Calculation of bond order and magnetism spin only formula, Comparison of valence bond theory and molecular orbital theory.	18
II	**CHEMICALBONDING-II** **2.1. Shapes of covalent Molecules**: Hybridisation, formula for prediction of hybridization, sp (BeF_2, CO_2), sp^2 (BF_3, NO^- ion), sp^3 (NH_4^+ H_2O, SO_4^{2-}), sp^3d (PCl_5) –Bond strength, energy and length. Resonance - Canonical forms of CO_2, NO_2, CO_3^{2-} – Resonance energy, conditions. VSEPR – Postulates, shapes of $BeCl_2$, BH_3, CH_4, H_2O, NH_3, PCl_5 and SF_6. **2.2. Metallic Bond**: Properties of solids based on *Electron sea theory*, valence bond theory and band theory **2.3. Intermolecular forces:** van derWaals forces, ion-dipole, dipole-dipole, induced dipole, instantaneous-induced dipole interactions - Hydrogen Bond**:** Nature, types, effects on physical and chemical properties.	18
III	**3.1. Alkanes** Homologous series, Isomerism - Methods of preparation - Wurtz synthesis, Corey-House Alkane Synthesis and Kolbe's synthesis – Physical properties, Chemical Properties – Chlorination, Nitration, Sulphonation, Oxidation, isomerisation, Pyrolysis (cracking). Preparation, Properties and uses of methane and ethane. **3.2. Cycloalkanes (**3 to 6 membered rings**):** Nomenclature, Methods of Preparation-Dieckmann, Simmons-Smith reaction. Properties -Physical and Chemical - Substitution and Ring-Opening reaction - Stability of Cycloalkanes -Bayer's strain Theory. **3.3. Petroleum:** Composition, mining, Refining–Cracking-Synthetic Petrol-Octane Number, Cetane Number, Flash Point and fire point. Petrochemicals – Definition, Composition and uses of Compressed Natural Gas (CNG), Biodiesel, Liquefied Natural Gas (LNG) and *Liquefied Petroleum Gas (LPG)*.	18
IV	**LIQUIDS AND COLLOIDS** **4.1. Liquids:** Physical properties of liquids-Vapour pressure, Measurement by isoteniscopic method, Heat of vaporization, Trouton's rule - Surface tension, Measurement by Capillary-Rise Method, Variation with temperature and pressure. Viscosity – Variation with temperature and pressure. Reynolds number **4.2.Liquid crystals:** definition, classification, theory of liquid crystals, molecular arrangements in various states of liquid crystals, physical properties of liquids, molar volume-parachor, atomic and *structural parachor*, applications. **4.3. Colloids:** Definition, differences between true solution, colloidal solution and suspension, phases of colloidal solution-Electrical properties–Zeta potential, charge on colloidal particles, double layer and zeta potential. Electrophoresis and Electro osmosis, Brownian movement, Tyndall effect (definition and uses only) - protection of colloids – Gold number, stabilities of sols, medicinal applications of colloids.*Surfactants, Emulsion and Gels-definition, types and their uses*.	18

V	**SOLID STATE AND ADSORPTION** **5.1. Solid state:** *Classification- crystalline and amorphous solids, isotropic and anisotropic solids, symmetry elements, unit cell, space lattice*, Bravais lattice, seven crystal systems, Law of rational indices, Weiss indices and Miller indices. Crystal structure of NaCl and CsCl. Packing in crystals –hcp, ccp and bcc. **5.2. X- ray diffraction:** Derivation of Bragg's equation – Determination of crystal structure by Laue's powder method – Determination of Avogadro's number. (Simple problems from Bragg's equation) **5.3. Adsorption on solids:** Chemisorption and physisorption. Postulates and mathematical form of Freundlich, Langmuir and BET adsorption isotherms.	**18**
VI	**Current Trends (For CIA only)** Nanocolloids**:** Medicinal applications of nanocolloids	

…… Self Study

Text Books:

1. P.L. Soni, Text book of Inorganic Chemistry, S.Chand & Co., NewDelhi, Revised Edition, 2017.
2. P.L. Soni and H.M. Chawla, Text Book of OrganicChemistry, Sulthan and Chand company, New Delhi, 28th Edition, 1999
3. B. S. Bahl, G.D.Tuli and ArunBahl, Essentials of PhysicalChemistry, S.Chand &Co.,NewDelhi 28th Edition, 2020.
4. B. R. Puri, L. R. Sharma and M. S. Pathania, Principles of Physical Chemistry, Vishal Publications, Jalandhar, 48th Edition, 2019.

Reference Books:

1. R.D. Madan, Modern Inorganic Chemistry, S.Chand& Co., NewDelhi, 2ndReprint, 1987
2. B.R.Puri, L.R.Sharmaand K.C.Kalia, Principles of Inorganic Chemistry, Vishal Publications, Jalandhar, NewPaper back Edition, 2020
3. Bahl and ArunBahl, Advanced Organic Chemistry, Sulthan and Chand Company, New Delhi, 19thEdition, 2005
4. R.L.Madan and G.D. Tuli, Simplified Course in Physical Chemistry, S.Chand & Co., NewDelhi, 5th Revised and Enlarged Edition, 2009
5. J. N. Gurtu and A. Gurtu, Advanced PhysicalChemistry, Pragathi Prakashan,Meerut, 4th Edition, 2017

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc23_cy25/preview
2. https://nptel.ac.in/content/syllabus_pdf/104101121.pdf
3. https://byjus.com/jee/chemical-bonding/
4. https://en.wikipedia.org/wiki/Colloid

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Remember the concepts of ionic bond, covalent bond and metallic bonds	**K1**
CO2	Understand the properties of petroleum products	**K2**
CO3	Apply Molecular Orbital theory, VSEPR to study the properties of molecules	**K3**
CO4	Analyze nature of bonds present in the molecules	**K4**
CO5	Compare the salient features of solids, crystals, liquids, liquid crystals and colloids	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	2	3	3	3	3	3	2.9
CO2	3	3	1	2	1	3	1	2	1	1	1.8
CO3	3	2	2	3	2	3	3	3	1	2	2.4
CO4	3	3	3	3	2	3	3	3	2	2	2.7
CO5	3	1	1	1	1	3	1	1	1	1	1.4
Mean Overall Score											2.24
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. J. Muneer Ahamath

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UCH2CC4P	Core – IV	3	3	20	80	100

Course Title	Industrial Chemistry- Practical

Contents	Hours
1. Estimation of total hardness of water using EDTA 2. Determination of Iodine value of oil by Hanus method. 3. Determination of saponification value of an oil 4. Estimation of ascorbic acid (Vitamin – C) 5. Determination of percentage purity of washing soda 6. Estimation of available chlorine in bleaching powder 7. Determination of percentage of calcium in lime stone 8. Determination of acid value of an edible oil **Scheme of valuation** **Record** – 10 Marks **Procedure writing** – 10 Marks **For Estimation** – 60 Marks **For Estimation Results:** 1-2% - 60 marks 2-3% - 50 marks 3-4% - 40 marks >4% - 30 marks	**45**

Text Books:

1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 1997, 2nd Edition.
2. K.B. Baliga et al., College Analytical Chemistry, Himalaya Publishing House, 2011, 19th Edition.
3. J. Merdharn, R.C. Denney, J.D. Barnes, M. Yhomas, Vogels's Textbook of Quantitative Chemical Analysis, Pearson Education Limited, New Delhi, 2006, 6th Edition.

Reference Books:

1. Henry W. Schimpf, Essentials of Volumetric Analysis, New York John Wiley Sons,. London, 1917, 3rd Edition.
2. Michal J. Sienko, Robert A. Plane, Stanley T. Marcus, Experimental Chemistry, MCGraw-Hill Book Company, New Delhi, 1985, 6th Edition.
3. D.V. Jahagirdar, Experiments in Chemistry, Himalaya Publishing House, Mumbai, 2018, 2nd Edition.

Web Resources:

1. https://collegedunia.com/courses/industrial-chemistry
2. https://www.gsfcuni.edu.in/bsc-industrial-chemistry

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Identify the purity of commercial samples	**K1**
CO2	Express the total hardness of water	**K2**
CO3	Determine the availability of chemical constituents in various commercial products	**K3**
CO4	Analyse the quality of oil samples	**K4**
CO5	Measure the percentage of additives in washing powder	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	2	1	3	3	2	2	1	2.3
CO2	3	3	3	2	1	3	3	2	1	1	2.2
CO3	3	3	3	2	1	3	2	2	1	1	2.2
CO4	3	3	3	2	2	3	2	2	2	1	2.3
CO5	3	3	3	2	1	3	2	2	2	1	2.2
Mean Overall Score											**2.2**
Correlation											**Medium**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Farook Basha

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UPH2AC3	ALLIED – III	4	4	25	75	100

Course Title	ESSENTIALS OF PHYSICS

SYLLABUS		
Unit	**Contents**	**Hours**
I	OPTICS Spherical Aberration in a lens – Methods of minimizing Spherical Aberration – Interference– Air-wedge – Thickness of a thin wire (Theory and Experiment) – Newton's rings – Radius of curvature of the lens-Diffraction-Determination of wavelength of light using grating- *Polarization* –Specific Rotatory Power- Laurent's Half Shade Polarimeter	12
II	ELECTRICITY Coulomb's law – Gauss law - Principle of capacitor –Energy stored in a charged capacitor – Loss of energy due to sharing of charges – *Kirchhoff's laws* – Application of Kirchhoff's laws to Wheatstone bridge – Carey Foster bridge – Determination of specific resistance – Potentiometer - Calibration of low range voltmeter and ammeter	12
III	ATOMIC AND NUCLEAR PHYSICS Vector atom model – Quantum numbers – Coupling schemes – The Pauli's Exclusion Principle – Zeeman Effect – Experimental arrangement for normal Zeeman effect – Liquid drop model –Construction and working of an Ionization chamber and Geiger Muller Counter – *Nuclear fission* – Energy released in fission –Nuclear fusion	12
IV	ELECTRONICS Formation of P-N Junction Diode – Forward and Reverse biasing of a Junction diode – V-I Characteristics of a Junction Diode – *Junction diode as bridge rectifier* – Zener diode – V-I Characteristics of a Zener Diode – Construction and Working of a transistor – Characteristics of a transistor in Common Emitter (CE) and Common Base (CB) configurations	12
V	NUMBER SYSTEMS AND LOGIC CIRCUITS Conversion between Decimal, Binary, Octal and Hexadecimal number systems – *The basic logic gates (AND, OR, NOT) using discrete components – NAND and NOR as universal gates – The Exclusive OR gate* – Laws of Boolean algebra – De-Morgan's theorems – Half Adder– Full Adder	12

……. Self Study

Text Books:

1. R. Murugeshan, KiruthigaSivaprasath,Optics and Spectroscopy, S. Chand & Company PVT. Ltd, New Delhi, Reprint, 2016.
   Unit–I:Section1.16 – 1.7, 2.1,2.7-2.9, 3.17,4.19,4.20
   Unit – VI: Section 5.3 – 5.6
2. R. Murugeshan, Electricity and Magnetism,S. Chand & Company PVT. Ltd, New Delhi, Tenth Edition, 2017.
   Unit–II: Section 1.2, 2.2, 4.1, 4.9, 4.11, 6.6 – 6.8R. Murugeshan, KiruthigaSivaprasath, Modern Physics,S. Chand & Company PVT. Ltd, New Delhi, Eighteenth Edition, 2016.
   Unit –III: Section 4.12 – 4.23, 17.10, 18.3, 18.6, 22.1, 22.6 – 22.6.1
   Unit –IV: Section 33.1 – 33.2.1, 33.5.3, 34.1, 35.1 – 35.3
   Unit – V: Section 41.1 – 41.15
3. N. Subrahmanyam, Brijlal and M.N. Avadhanulu, A Textbook of Optics, S. Chand & Company PVT. Ltd, New Delhi, Twenty Fourth Edition, 2015.
   Unit – VI: Section 22.8, 22.14 – 22.19

Reference Books :

1. Arthur Beiser, Concepts of Modern Physics, McGraw Hill, Fifth edition, 2002.
2. V.K.Mehta,RohitMehta,PrinciplesofElectronics, S.ChandPublications, Reprint2016

Web Resources:

1. https://www.classcentral.com/course/edx-electricity-and-magnetism-part-1-3032
2. https://www.electronics-tutorials.ws/
3. https://www.nuclear-power.net/nuclear-power/reactor-physics/atomic-nuclear-physics/

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Recall the basic principles and contemporary concepts on various fields on physics like optics, electrostatics, atomic and nuclear physics	K1
CO2	Understand the basic ideas of geometric optics	K2
CO3	Construct digital circuits for simple real world problems	K3
CO4	List the applications of electronics in modern gadgets	K4
CO5	Explain the fundamental concepts of electricity	K5

Relationship Matrix

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	2	1	3	2	2	3	1	2	3	2.1
CO2	2	3	1	2	3	2	3	2	3	2	2.3
CO3	2	3	2	3	1	1	3	2	1	3	2.1
CO4	3	2	3	1	1	3	2	2	2	3	2.2
CO5	3	2	3	3	2	3	2	2	3	1	2.4
Mean Overall Score											2.22
Correlation											MEDIUM

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

Dr. S. Shek Dhavud
Dr.P. Revathi

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UPH2AC4P	ALLIED – IV	3	2	20	80	100

Course Title	OPTICAL, THERMAL AND ELECTRICITY - PRACTICAL

List of Experiments:

1. Young's modulus – Cantilever depression method
2. Potentiometer – Ammeter calibration.
3. Compound Pendulum: Determination of the radius of Gyration
4. Comparison of radii: Capillary flow method.
5. Sonometer – Verification of transverse laws of vibration (I & II Law)
6. Meter bridge resistance.
7. Verification of De Morgan's theorems using ICs.
8. Determination of the resistance of a material using post office box.

Books for Reference:

1. M.N. Srinivasan,S. Balasubramaniyan, R. Ranganathan, A text book of Practical Physics, S.Chand&Sons , reprint 2010.
2. C.C. Ouseph, U.J. Rao& V. Vijayendran, Practical physics and electronics, S. Viswanathan, Pvt,Ltd, First edition,2007.

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall the basic principles of properties of matter and underlying the concepts of bending behaviour beams	**K2**
CO2	Make practical skills essential for experimentation.	**K3**
CO3	Apply experimental approaches to correlate with physics theory to develop practical understanding.	**K3**
CO4	Analyze the concepts of heat and acoustics and understood the measurements of some physical quantities through heat and electricity experiments	**K4**
CO5	evaluate the circuit construction in the electronics	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	2	2	2	1	2	2	2	2.2
CO2	2	3	2	3	2	2	2	2	3	2	2.3
CO3	2	2	2	3	3	2	3	3	2	2	2.4
CO4	2	1	2	2	2	2	2	3	2	2	2.0
CO5	2	3	3	2	3	3	2	1	2	2	2.3
Mean Overall Score											2.22
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Mr. S. Mohamed Ibrahim Sulaiman Sait

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UCN2SS	Soft Skills Development	2	2	-	100	100

Course Title	Soft Skills Development

SYLLABUS		
Unit	**Contents**	**Hours**
I	**Communication Skills:** Verbal and Non - Verbal communication - The active vocabulary - Conversational Etiquette - KOPPACT syndrome	6
II	**Emotional Skills:** Emotional Intelligence - The five steps to Emotional Quotient - Self Awareness and Regulation - Empathy - Social Intelligence - stress management - coping with failures	6
III	**Functional Skills:** Using the tools of communicatory and emotional skills - Resume writing - Preparation of Curriculum Vitae - interview skills - Acing the interview - Group dynamics - Mock interviews and Group discussions	6
IV	**Interpersonal Skills:** Synergising relationships - SWOT analysis - SOAR analysis - The social skills - Time Management - Decision making - problem solving - prioritising and Implementation	6
V	**Personality Skills:** Leadership skills - Attributes and Attitudes - Social leader Vs The Boss - critical and creative thinking	6

Hours of Teaching : 5 hours and Hours of Activity: 25 hours

Textbook(s):

1. Social intelligence: The new science of human relationships - Daniel Goleman; 2006.
2. Body Language in the workplace - Allan and Barbara Pease; 2011.
3. Student's Hand Book: Skill Genie - Higher education department, Government of Andhra Pradesh.

Web References:

1. https://nptel.ac.in/courses/109105110

EVALUATION CRITERIA

Work Book (Each unit carries 10 marks) - 50 Marks
Examination - 50 Marks

1. Teacher who handles the subject will award 50 marks for work book based on the performance of the student.
2. On the day of examination the examiners (Internal & External) will jointly award the marks for the following categories:

- Self-Introduction - 20 Marks
- Resume - 10 Marks
- Mock Interview - 20 Marks

To assess the self-introduction, Examiners are advised to watch the video presentation submitted by the students. If they failed to submit the video presentation, the Examiners may direct the student to introduce himself orally and a maximum 10 marks only will be awarded.

Mock Interview Marks Distribution (**20-Marks**)

Attitude (self interest, confidence etc.) (4 Marks)	Physical appearance including dress code (4 Marks)	Communication Skills (6 Marks)	Answering questions asked from the resume and work book (6 Marks)

Course Coordinator:
Dr. M. Syed Ali Padusha

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UCH3CC5	Core - V	4	4	25	75	100
Course Title	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - III						

SYLLABUS

Unit	Contents	Hours
I	**s - BLOCK ELEMENTS, HALOGENS AND NOBLE GASES** 1.1. Hydrogen: Position of hydrogen in the periodic table. Alkali metals: Comparative study of the elements with respect to oxides, hydroxides, halides, carbonates, and bicarbonates. 1.2. Halogens: General characteristics of halogen with reference to electronegativity, electron affinity, oxidation states and oxidizing power. Peculiarities of fluorine. Preparation, properties, and uses of Halogen acids-HF, HCl, HBr, HI and oxy acids. 1.3. **Noble Gases**: Position in the periodic table. Preparation, properties and structure of XeF_2 , XeF_4 ,*XeF_6 *and XeO_4 uses of noble gases-clathrate compounds.	12
II	**p - BLOCK ELEMENTS** 2.1. **Boron Group**: Structure, preparation, properties,and uses of borax, diborane, boron nitride, borazine and borazole. Comparative study of boron group elements. 2.2. **Carbon Group**: Comparative study of carbon group and their hydrides, halides andoxides. Preparation and properties of *carbon disulphide,* cyanogens, HCN and pseudo halogens. 2.3. **Oxygen Group**: Structure and allotropy of elements - chemistry of ozone - Classification and properties of oxides – oxides of sulphur and selenium–Oxyacids of sulphur(Caro's and Marshall's acids)	12
III	**OLEFINS AND ACETYLENES** 3.1. **Alkenes** – Preparation and properties of alkenes – electrophilic and free radical addition. *Markownikoff's and anti-Markownikoff's rules.* 3.2.**Alkadienes**- Nomenclature-classification–isolated,conjugatedandcumulateddienes,stabilityofconjugateddienes,mechanismofelectrophiliadditiontoconjugated dienes - 1, 2 and 1, 4 additions-free radical additions to conjugateddienes,Diels–Alder reactions. 3.3. **Alkynes** –Preparation from dihalides. Addition reactions - hydrogen, halogens, halogen acids, water, oxidation by $KMnO_4$, ozonolysis. acidity of alkynes.	12
IV	**ALCOHOLS AND ALKYL HALIDES** 4.1 **Alcohols**: Classification, isomerism, preparation and properties. Distinction between primary, secondary and tertiary alcohols by Lucas and Victor Meyer methods. *Glycol – preparation and properties.* Glycerol – preparation and properties. **4.2 Aromatic alcohols** Nomenclature, benzyl alcohol – methods of preparation – hydrolysis, reduction of benzaldehyde, Cannizzaro reaction. **4.3.Alkyl halides**: Vicinal dihalides and gem dihalides - Preparation and properties. Aliphatic Nucleophilic substitution reactions - mechanism of SN^1, SN^2 and SNi reactions. Elimination reactions - mechanisms of E_1 and E_2 reactions – Saytzeff's and Hofmann rules.	12
V	**ELECTRICAL AND MAGNETIC PROPERTIES OF MATTER** 5.1 **Electrical Properties of Matter**: *Polar and non-polar molecules, dipole moment, Stark effect*, Polarization of molecules in an electric field - electronic polarization, atomic polarization and orientation polarization – Clausius - Mosotti equation (noderivation) and Debye equation (no derivation)- Methods to determine dipole moment – Temperature method and dilute solution method - applications of dipole moment - determining the percentage of ionic character of bonds- shapes of simple molecules (H_2O, CO_2 and NH_3). 5.2 **Magnetic Properties of Matter**: Magnetic flux, Magnetic Permeability, Magnetic susceptibility, Types of magnetism - dia, para, ferro and antiferro magnetism. Determination of magnetic susceptibility by Guoy balance method. Application to solving of simple structural problems.	12
VI	Current Trends (For CIA only) – **Super para magnetism and Neel relaxation time.**	

…….. Self Study

Text Book(s):
1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers and distributors, New Delhi, 1st Edition, 2012 2. Bahl and ArunBahl, Advanced Organic Chemistry, Sulthan and Chand Company, New Delhi, 19th Edition, 2005 3. P.W. Atkins, Physical Chemistry, Oxford University Press, 7th edition, 2009
Reference Book(s):
1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers and distributors, New Delhi, 1st Edition, 2012 2. V. K. Ahluwalia, Text book of Organic Chemistry Vol-I &Vol-II, Ane's Student edition, New Delhi, 1st Edition, 2010 3. J. N. Gurtu and A.Gurtu, Advanced Physical Chemistry, PragathiPrakashan, Meerut, 3rd Edition, 2016
Web Resource(s):
1. https://nptel.ac.in/courses/113/105/113105024/ 2. https://www.khanacademy.org/science/organic-chemistry/aromatic-compounds 3. https://study.com/academy/topic/ethers-carbonyl-compounds.html

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Describe the chemistry of binary compounds and alloys and metallurgy.	**K1**
CO2	Analyse the aromaticity of the organic compounds and their mechanism towards electrophilic substitution.	**K2**
CO3	Understand the properties of carbonyl compounds and ethers.	**K3**
CO4	Infer the concepts of acids and bases.	**K4**
CO5	Explain the kinetics of chemical reactions.	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	2	**2**	**2**	**3**	**2**	**1**	**3**	**1**	**2**	**2.0**
CO2	**3**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**2**	**2.0**
CO3	**3**	**2**	**2**	**1**	**3**	**2**	**1**	**2**	**2**	**2**	**2.0**
CO4	**3**	**3**	**2**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**2.1**
CO5	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**2.2**
										Mean Overall Score	**2.04**
										Correlation	**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator:

1. **Dr. K. Riaz Ahamed**
2. **Dr. J. Muneer Ahamath**

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UCH3CC6P	Core - VI	3	3	20	80	100

Course Title	Analysis of Domestic Products and Food Samples - Practical

SYLLABUS

Contents	Hours
I. List of experiments **40 marks** 1. Preparation of Detergent washing powder and determination of its pH, Surface tension, Cleaning ability and Foaming ability 2. Preparation of Utensils cleaning powder and determination of its pH, Surface tension, Cleaning ability, Foaming ability 3. Preparation of Normal shampoo and determination of its pH, Cleaning ability and Foaming ability 4. Preparation of Tooth paste and determination of its pH, Abrasiveness, Cleaning ability and Foaming ability 5. Preparation of Decarbonizes and determination of its pH and Cleaning ability 6. Preparation of Soap and determination of its pH, Surface tension, Cleaning ability and Foaming ability 7. a. Preparation of White Phenoyl b. Preparation of LCD screen cleaner 8. a. Preparation of Sanitizer b. Preparation of Hand and Body lotion 9. a. Preparation of Pain relieving balm b. Preparation of Pain relieving liniment 10. a. Preparation of Rose water b. Preparation of Room freshener **II Video Presentation** **10 marks** Preparation of 3-5 minutes video presentation for marketing the products **III Spectrophotometric Estimation** **20 marks** 1. Estimation of chromium in foods 2. Estimation of Iron in foods **IV. Record** **10 marks** **Scheme of Valuation** **I& II Preparation and Quality Measurements of Domestic Products** **50 marks** Procedure writing : 10 marks Preparation of Domestic Product : 30marks Video presentation : 10marks **III. Spectrophotometric Estimation – 20 marks** 1-2% error - 20 marks 2-3%error - 15marks 3-4 %error - 10marks >4%error - 5marks	**45**

Text Book(s):

1. Hilda Butler, Pouchers-Perfumes, Cosmetics and Soaps, Springer, New Delhi, 12th Edition, 2012
2. Howard, Perfumes Cosmetics And Soaps Volume-I, Springer, Meri Pustak publications, New Delhi, 9th Edition, 2018.

Reference Book(s):
1.fssai Manual of Methods of Analysis of Foods Metals, Food Safety and Standards Authority of India, Ministry of Health and Family Welfare, Government of India, New Delhi, 2016. 2. Manual of Laboratory Methods for Fortified Foods, East, Central and Southern African Healthy Community, Part-III, 1st Edition, 2007.
Web Resource(s):
1. https://fssai.gov.in/upload/uploadfiles/files/Manual_Metals_25_05_2016(1).pdf 2. https://www.fssai.gov.in/flipbook.php?bookid=362&doc2=0#book2/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Select the chemicals required for the domestic product preparation.	**K1**
CO2	Produce the products in small scale	**K2**
CO3	Appraise the quality of domestic products.	**K3**
CO4	Formulate the combination for commercialization	**K4**
CO5	Become an enterperuner.	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3.0**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2.9**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2.9**
CO4	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.9**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**2.9**
Mean Overall Score											**2.92**
Correlation											**High**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. **Dr. M. Syed Ali Padusha**
2. **Dr. R. Abdul Vahith**

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMA3AC5:3	Allied – V	4	3	25	75	100

Course Title	CALCULUS

SYLLABUS		
Unit	**Contents**	**Hours**
I	Successive Differentiation – The n^{th} derivatives of Standard result – Trigonometrical transformation of functions - * Formation of equations involving derivatives* - Leibnitz formula for the n^{th} derivative of a product (Statement only) - Related problems.	**12**
II	Partial Differentiation – Successive partial derivatives – Function of function rule - *Total differential coefficient and special case* – implicit functions - Homogeneous functions - Partial derivatives of a function of two functions.	**12**
III	Properties of definite integrals – Integration by parts - Reduction formulae $\int x^n e^{ax}, \int sin^n x, \int cos^n x, and \int sin^m x cos^n x$- Related problems.	**12**
IV	Curvature: Circle, Radius and Center of Curvature - Cartesian Formula for the Radius of Curvature - Coordinates of the Center of Curvature.	**12**
V	Evolute and Involute – Radius of curvature when the curve is given in polar co-ordinates – p-r equation – pedal equation of a curve.	**12**

…… Self Study

Text Book(s):

T. K. Manicavachagom Pillay and Others, Calculus Volume-I, S. Viswanathan Publishers Pvt. Ltd. (2004).

UNIT I	Chapter III	Sections 1.1 – 1.6, 2.1, 2.2 (Section 2.1: statement only Section 2.2: problems only)
UNIT II	Chapter V	Sections 1.2, 1.3, 1.5(Section 1.2 and 1.3: Theorems statement only, Section 1.5: Working Rules and problems only)
	Chapter VIII	Sections 4, 5
UNIT III	Chapter VIII	Sections 1.1 – 1.7
UNIT IV	Chapter X	Sections 2.1 – 2.4
UNIT V	Chapter X	Sections 2.5 – 2.8

Reference Book(s):

1. A. Abdul Rasheed, Allied Mathematics, Tata McGraw Hill Education (2006)
2. S. Arumugam and A. Thangapandi Isaac, Calculus, New Gamma Publishing House (2008).

Web Resource(s):

1. https://nptel.ac.in/courses/111104092
2. https://nptel.ac.in/courses/111105122

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Find the nth derivatives of a function and apply the Leibnitz's theorem for finding n^{th} derivative of product of two functions.	**K1**
CO2	Explain the concept of curvature of a curve and to find the radius and center of curvature of a given curve.	**K2**
CO3	Solve maxima and minima for a function of one, two variables.	**K3**
CO4	Understand the concept of evolute, involute and to find radius of curvature using polar co-ordinates and forming pedal equation of a curve.	**K4**
CO5	Discuss the partial derivatives of a function of functions depending on two independent variables and to understand the concepts of homogeneous function, Euler's theorem, total differentiation and implicit functions.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	3	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2.8**
CO2	**3**	**1**	**3**	**3**	**3**	**3**	**1**	**3**	**1**	**3**	**2.4**
CO3	**3**	**3**	**1**	**3**	**2**	**3**	**3**	**1**	**3**	**3**	**2.5**
CO4	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**2.8**
CO5	**3**	**1**	**3**	**3**	**3**	**1**	**3**	**3**	**1**	**3**	**2.4**
Mean Overall Score											**2.58**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. P. Muruganatham
2. Mr. T. Rabeeh Ahamed

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UMA3AC6:3	Allied – VI	3	3	25	75	100

Course Title	ALGEBRA AND TRIGONOMETRY

SYLLABUS

Unit	Contents	Hours
I	Theory of equations: *Nature of roots* – Relation between the coefficients and the Roots of an algebraic equation – Transformation of equations – Reciprocal equations.	9
II	Matrices- *Special types of matrices*- Scalar multiplication of a matrix- Equality of matrices, Addition of matrices- Subtraction- Symmetric matrix-Skew symmetric matrix-Hermitian and skew Hermitian matrices- Multiplication of matrices (Problems only).	9
III	Matrices: *Various types of Matrices* - Rank of a Matrix - Eigen values and Eigen Vectors- Verification of Cayley-Hamilton theorem.	9
IV	Trigonometry: Expansions of $\cos n\theta$ and $\sin n\theta$ – Powers of sines and cosines of θ in Terms of functions of multiple of θ.	9
V	Hyperbolic functions – Simple Problems	9

…… Self Study

Text Book(s):

1. S.Narayanan, R.Hanumantha Rao and T.K. Manicachagom Pillay, P. Kandaswamy, Ancillary Mathematics, Volume I, S. Viswanathan Publishers Pvt. Ltd. Revised Edition (2007).
2.T.K. Manicavachagom Pillay, T. Natarajan and K.S. Ganapathy, Algebra Volume-II, Ananda Book Depot, Chennai (2019).

UNIT I	Chapter 2	Sections 2.1– 2.4	TB-1
UNIT II	Chapter 2	Sections 1-7	TB-2
UNIT III	Chapter 3	Sections 3.1, 3.2, 3.4.	TB-1
UNIT IV	Chapter 5	Sections 5.1, 5.2	TB-1
UNIT V	Chapter 5	Section 5.4.	TB-1

Reference Book(s):

1. A. Abdul Rashid, Allied Mathematics, Vijay Nicole Publishing Company (2008).
2. S. Arumugam and A. Thangapandi Isaac, Ancillary Mathematics, New Gamma Publishing house (2002).

Web Resource(s):

1. https://nptel.ac.in/courses/111107119
2. https://www.digimat.in/nptel/courses/video/111107119/L01.html

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand of common algebra and how they are used to obtain solutions of matrices then mathematical problems.	**K1**
CO2	Derive the Trigonometry Expansions of cosnθ and sinnθ – Powers of sines and cosines.	**K2**
CO3	Apply algebra and Trigonometry to obtain solutions to mathematical problems.	**K3**
CO4	Analyse mathematical problems to determine the suitable functions.	**K4**
CO5	Evaluate various Trigonometry functions and roots of algebraic equation, hyperbolic functions.	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**3**	**3**	**2**	**1**	**3**	**3**	**3**	**2**	**3**	**2.6**
CO2	**2**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**1**	**3**	**2.5**
CO3	**3**	**1**	**3**	**3**	**1**	**3**	**1**	**3**	**3**	**3**	**2.4**
CO4	**3**	**2**	**3**	**2**	**1**	**1**	**2**	**3**	**3**	**3**	**2.3**
CO5	**2**	**3**	**1**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**2.5**
Mean Overall Score											**2.46**
Correlation											**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. V. Krishnan
2. Mr. T. Rabeeh Ahamed

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UBO3AC5	Allied – V	4	4	25	75	100
Course Title	**Applied Botany – I**						

Syllabus

Unit	Contents	Hours
I	**Algae:** General characteristics and outline classification of algae (F. E. Fritsch, 1935). Thallus organization, food reserve and habitats of algae. A detailed study of structure, reproduction, life cycle (excluding development stages) and economic uses of the following genera – **Oscillatoria**, *Chlorella*, *Sargassum* and *Gracilaria*. Cultivation methods of fresh water (*Spirulina*), and marine (*Kappaphycus*) algae.	12
II	**Fungi and Lichens:** General characteristics and outline classification of fungi (Alexopoulos and Mims, 1979). Detailed study of occurrence, morphology, reproduction and life cycle of the following genera – *Albugo*, Brief account on cultivation of edible mushroom (*Pleurotus*). Introduction to medicinal mushrooms (*Ganoderma*) and antibiotic producing fungi (*Penicillium*). Brief account on production of citric acid and acetic acid from fruit peel waste. *Lichens – General characters, types and economic importance of Lichens*.	12
III	**Bryophytes:** General characteristics and outline classification of Bryophytes (Watson, 1971). Structural description (excluding development stages) of the following genera – *Marchantia* and *Polytrichum*. A brief mention of use of bryophytes for antibiotics, anti-cancer, food, ornamental, non-absorbant bandage and pesticides. Environmental importance of mosses in pedogenesis and *peat bog*.	12
IV	**Pteridophytes**: General characteristics and outline classification of Pteridophytes (Sporne, 1975). Structural description (excluding developmental stages) of the following genera – *Lycopodium* and *Adiantum*. and *Economic importance of Pteridophytes*. Cultivation of *Azolla*.	12
V	**Gymnosperms**: General characters and outline classification of gymnosperms (Sporne, 1967). Morphology, anatomy, reproduction, life cycle (excluding developmental stages) and economic uses of *Cycas*. Importance of gymnosperms as wood and resins (*Pinus*), anti-cancer drug (*Taxus* and *Ephedra*). A brief study of types and application of fossil plants in paleoclimatology and *climate models*.	12

..... Self-Study

Text Book(s):

1. Vasishta PC, Sinha AK and Kumar A, Botany for Degree Students (Volumes), 2nd Edition, Chand & Company Pvt Ltd, New Delhi, India, 2010.
2. Hait G, Bhattacharya K and Ghosh AK, A Text Book of Botany, 5th Edition, New Central Book Agency Pvt Ltd, Kolkata, India, 2011.
3. Sharma OP, Plants and Human Welfare, Prakathi Prakashan Publications Pvt Ltd, Meerut, India, 2015.

Reference Book(s):

1. Alexopoulos CJ, Mims CW and Blackwell M, Introductory Mycology, 4th Edition, Wiley Publishers, New Delhi, India, 2007.
2. Sharma OP, A Text Book of Algae, 1st Edition, Tata McGrew Hill Education Pvt Ltd, New Delhi, India, 2011.

Course Outcomes		
Course Outcomes: Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-level)**
CO1	Outline the diversity of cryptogams and seed plants.	K1
CO2	Identify the economic uses of natural wealth from cryptogams and seed plants.	K2
CO3	Perceive the alternative uses of and applications of cryptogams and seed plants.	K3
CO4	Appraise the values of natural wealth from cryptogams and seed plants.	K4
CO5	Recommend alternative bio resources for human welfare.	K5

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	2	2	1	1	3	1	1	3	2
CO2	2	2	2	2	1	3	1	1	3	2	1.9
CO3	1	1	3	3	2	1	1	2	2	1	1.7
CO4	2	2	2	3	1	1	1	1	1	1	1.5
CO5	2	2	2	3	1	1	1	1	1	1	1.5
										Mean Overall Score	1.7
										Correlation	Medium

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. A. Aslam

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UBO3AC6P	Allied - VI	3	2	20	80	100
Course Title	**Laboratory Course for Applied Botany - I – Practical**						

Syllabus		
	Contents	**Hours**
	1. Generic level identification of algal specimens in a mixture. *a. Oscillatoria* *b. Chlorella* *c. Spirulina* *d. Sargassum* *e. Gracilaria* 2. Identification of following fungi in both host as well as permanent slides *a. Albugo* *b. Saccharomyces* 3. Observation of external and internal structure of *a. Marchantia* *b. Polytrichum* *c. Lycopodium* *d. Adiantum* *e. Cycas* *f. Pinus* 4. Identification of spotters related to economic uses of species mentioned in theory	45

Text Book(s):

1. Santra SC, Chatterjee TP and Das AP, College Botany Practical (Volume II), 1st Edition (Reprinted), New Central Book Agency Pvt Ltd, Kolkata, India, 2001.
2. Pandey BP, Modern Practical Botany, 1st Edition (Reprinted), Chand & Company Pvt Ltd, New Delhi, India, 2011.
3. Sharma OP, Practical Botany, 7th Edition, Pragati Prakashan Educational Publishers Pvt Ltd, Meerut, India, 2014.

Course Outcomes		
Course Outcomes: Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-level)**
CO1	Experience laboratory skills of handling botanical specimens.	K1
CO2	Describe diversity of plants.	K2
CO3	Demonstrate preparation and curation of botanical specimens.	K3
CO4	Identify commercial potential of cryptogams.	K4
CO5	Appraise the traits and key characters of cryptogams.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	1	3	1	3	1	3	3	2	1	1	1.9
CO2	1	3	1	1	2	3	3	2	1	1	1.8
CO3	2	1	1	3	1	1	3	2	1	1	1.6
CO4	1	3	2	1	1	1	3	2	1	1	1.6
CO5	1	3	1	3	1	1	3	2	1	1	1.7
										Mean Overall Score	1.7
										Correlation	Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. A. Aslam

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UCH3GE1	Generic Elective-I	2	2	-	100	100

Course Title	Food and Nutrition

SYLLABUS		
Unit	**Contents**	**Hours**
I	**FOOD AND ITS CONSTITUENTS** 1.1. Food: Definition - Classification based on nutritional values, nutritive values of cereals and nuts - oil seeds. 1.2. Minimum Nutritional Requirement and RDA - Child, Adult, Pregnant Women and lactating women. :	6
II	**MINERALS AND VITAMINS** 2.1. Minerals & Trace Elements, Physiological Role & requirements, sources, deficiency & excess (Calcium, Sodium, Potassium Phosphorus, Iron, Fluoride, Zinc, Selenium, Iodine, Chromium). 2.2. Vitamins – classification, sources, deficiency & excess of vitamin A, B_6, B_{12}, C, D, E and K .	6
III	**MEAL PLANNING** 3.1 Importance of meal planning-importance of mother's milk, Milk and milk products - Composition, Classification, Processing, Storage and uses in different preparations. 3.2.Diet during fever, dysentery, anemia, blood pressure, corona virus *obesity and diabetes* IV – Aavin Milk Tiruchirappalli Corporation	6
IV	**FOOD SPOILAGE AND PRESERVATION** 4.1: Food spoilage due to contamination and microorganisms – vegetables, fruits, fish, meat, eggs and milk. 4.2 Food Preservation: definition, objectives and principles of food preservation. *Different methods of food preservation*.	6
V	**FOOD ADULTERATION** 5.1. Food adulteration - Definition, classification - common adulterants in food- detection and ill Effects, packing hazards and food additives. 5.2. Practical rules for good sanitation of food - Food laws and standards – Food Standards : ISI, *Agmark*, FPO, MPO, PFA, FSSAI. IV – Bunge India PVT, Trichy	6

……. Self Study

Text Book(s):

1.Dr. M. Swaminathan, Handbook of foodand Nutrition, Printing andPublishing Co Ltd,Bangalore, 5th Edition, 2007.
2.B. Srilaksmi, Food Science, New Age International(P) Ltd, New Delhi, 3rd edition, 2005.
3. M. Raheena Begum, A Text Book ofFoods, Nutrition andDietetics, StrlingPublishers,New Delhi, 3rd edition, 2010.

Reference Book(s):

1. JayashreeGhose,Fundamental Conceptsof Applied Chemistry, S. Chand andCompany (P) Ltd, New Delhi, 1st Edition, 2006.
2.Morris B. Jacobs, The Chemical Analysisof Foods and FoodProducts, CBS Publishers and Distributors, New Delhi, 3rd Edition, 1993.
3.H.K. Chopra andP.S. Panesar, Food Chemistry, Narosa Publisher, NewDelhi, 3rd Edition, 2010.

Web Resource(s):
1. https://onlinecourses.swayam2.ac.in/cec19_ag02/preview 2.https://www.careers360.com/courses-certifications/food-nutrition-courses-brpg 3.http://www.pjc.ac.in/pdf/syllabus/UG-Food-Nutrition-Syllabus-09042019.pdf

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the major components of foods in the environment	**K 1**
CO2	Explain the causes of food spoilage and principles of different techniques used in preservation of foods	**K 2**
CO3	Examine the importance of meal planning and diet	**K 3**
CO4	Analyze the biological functions of minerals and vitamins	**K 4**
CO5	Compare the adulterants added to foods	**K 5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	2	2	3	3	2	3	2	2.4
CO2	3	3	3	3	2	3	3	3	2	2	2.7
CO3	3	3	3	3	2	3	3	3	2	2	2.7
CO4	3	3	3	3	2	2	3	3	2	2	2.6
CO5	3	3	2	3	2	3	3	2	2	2	2.5
										Mean Overall Score	2.58
										Correlation	**High**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator
1. Dr. K Loganathan
2. Dr. S. S. Syed Abuthahir

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
III	23UCN3AE2	AECC - II	2	2	-	100	100
Course Title	**Environmental Studies**						

Unit	Contents	Hours
I	The multidisciplinary nature of environmental studies Definition, scope, importance, awareness and its consequences on the planet.	6
II	**Ecosystems:** Definition, structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	6
III	**Natural Resources:** Renewable and Non-renewable Resources: Land Resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Heating of earth and circulation of air; air mass formation and precipitation. Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. renewable energy resources significance of wind, solar, hydal, tidal, waves, ocean thermal energy and geothermal energy.	6
IV	**Biodiversity and Conservation:** Levels of biological diversity: genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns biodiversity hot spots. mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: *In situ* and *Ex situ* conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	6
V	**Environmental Pollution & Conservation:** Environmental pollution: types, causes, effects and controls; Air, water, soil, chemical and noise pollution Waste to wealth - Energy from waste, value added products from waste, fly ash utilization and disposal of garbage, solid waste management in urban and rural areas, Swachh Bharat Abhiyan, recent advances in solid waste management, modern techniques in rain water harvesting and utilization.	6

Text books:

1. Asthana DK and Meera A, Environmental studies, 2nd Edition, Chand and Company Pvt Ltd, New Delhi, India, 2012.
2. Arumugam N and Kumaresan V, Environmental studies, 4th Edition, Saras Publication, Nagercoil, Tamil Nadu, India, 2014.

Activity – I:

1. Assignments – Titles on Environmental awareness to be identified by teachers from the following (scripts not less than 20 pages)
2. Elocution – (Speech on "Environment beauty is the fundamental duty" of citizen of the country for 3 to 5 minutes)
3. Environment issues – TV, Newspaper, Radio and Medias messages – Discussion ϖ Case Studies/Field Visit/Highlighting Day today environmental issues seen or heard
4. Debating/Report Submission – Regarding environment issues in the study period Activity II
5. Environmental awareness through charts, displays, models and video documentation.

Celebrating Nationally Important Environmental Days
National Science Day – 28th February World wild life Day – 3rd March International forest Day – 21st March World Water Day – 22nd March World Meteorological Day – 23rd March World Health Day – 7th April World Heritage Day – 18th April Earth / Planet Day – 22nd April Plants Day – 26th May Environment Day – 5th June Activity III Discipline specific activities
EVALUATION COMPONENT: Component I: (25 Marks) Document (or) Poster presentation or Elocution Component II: (25 Marks) Album making (or) case study on a topic (or) field visit Component III: (25 Marks) Essay writing (or) Assignment submission Component IV: (25 Marks) Quiz (or) multiple choice question test

Course Outcomes		
Course Outcomes: Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-level)**
CO1	To understand the multi-disciplinary nature of environmental studies and its importance	K1
CO2	To obtain knowledge on different types of ecosystem	K2
CO3	To acquire knowledge on Renewable and non-renewable resources, energy conservation	K3
CO4	To understand biodiversity conservation	K4
CO5	To analysis impact of pollution and conversion waste to products	K5

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	02	02	02	02	02	03	03	03	03	03	2.5
CO2	02	03	03	02	03	03	03	03	03	03	2.8
CO3	02	03	03	03	03	03	03	03	03	03	2.9
CO4	02	02	03	03	03	03	03	03	03	03	2.8
CO5	02	03	03	03	03	03	03	02	03	03	2.8
										Mean Overall Score	2.7
										Correlation	High

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. B. Balaguru

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UCH4CC7	Core - VII	5	5	25	75	100

Course Title	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - IV

SYLLABUS

Unit	Contents	Hours
I	**BINARY COMPOUNDS AND METALLURGY** 1.1. **Binary compounds**: Borides, Hydrides, Carbides, Nitrides – Classification, structure-bonding and uses. 1.2. **Metallurgy**: Occurrence of metals in India – Extraction of V and Ti from their ores.Concentration of ores – Froth floatation, Magnetic separation, roasting, smelting. Purification of metals - Reduction, Electrolysis, Van Arkel process, *Zone refining, Alumino thermic process*. 1.3. Alloys: Classification - Preparation and properties – role of carbon in steel – important alloys – Bronze, Brass, Duralamine, gun metal, stainless steel, Nickel steel, Magnalium, Cast Iron, Nichrome, Solder - composition and uses.	15
II	**AROMATIC COMPOUNDS** 2.1 **Aromaticity**: Resonance in benzene - delocalised cloud in benzene Huckel's rule and its application to aromaticity of benzenoid (benzene, naphthalene and phenanthrene) and non-benzenoid (cyclopropenium cation and cyclopentadienyl anion) compounds. 2.2 **Aromatic Electrophilic substitution reactions**: General mechanism of electrophilic reactions – Halogenation, nitration and sulphonation. Fridel-Craft's alkylation and acylation reactions. Orientation effects of various substituents – ortho/para ratio. Nuclear and side chain halogenations of toluene.	15
III	**CARBONYL COMPOUNDS AND ETHERS** 3.1. **Carbonyl Compounds:** General methods of preparation and properties of acetone and acetaldehyde. Benzaldehyde, Benzophenone and acetophenone preparation and properties. 3.2. **Ethers**: Nomenclature, isomerism, general methods of preparations, reactions involving cleavage of C-O linkages, alkyl group and ethereal oxygen. Zeisel's method of estimation of methoxy group. Preparation, properties and uses of Anisole 3.3. Thioethers - nomenclature, structure, preparation, properties and uses.	15
IV	**CONCEPTS OF ACIDS AND BASES** 4.1 **Acids and bases** – *Arrhenius, Bronsted- Lowry and Lewis concepts of acids and bases*– Ionic Equilibria - Buffer solution – Definition, buffer action mechanism and its uses –Buffer capacity - various measurement scales for the strength of acids and bases, pH, pOH, and pK_a - calculation of pH of a buffer by Henderson's equation - 4.2 **Hydrolysis of salts** – Definition, - salt of weak acid and strong base, salt of weak base -strong acid and salt of weak acid and weak base- hydrolysis constant (K_h), relation between K_h, K_a and K_w, Degree of hydrolysis - salt of weak acid - strong base, salt of weak base -strong acid and salt of weak acid - weak base.	15
V	**CHEMICAL KINETICS, CATALYSIS AND PHOTOCHEMISTRY** 5.1 **Chemical Kinetics:** Rate and rate constant – factors affecting rate of reactions – Temperature effect on reaction rate - Arrhenius rate equation, energy of activation and its significance,. Theories of reaction rates – simple collision theory, Absolute Reaction Rate Theory (ARRT) to simple uni-molecular and bimolecular processes - Comparison of collision theory & ARRT (Solving problems using Arrhenius rate equation) 5.2 **Catalysis:** Catalyst, types of catalysts - *homogeneous and heterogeneous catalysis* –theories of catalysis- Intermediate compound formation theory and modern adsorption theory - synthetic and industrial importance of catalyst. 5.3 **Photochemistry:** Differences between thermal and photochemical reactions- Laws of photochemistry, Definition - quantum yield and chemical actinometry.	15
VI	**Current Trends (For CIA only)**-Novel catalyst - NADPH, Ce-Zr, CLPN-Pd – applications.	

..... Self Study

Text Book(s):

1. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers and distributors, New Delhi, 1st Edition, 2012.
2. Bahl and Arun Bahl, Advanced Organic Chemistry, Sulthan and Chand Company, New Delhi, 19th Edition, 2005.
3. V. K. Ahluwalia, Text book of Organic Chemistry Vol-I &Vol-II, Ane's Student edition, New Delhi, 1st Edition, 2010.
4. R. L. Madan and G. D. Tuli, Simplified Course in Physical Chemistry, S. Chand & Co., New Delhi, 5th Revised and Enlarged Edition, 2009

Reference Book(s):

1. R. D. Madan, Modern Inorganic Chemistry, S. Chand & Co.,New Delhi, 2nd Reprint, 1987
2. M. K. Jain, Organic Chemistry, Sulthan and Chand Company, New Delhi, 12th Edition, 2003
3. P.W. Atkins, Physical Chemistry, Oxford University Press, 7th Edition, 2009
4. J. N. Gurtu and A.Gurtu, Advanced Physical Chemistry, Pragathi Prakashan, Meerut, 3rd Edition, 2016

Web Resource(s):

1. https://nptel.ac.in/courses/113/105/113105024/
2. https://www.khanacademy.org/science/organic-chemistry/aromatic-compounds
3. https://study.com/academy/topic/ethers-carbonyl-compounds.html

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Describe the chemistry of binary compounds and alloys and metallurgy.	**K1**
CO2	Understand the properties of carbonyl compounds and ethers.	**K2**
CO3	Analyze the aromaticity of the organic compounds and their mechanism towards electrophilic substitution.	**K3**
CO4	Infer the concepts of acids and bases.	**K4**
CO5	Explain the kinetics of chemical reactions.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	2	**2**	**2**	**3**	**2**	**1**	**3**	**2**	**2**	**2.0**
CO2	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1.9**
CO3	**2**	**2**	**2**	**1**	**3**	**2**	**1**	**2**	**1**	**2**	**1.8**
CO4	**3**	**3**	**2**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**2.1**
CO5	**2**	**3**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**2.2**
										Mean Overall Score	**2.0**
										Correlation	**Medium**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. **Dr. J. Sirajudeen**
2. **Dr. S. Mohamed Rabeek**

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UCH4CC8P	Core - VIII	3	3	20	80	100

Course Title	SEMIMICRO QUALITATIVE ANALYSIS OF INORGANIC SALT MIXTURE - PRACTICAL

SYLLABUS	
Contents	**Hours**
I. List of Practicals: **Qualitative analysis of inorganic salts** **70 marks** Analysis of a mixture containing two cations and two anions of which one will be an interfering ion by Semimicro methods. **Cations to be analysed**: Lead, copper, bismuth, cadmium, tin, iron, zinc, manganese, cobalt, nickel, barium, calcium, strontium, magnesium and ammonium. **Anions to be analysed**: Carbonate, sulphide, sulphate, nitrate, chloride, bromide, fluoride, borate, oxalate and phosphate. **II. Record** **10 marks** **Scheme of valuation** Procedure Writing : 10 marks 4 radicals correct with suitable tests : 60 marks 3 radicals correct with suitable tests : 45 marks 2 radicals correct with suitable tests : 30 marks 1 radical correct with suitable tests : 15 marks	**45**
Text Book(s):	
1.V.Venkateswaran, R.Veeraswamy and A.R. Kulandivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons,New Delhi, second edition,1997.	
Web Resource(s):	
1.https://www.vlab.co.in/broad-area-chemical-sciences	

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Acquire knowledge on the systematic analysis of Mixture of salts.	**K1**
CO2	Infer the cations and anions in the unknown substance.	**K2**
CO3	Identify the cations and anions in the given substance by doing the suitable tests and to test the qualityof the unknown substance.	**K3**
CO4	Deduct the role of common ion effect in the given substance	**K4**
CO5	Explain importance of the role of solubility product in qualitative analysis	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	2	2	2	2	2	2	3	2	3	**2.2**
CO2	3	3	3	2	2	2	3	3	3	2	**2.6**
CO3	2	2	2	2	2	2	3	2	2	2	**2.1**
CO4	2	2	2	2	2	2	3	3	3	3	**2.4**
CO5	2	2	3	2	3	2	2	2	2	2	**2.2**
Mean Overall Score											**2.3**
Correlation											**Medium**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. **Dr. M. Syed Ali Padusha**
2. **Dr. S. Farook Basha**

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMA4AC7:3	Allied – VII	4	3	25	75	100

Course Title	**DIFFERENTIAL EQUATIONS** (For Chemistry)

SYLLABUS

Unit	Contents	Hours
I	Linear equation – Bernoulli's equation – Exact differential equations.	12
II	Equations of the first order but of higher degree - Equations solvable for dy/dx Equations solvable for y - *Equations solvable for x* – Clairaut's form – Equations that do not contain x explicitly - Equations that do not contain y explicitly - Homogeneous equations in x and y.	12
III	Linear Equations with constant coefficients - The operator D - Complementary function of a linear equation with constant coefficients –Particular integrals.	12
IV	Linear equations with variable coefficients – Equations reducible to the linear equations –Variation of parameters.	12
V	Partial Differential Equations of the first order - Classification of integrals - Derivation of PDE by elimination of constants and functions - Lagrange's method of solving the linear equation -Special methods -Standard forms I, II, *III and IV (Clairant's form) *	12

…… Self Study

Text Book(s):

S. Narayanan and T. K. Manicavachagom Pillay, Differential Equation and its Application, S. Viswanathan Publishers Pvt. Ltd., Ninth edition (2006).

UNIT I	Chapter II	Sections 4, 5, 6.1 –6.4
UNIT II	Chapter IV	Sections 1 – 4
UNIT III	Chapter V	Sections 1 – 4
UNIT IV	Chapter V	Sections 5 and 6
	Chapter VIII	Section 4
UNIT V	Chapter XII	Sections 1 – 5

Reference Book(s):

1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand & Co. (2010).
2. M.L. Khanna, Differential Equations, Jai Prakash Nath and Co. (2004).

Web Resource(s):

1. https://nptel.ac.in/courses/111/105/111105093/
2. https://nptel.ac.in/courses/111/107/111107111/
3. https://nptel.ac.in/courses/122/107/122107037/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall the concept of differential equations.	**K1**
CO2	Classify the different forms of differential equations	**K2**
CO3	Solve the linear differential equations with constant coefficients and particular integrals	**K3**
CO4	Simplify the differential equations with variable coefficients	**K4**
CO5	Evaluate the partial differential equation by Lagrange's method	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2.5**
CO2	**3**	**2**	**1**	**1**	**2**	**3**	**3**	**3**	**3**	**2**	**2.3**
CO3	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2.5**
CO4	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**2**	**2**	**2.4**
CO5	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**2**	**2**	**2**	**2.4**
Mean Overall Score											**2.42**
Correlation											**Medium**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. U. Abuthahir
2. Dr. C. Gurubaran

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UMA4AC8:3	Allied – VIII	4	3	25	75	100

Course Title	STATISTICS AND VECTOR CALCULUS (For Chemistry)

SYLLABUS

Unit	Contents	Hours
I	Measures of central tendency- Arithmetic Mean - Properties of Arithmetic Mean - Weighted mean – Median- *Merits and Demerits of Mean, Median*.	12
II	Mode - Geometric mean - Harmonic mean. Graphical Location of the Partition values. *Merits and Demerits of Mode, Geometric Mean and Harmonic Mean*.	12
III	Dispersion-characteristics for ideal measure of dispersion - Measures of Dispersion - Range - Q.D - M.D - S.D, coefficient of dispersion - *Coefficient of variation* - Simple problems.	12
IV	Correlation – Bivariate distribution, correlation – scatter diagram – Karl- Pearson's coefficient of correlation – Rank correlation- Regression - Properties of correlation and regression coefficients. (Numerical Problems only)	12
V	Vector Calculus: The vector differential operator – Gradient - Direction and Magnitude of gradient - Divergence and curl - Related problems.	12

…… Self Study

Text Book(s):

1. S.C.Gupta & V.K.Kapoor, Elements of Mathematical Statistics, Sultan Chand and Sons, Third Edition, Reprint 2010.
2. S.Narayanan, R.Hanumantha Rao , T.K. Manicachagom Pillay and P. Kandasamy, Ancillary Mathematics, Volume II, S. Viswanathan Publishers Pvt. Ltd. Revised Edition (2008).

UNIT I	Chapter 2	Sections 2.3 - 2.6	TB-1
UNIT II	Chapter 2	Sections 2.7-2.9.1, 2.11.1	TB-1
UNIT III	Chapter 3	Sections 3.1-3.7, 3.7.3, 3.8	TB-1
UNIT IV	Chapter 10	Sections 10.1 to 10.3, 10.6, 10.7	TB-1
UNIT V	Chapter 8	Sections 16-20	TB-2

Reference Book(s):

1. Murray R. Speigel, John Jschiller, R. Alu Srinivasan, Probability and Statistics, Third Edition, Shaum's Outline Series (2010).
2. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons Publication, Eleventh Edition (2013).
3. M.L, Khanna, Vector calculus, Jai Prakash Nath and Co., Eighth Edition (1986).

Web Resource(s):

1. https://nptel.ac.in/courses/111/106/111106112/
2. https://nptel.ac.in/courses/111105122

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Relate and study of vector differential operator with examples	**K1**
CO2	Acquire more knowledge on Measures of Central Tendency	**K2**
CO3	Demonstrate and discuss the Measures of Dispersion	**K3**
CO4	Apply domain knowledge for bivariate distributions with examples	**K4**
CO5	Remember the integration and its applications	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**2.7**
CO2	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2.7**
CO3	**3**	**1**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**2.4**
CO4	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**2.5**
CO5	**1**	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**2.5**
Mean Overall Score											**2.56**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators:

1. Dr. H. Sheik Mujibur Rahman
   Dr. C. Gurubaran

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UBO4AC7	Allied – VII	5	4	25	75	100
Course Title	**Applied Botany - II**						

Syllabus		
Unit	**Contents**	**Hours**
I	**Plant morphology:** Parts of a plant – root, Stem and Leaf and their modifications with examples – Simple and compound leaves - Phyllotaxy - Inflorescence - Racemose, Cymose, Mixed and Special types - Terminology of floral parts, diagram and formula. **Anatomy:** Primary internal structure of root and stem in dicots and monocot.	15
II	**Systems of Classification:** Artificial (Linnaeus system) - Natural (Outline of Bentham and Hooker's system; its merits and demerits). Plant Nomenclature - Brief account of ICN, Herbarium technique. Study of the general characteristics and economic importance of Annonaceae, Rutaceae, Caesalpiniaceae, Rubiaceae, Cucurbitaceae, Apocynaceae, Euphorbiaceae and Arecaceae.	15
III	**Economic Importance of plants:** Plant diet for cardio, renal, hypertention, aging, bone, detox and mental health. Non-alcoholic beverage plants – Coffee, Tea therapy (green tea) Tea extract capsules, Cocoa, Chocoloate, Gano-coffee, herbal 'teas' (*Psidium*, *Mangifera*). Prebiotic fibre plants (*Murayya*, *Cyamopsis*), Cereals, pseudo-cereals and *small grain cereal and their value addition as food supplements and snacks*.	15
IV	**Oil yielding plants:** Essential oils – applications – perfumes (rose, ylang-ylang, jasmine, lemon grass oil, rosemary and sandalwood oil). Food supplement oils – linseed, flax seed oils as source of omega-3-fatty acid. Vegetable oils – coconut, palm oil. Soapbark, soapwort, soap berries, soap pods. Preparation of organic herbal soap. *Importance of herbal cosmetics*.	15
V	**Plant physiology** Water relations in plants – osmosis, transpiration and hydrological cycle. Types and factors affecting transpiration. Water footprint of products and processes. Photosynthesis: apparatus, pigments – light (z-scheme) and dark reaction – outline of Calvin cycle. A brief mention of difference between C3, C4 and CAM pathway and their relevance to indoor gardening. Introduction to carbon sequestration and *carbon banking*. – Aerobic and anaerobic respiration (fermentation - and its importance). Plant growth regulators – types. *Commercial application of auxin in horticulture*.	15

..... Self-Study

Text Book(s):

1. Rao KN, Krishnamurthy KV and Rao GS, Ancillary Botany, 1st Edition, Viswanathan Pvt Ltd, New Delhi, India, 1983.
2. Shukla RS and Chandel PS, Ecology and utility of plants, 2nd Edition, Chand & Company Pvt Ltd, New Delhi, India, 2008
3. Sharma OP, Plants and Human Welfare, 2nd Edition, Prakathi Prakashan Publications Pvt Ltd, Meerut, India, 2015.

Reference Book(s):
1. Jeffrey C. An Introduction to Plant Taxonomy, 1st Edition, Cambridge University Press, United Kingdom, 1982. 2. Pandey BP. Taxonomy of Angiosperms, 2nd Edition, Chand & Company Pvt Ltd, New Delhi, India, 1999.

Course Outcomes		
Course Outcomes: Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-level)**
CO1	Outline the diversity of cryptogams and seed plants.	K1
CO2	Identify the economic uses of natural wealth from cryptogams and seed plants.	K2
CO3	Perceive the alternative uses of and applications of cryptogams and seed plants.	K3
CO4	Appraise the values of natural wealth from cryptogams and seed plants.	K4
CO5	Recommend alternative bio resources for human welfare.	K5

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	2	2	1	1	1	2	1	1	2	1.6
CO2	3	2	2	1	1	2	1	1	3	2	1.8
CO3	1	1	2	1	1	1	1	3	3	1	1.5
CO4	3	2	2	1	1	1	1	1	3	2	1.7
CO5	3	2	2	1	1	1	1	1	3	2	1.7
									Mean Overall Score		1.6
									Correlation		Medium

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. A. Aslam

Semester	Course Code	Course Category	Hours / Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UBO4AC8P	Allied - VIII	3	2	20	80	100
Course Title	**Laboratory Course for Applied Botany - II – Practical**						

Syllabus	
Contents	**Hours**
List of Practical **A. Angiosperm morphology and taxonomy (drawing and description of specimens only):** 1. Parts of a dicot plant (*Amaranthus*) 2. Phyllotaxy (*Annona, Psidium, Quisqualis, Nerium, Allamanda, Acalypha* and *Mollugo*) 3. Compound leaves (*Azadirachta, Butea, Albizzia, Moringa, Cleome*) 4. Parts of a flower (*Tribulus*) 5. Racemose inflorescence (*Crotalaria, Mangifera, Caesalpinia, Achyranthes, Cocos, Allium, Tridax*) 6. Cymose inflorescence (*Jasmine, Clerodendron, Hamelia, Heliotropium, Mollugo*) 7. Mixed and special (*Ficus, Leucas, Euphorbia cyathophora, Ocimum, Zizyphus*) 8. Description and identification features for the families (Annonaceae, Rutaceae, Caesalpiniaceae, Rubiaceae, Apocynaceae, Cucurbitaceae, Euphorbiaceae, and Arecaceae). **B.** T.S of stem and root in dicots (*Tridax*) and monocots (*Zea mays*) **C. Nutritional quality analysis of plants (Minor experiments):** 1. Analysis of nutritional quality of plants using chart 2. Estimation of ascorbic acid (vitamin-C) 3. Determination of moisture content in plant samples. 4. Observation of oxidative darkening of vegetables and fruits. 5. Observation of glutan formation in natural foods. **D. Physiology experimental set up** 1. Ganong's photometer 2. Light screen experiment 3. Demo of paper chromatography 4. Bell jar experiment for oxygen evolution 5. Observation of Kranz anatomy of leaves 6. Observation of transpiration in leaves.	45

Text Book(s)

1. Mehta AS and Verma AP, Experiments in Plant Physiology, 1st Edition, Chand &Company Pvt Ltd, New Delhi, India, 1987.
2. Pandey BP, Modern Practical Botany, 1st Edition (Reprinted), Chand & Company PvtLtd, New Delhi, India, 2011.
3. Sharma OP, Plants and Human Welfare, 2nd Edition, Prakathi Prakashan Publications PvtLtd, Meerut, India, 2015.

Course Outcomes		
Course Outcomes: Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-level)**
CO1	Illustrate the external characters of flowering plants.	K1
CO2	Classify the flowering plants based on their external characters.	K2
CO3	Appraise the plants as useful resources for human use and welfare.	K3
CO4	Recommend unique food supplements and herbal value-added products.	K4
CO5	Solve the problems related with human environment applying physiology principles.	K5

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	1	1	2	3	1	3	1	2	1	1.8
CO2	3	1	1	2	3	1	3	1	2	1	1.8
CO3	3	2	1	2	3	1	3	1	2	1	1.9
CO4	3	2	1	2	3	1	3	1	2	1	1.9
CO5	3	1	1	2	3	1	3	1	2	1	1.8
Mean Overall Score											1.8
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. A. Aslam

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
IV	23UCH4GE2	Generic Elective - II	2	2	-	100	100
Course Title	Chemistry in Everyday Life						

Syllabus		
Unit	**Content**	**Hours**
I	**Essential oils and Perfumes:** 1.1. Essential oils: Definition, occurrences, isolation of essential oil - ***steam distillation*** and expression method. 1.2. Perfumes: Definition, Requirements of a good perfume, composition of perfumes - vehicle, fixative, odoriferous substance, classification of perfumery materials-animals-synthetic-formulations.	**6**
II	**Cosmetics:** 2.1. Face cream, vanishing cream, sun screen lotion, shaving cream, talcum powder – composition – formulation – preparation, uses and their hazards. 2.2. Body Spray, hand lotion, nail lacquers, nail bleaches, bath oil ***hair oil, hair dyes *-** composition- formulation – preparation, uses and their hazards.	**6**
III	**Soaps and Detergents** **3.1 Soaps**: Manufacture of soap, General consideration of soap making. Toilet soap transparent soap and Metal soaps – Manufacture method and uses. Cleaning action of soaps. 3**.2 Detergents** - Definition – classification of face active agents – anionic detergents - cationic detergents – ***** properties of detergents – Health hazards***** .	**6**
IV	**Fertilizers:** **4.1 Fertilizers**: Types, need for fertilizer, essential requirements, fertility of the soil. **4.2** Source of fertilizer, Classification – Natural organic fertilizers, natural inorganic fertilizers, Artificial fertilizers. Urea- Action of urea as fertilizer. NPK fertilizer, pollution caused by fertilizer and effect of fertilizers.	**6**
V	**Fuels and Fire Extinguishers:** 5.1 Fuel: Definition, classification - solid, liquid and gaseous fuels, requirements of a good fuel-composition and uses of ***LPG*,** gobar gas, bio gas and water gas. 5.2 Fire Protection: Causes of fire accidents in homes, fire fighting in homes – methods of extinguishing fire, chemical fire extinguishers - merits and demerits. Importance of safety requirements, Automatic fire detection cum control, causes and fire fighting.	**6**

*……*Self Study

Text Books:	
1	Thangammal Jacob A Textbook of Applied Chemistry 5th Edition McMillan Company Ind. Ltd, 1979,
2	P. L. Soni and H. M. Chawla, Text Book of Organic Chemistry, 28th Edition, Sulthan and Chand company, New Delhi, 1999
Books for Reference:	
1	B. K.Sharma Industrial Chemistry, 21st Edition, Goel Publishing House, Meerut, 2018
2	Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, 1st Edition, S.Chand Company Ltd – New Delhi, 2006
Web Reference: https://www.nationwide.com/lc/resources/home/articles/fire-extinguisher-safety	

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No:	**CO statement**	**Cognitive level (K-Level)**
CO1	Understand the nature of essential oils and perfumes	K1
CO2	Formulate the cosmetic products	K2
CO3	Explain the chemistry of soap and highlight their importance	K3
CO4	Appreciate the importance of fertilizers	K4
CO5	Compare the properties of fuels and fire protectors.	K5

Relationship Matrix:

Course Outcomes (Cos)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**2**	**3**	**3**	**2**	**3**	**1**	**3**	**2**	**3**	**3**	**2.5**
CO2	**2**	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**2**	**2.3**
CO3	**2**	**2**	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**2**	**2.4**
CO4	**2**	**1**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**2.0**
CO5	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**1**	**2**	**2**	**2.3**
Mean Overall Score											**2.3**
Correlation											**Medium**

Mean Overall Score	Correlation
< 1.5	Low
> 1.5 and < 2.5	Medium
> 2.5	High

Course Coordinator:

1. Dr. A. Jafar Ahamed

2. Dr. M. Yaseen Mowlana

Allied Chemistry for B.Sc. Physics

Allied Chemistry for B.Sc. Botany & B.Sc. Zoology

Allied Chemistry for B.Sc. Physics

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCH1AC1:1	Allied – I	5	4	25	75	100
Course Title	INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY – I						

SYLLABUS		
Unit	**Contents**	**Hours**
I	**PERIODIC PROPERTIES, MOLECULAR ORBITAL THEORY AND INDUSTRIAL CHEMISTRY** 1.1.**Periodic properties:** Ionization potential, electron affinity and electro negativity- Definition, factors affecting and variation in the periodic table. 1.2. **Molecular Orbital Theory:** LCAO, Bonding, anti-bonding orbital and bond order. MO diagrams of H_2, He_2, N_2, O_2 and F_2 molecules. **1.3. Industrial Chemistry:** Fuel gases composition and preparation of Water gas, Producer gas, LPG, Gobar gas and Natural gas. Fertilizers – NPK and mixed fertilizers. *Soap and detergents – An elementary idea of soap and detergent*.	**15**
II	**SOLUTIONS** 2.1. **Solutions:** Definition, Types of solutions - classification based on the solute and solvent, Ideal and non-ideal solutions, Liquid-Liquid type, Primary and secondary standards, preparation of standard solutions. 2.2. **Concentration of Solutions:** Molarity, Molality, Equivalent weight – acid, base and salt, Normality, Mole fraction, percentage (W/V, V/V) and Parts Per Million.	**15**
III	**POLYMERS, HETEROCYLIC COMPOUNDS AND STEREOISOMERISM** 3.1. **Polymers** – Definition, classifications of polymers – Natural and synthetic polymers, Thermoplastic and thermosetting polymer. Addition and condensation polymerization. Preparation, properties and uses of polyethylene, *PVC, Teflon*, polystyrene, nylon 6, 6, and Bakelite. 3.2**. Heterocyclic compounds** – Furan, thiophene and pyridine – Preparation, properties and uses. 3.3. **Stereoisomerism:** Optical isomerism – lactic and tartaric acid, Racemic mixture and resolution, Geometrical isomerism – cis – trans isomerism, maleic and fumaric acid.	**15**
IV	**CHROMATOGRAPHY, PHOTOCHEMISTRY AND PHASE RULE** 4.1 **Chromatography** – Definition, classification – principles, Technique and application of TLC. 4.2 **Photochemistry**: Differences between thermal and Photochemical reactions, photochemical laws – Lambert's law, Beer's law, Grothus - Draper's law, Einstein's law of photo chemical equivalence, *Quantum efficiency*. 4.3 **Phase Rule:** Phase, Component, Degree of freedom, Phase Rule – definition, one component system –Water system.	**15**
V	**CONDUCTANCE, CORROSION, pH AND BUFFER** 5.1. **Conductance:** specific and equivalent conductance – Determination, Effect of dilution on conductivities, Ostwald's dilution law and Kohlrausch's law, conductometric titrations- Principle, applications (Strong acid vs Strong base and Weak acid and Weak base) and advantages. 5.2. **Corrosion:** Definition, types, wet and dry corrosion and prevention of corrosion. 5.3**. pH and Buffer:** *pH, buffer solution*, Henderson-Hasselbalch equation and its importance (no derivation)-Biological importance of pH and Buffer solutions in living system.	**15**

……. Self Study

Text Book(s):
1. P. L. Soni, Text book of Inorganic Chemistry, S. Chand & Co., New Delhi, Revised Edition, 2017. 2. P. L. Soni and H.M. Chawla, Text Book of Organic Chemistry, S. Chand & Co., New Delhi, 28th Edition, 1999. 3. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Vishal Publications, Jalandhar, 48th Edition, 2019.
Reference Book(s):
1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand & Co. New Delhi, 23rd, 1993. 2. Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co., New Delhi, 19th Edition, 2005 3. R. L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, S. Chand & Co., New Delhi, 5th Revised and Enlarged, 2009.
Web Resource(s):
1. https://onlinecourses.nptel.ac.in/noc22_cy03/preview 2. https://www.toppr.com/ 3. https://byjus.com/chemistry/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Describe the periodic properties, polymers and conductance	**K1**
CO2	Explain the terms involved in expressing concentrations of solutions	**K2**
CO3	Apply chromatographic techniques and photochemical laws	**K3**
CO4	Predict the stereoisomerism of organic compounds	**K4**
CO5	Measure the pH and buffer solutions	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	3	3	3	3	3	3	**3**
CO2	2	2	2	2	2	2	2	2	2	2	**2**
CO3	2	2	2	2	2	2	2	2	2	2	**2**
CO4	2	2	2	2	2	2	2	2	2	2	**2**
CO5	2	2	2	2	2	2	2	2	2	2	**2**
										Mean Overall Score	**2.2**
										Correlation	**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: Dr. R. Abdul Vahith

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCH1AC2P	Allied – II	3	2	20	80	100

Course Title	VOLUMETRIC ESTIMATIONS - PRACTICAL

List of Practicals	Hours
Volumetric Estimation Practicals 1. Estimation of Sodium Hydroxide (Na_2CO_3 *Vs* HCl *Vs* NaOH) 2. Estimation of Hydrochloric Acid ($H_2C_2O_4$ *Vs* NaOH *Vs* HCl) 3. Estimation of Oxalic Acid ($FeSO_4$ *Vs* $KMnO_4$ *Vs* $H_2C_2O_4$) 4. Estimation of Ferrous Sulphate ($H_2C_2O_4$ *Vs* $KMnO_4$ *Vs* $FeSO_4$) 5. Estimation of Ferrous Ammonium Sulphate ($H_2C_2O_4$ *Vs* $KMnO_4$ *Vs* $(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O$ 6. Estimation of $KMnO_4$ ($K_2Cr_2O_7$ *Vs* FAS *Vs* $KMnO_4$) 7. Estimation of Zinc by EDTA ($MgSO_4$ *Vs* EDTA *Vs* $ZnSO_4$) 8. Estimation of Magnesium by EDTA ($MgSO_4$ *Vs* EDTA *Vs* $MgSO_4$) **Scheme of valuation** **Record** – 10 Marks **Procedure writing** – 10 Marks **For Estimation** – 60 Marks **For Estimation Results:** 1-2% - 60 marks 2-3% - 50 marks 3-4% - 40 marks >4% - 30 marks	**45**

Text Books:

1. Peter McPherson, Volumetric Analysis, Royal Society of Chemistry, 1st Edition 2014.
2. K.B. Baliga et al., College Analytical Chemistry, Himalaya Publishing House, 19th Edition, 2011
3. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 2nd Edition1997.

Reference Books:

1. Handbook Of Inorganic Qualitative Analysis by Maharudra Chakraborty, Scifinity Publication; 1st Edition 2019.
2. Vogel, Text Book of Quantitative Chemical Analysis,, Pearson Education, 6th edition ,2009.
3. Day R A., Underwood A l., Quantitative Analysis, New York: Pearson Emory University. Print. 6th edition, 1991

Web Resources:

1. https://www.studiestoday.com/useful-resources-chemistry-class-12-chemistry-practicals-volumetric-analysis-estimation-oxalic-0
2.https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXI/chemistry/kelm206.pdf

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall the principle of volumetric techniques and to classify the methods of preparation of solutions with different concentration.	**K1**
CO2	Estimate the concentration of a various solution	**K2**
CO3	Apply the principle of volumetric concept in the estimation	**K3**
CO4	Analyze the quality of portability of water	**K4**
CO5	Assess the quantity of chemical substance in a solution	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**1**	**2**	**2**	**2.5**
CO2	**3**	**3**	**3**	**3**	**1**	**3**	**3**	**2**	**2**	**2**	**2.5**
CO3	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**1**	**2.5**
CO4	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.6**
CO5	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2.7**
Mean Overall Score											**2.56**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. K. Periyasamy

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UCH2AC3:1	Allied - III	4	4	25	75	100

Course Title	Inorganic, Organic and Physical Chemistry – II

SYLLABUS		
Unit	**Contents**	**Hours**
I	**COORDINATION CHEMISTRY AND METALLIC BOND** 1.1. **Coordination Chemistry:** Introduction to co-ordination compounds, Werner's theory; ligands, co-ordination number, denticity, chelation; IUPAC nomenclature of mononuclear coordination compounds, isomerism; Bonding-Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties; Importance of coordination compound 1.2. **Metallic Bond:** Properties - Electron gas and Band Theories. Semiconductors – Intrinsic and Extrinsic, n and *p- type*, super conductors.	**12**
II	**ELECTRON DISPLACEMENT EFFECTS, AROMATICITY AND SUBSTITUTION REACTIONS** 2.1**. Electron Displacement Effects**- Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strength. 2.2. **Aromaticity** – Criteria's – Huckel's rule - aromaticity of benzene, furan, thiophene, pyrrole and pyridine. 2.3. **Substitution reactions**- mechanism of nitration, halogenation, sulphonation, *Friedel Crafts alkylation and acylation of benzene*.	**12**
III	**CHLORO COMPOUNDS, CHEMOTHERAPHY AND NAME REACTIONS** 3.1. **Chloro compounds**: Preparation and uses of dichloromethane, chloroform, carbon tetrachloride, freons, DDT and BHC. 3.2. **Chemotherapy:** Sulpha drugs-structure, preparation and uses of sulphapyridine, sulphathiazole and sulphadiazine, Antibiotics –Structure and uses of penicillin–G and *Chloromycetin*. 3.3. **Name reactions:** Benzoin, Perkin, Cannizzaro, Reimer-Tiemann and Kolbe's reactions. (Mechanism not necessary)	**12**

IV	**SOLID STATE AND COLLOIDS** 4.1 **Solid State:** Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, seven crystal systems - X-ray diffraction, Bragg's law. Defects in crystals (stoichiometric and non- stoichiometric). 4.2. **Colloids:** Definition, differences between true solution, colloidal solution and suspension, principle, applications -Electrical properties – Electrophoresis and Electro osmosis (definition and uses only) - protection of colloids – Gold number- *medicinal applications of colloids*. 4.3. **Emulsion and Gels:** definition, types, preparation, properties and applications.	**12**
V	**CHEMICAL KINETICS, CHEMICAL EQUILIBRIUM AND CATALYSIS** 5.1 **Chemical Kinetics:** Rate of a chemical reaction, factors affecting the rate of reactions: concentration, temperature, pressure and catalyst; elementary and complex reactions, order and molecularity of reactions, rate law, rate constant and its units. Arrhenius theory. 5.2 **Chemical Equilibrium:** Criteria of homogeneous and heterogeneous equilibria. Decomposition of HI and PCl_5 5.3 **Catalysis:** Catalysis – Importance of catalysis. Types of catalysis - Homogeneous and heterogeneous catalysis, factors affecting catalysis. Definitions of catalytic promoter, *catalytic inhibitor, catalytic poison*. Theory of catalysis - Acid-base catalysis	**12**

……. Self Study

Text Books:
1. P.L. Soni, Text book of Inorganic Chemistry, S. Chand & Co., New Delhi, 2017, Revised Edition, 2. P.L. Soni and H.M. Chawla, Text Book of Organic Chemistry, S. Chand & Co., New Delhi, 199728th Edition. 3. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Vishal Publications, Jalandhar, 2017, 48th Edition.
Reference Book(s):
1. B. R. Puri and L.R. Sharma, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., New Delhi, 2020, 55th Edition. 2. A .K. Srivastava, Organic Chemistry, New Age International Publishers, New Delhi, 2002, 1st Edition. 3. R.L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, S. Chand & Co., New Delhi, 2009, 5th Revised and enlarged Edition.
Web Resource(s):
1. https://onlinecourses.nptel.ac.in/noc19_cy19/preview 2. https://www.youtube.com/watch?v=1zima5tIXbY 3. https://nptel.ac.in/courses/104101128

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Understand the bonding nature of inorganic compounds and to classify different types of conductors	**K1**
CO2	Explain the concept of electron displacement effect and to apply Huckel's rule to identify the aromatic compounds	**K2**
CO3	Illustrate the preparation and uses of pesticides and some common drugs	**K3**
CO4	Differentiate types of solids and colloids	**K4**
CO5	Appraise the rate and molecularity reaction and to explain the application of catalysts	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	2	2	3	3	2	2	1	**2.4**
CO2	3	3	3	2	2	3	3	2	1	1	**2.3**
CO3	3	3	3	2	1	3	2	2	2	1	**2.3**
CO4	3	3	3	2	2	3	2	2	2	1	**2.3**
CO5	3	3	3	2	1	3	2	2	2	1	**2.2**
Mean Overall Score											**2.3**
Correlation											Medium

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. K. Periyasamy

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UCH2AC4P	Allied - IV	3	2	20	80	100

Course Title	Organic Analysis - Practical

List of Practicals	Hours
Qualitative analysis of the following organic compounds: 1. Carbohydrate 2. Amide 3. Aldehyde 4. Ketone 5. Monocarboxylicacid 6. Dicarboxylic acid 7. Amine **Scheme of valuation** **Record** – 10 Marks **Procedure writing** – 10 Marks **For Organic Analysis** – 60 Marks **For Organic Analysis Results Marks Distribution:** (i) Special Elements Present/ Absent - 20 marks (ii) Aromatic/ Aliphatic - 10 marks (iii) Saturated/ Unsaturated - 10 marks (iv) Functional Group Present - 20 marks	**45**

Text Books:

1. Ganapragasm N S and Ramamurthy G, Organic Chemistry Lab Manual, S. Vishwanathan Printers and Publishers (P) Ltd., Chennai, 2nd Edition, 2007.
2. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 2nd Edition, 1997.
3. Furniss B S, et al., Vogel's Textbook of Practical Organic Chemistry, ELBS Longman, London, 7th Edition, 1984.

Reference Books:

1. A. I. Vogel's, Text Book of Practical Organic Chemistry, Prentice Hall, 5th Edition, 1989.

Web Resources:

1.https://jru.edu.in/studentcorner/lab-manual/bpharm/Lab%20Manual%20-%20%20Pharmaceutical%20Organic%20Chemistry.pdf
2.https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXII/chemistry/lelm108.pdf
3.https://faculty.chas.uni.edu/~manfredi/860-121/ORG%20LAB%20MAN%20S08.pdf

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Recall the preliminary tests of organic qualitative analysis.	**K1**
CO2	Differentiate the aliphatic and aromatic nature of the organic compounds	**K2**
CO3	Examine the nature of the organic compound	**K3**
CO4	Separate the functional groups through appropriate chemical reactions	**K4**
CO5	Summarize their results of the organic analysis in a scientific way.	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	2	3	3	3	2	2	2.7
CO2	3	2	3	3	3	3	3	2	3	1	2.6
CO3	3	2	3	3	2	3	3	3	2	2	2.4
CO4	3	2	1	3	3	3	3	3	3	2	2.6
CO5	3	2	3	1	2	3	3	2	3	1	2.3
Mean Overall Score											2.52
Correlation											High

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Syed Abuthahir

Allied Chemistry for B.Sc. Botany & B.Sc. Zoology

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCH1AC1:2	Allied – I	5	4	25	75	100

Course Title	Inorganic, Organic and Physical Chemistry – I

SYLLABUS		
Unit	**Contents**	**Hours**
I	**PERIODIC PROPERTIES, INDUSTRIAL GASES AND INSECTICIDES** **1.1 Periodic properties**: Ionization potential, *electron affinity* and electro negativity - Definition, factors affecting and variation in the periodic table. **1.2 Industrial Gases:** Fuel gases composition and Preparation of Water gas, Producer gas, LPG, Gobar gas and Natural gas. **1.3 Insecticides:** Introduction – Lists of various pesticides, methods of pest control, methods of using pest control chemicals. Insecticides – Arsenic compounds, Bordeaux mixture DDT and BHC.	**15**
II	**BIOMOLECULES** 2.1. **Carbohydrates:** Classification. Glucose and fructose – Preparation, properties and uses. Sucrose –Manufacture and properties. Starch and cellulose – uses. 2.2. **Amino Acids and Proteins:** Amino acids – Definition, classification – Essential and non essential, preparation and properties of glycine – Peptide bond – Proteins – Classification based on physical properties and biological functions. 2.3. **Nucleic acids:** DNA and RNA – Differences between DNA and RNA, functions - *Structure of DNA*.	**15**
III	**BLOOD AND POLYMERS** 3.1. **Blood and Haematological agents:** Blood – Composition of blood, Blood grouping and matching, Clotting of blood. Haematological agents – Coagulants – Vitamin K and Protamine sulphate. Anticoagulants – Coumarine and Heparin. 3.2**. Polymers:** Definition, classifications of polymers – Natural and synthetic polymers, Thermoplastic and thermosetting polymer. Addition and condensation polymerization. Preparation, properties and uses of polyethylene, *PVC, Teflon*, polystyrene, nylon 6, 6, and Bakelite.	**15**
IV	**SEPARATION AND PURIFICATION TECHNIQUES** 4.1 **Separation Techniques:** Distillation-steam, *fractional* and azeotropic distillation, crystallization – principles, working techniques and applications. 4.2 **Chromatography** – Paper, thin layer chromatography, HPLC and GC-MS - principle, experimental techniques and applications.	**15**
V	**ACIDS - BASES AND CATALYSIS** 5.1. **Acids-Bases:** Arrhenius, Lowry-Bronsted and Lewis concepts of acids and bases, pH, buffer solution, Henderson-Hasselbalch equation and its importance (no derivation) - Biological importance of pH and buffer solutions in living system. 5.2 **Catalysis:** Catalysis – Importance of catalysis. Types of catalysis - Homogeneous and heterogeneous catalysis, factors affecting catalysis. Definitions of catalytic promoter, *catalytic inhibitor, catalytic poison*. Theory of enzyme catalysis.	**15**

……. Self Study

Text Book(s):

1. P. L. Soni, Text book of Inorganic Chemistry, S. Chand & Co., New Delhi, Revised Edition, 2017
2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co., New Delhi, First Edition, 2006
3. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Vishal Publications, Jalandhar, 48th Edition, 2019

Reference Book(s):
1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand & Co. New Delhi, 23rd, 1993 2. Bahl and Arun Bahl, Advanced Organic Chemistry, S.Chand & Co., New Delhi, 19th Edition, 2005 3. R. L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, S. Chand & Co., New Delhi, 5th Revised and Enlarged, 2009
Web Resource(s):
1. https://onlinecourses.nptel.ac.in/noc22_cy03/preview 2. https://www.toppr.com/ 3. https://byjus.com/chemistry/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Describe the periodic properties, polymers and catalysis	**K1**
CO2	Classify the carbohydrates, amino acids, proteins and appraise their applications.	**K2**
CO3	Apply chromatographic techniques	**K3**
CO4	Analyse the blood groups	**K4**
CO5	Evaluate the value of pH of a solution	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	3	3	3	3	3	3	**3**
CO2	2	2	2	2	2	2	2	2	2	2	**2**
CO3	2	2	2	2	2	2	2	2	2	2	**2**
CO4	2	2	2	2	2	2	2	2	2	2	**2**
CO5	2	2	2	2	2	2	2	2	2	2	**2**
										Mean Overall Score	**2.2**
										Correlation	**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: Mr. M. Varusai Mohamed

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
I	23UCH1AC2P	Allied – II	3	2	20	80	100

Course Title	VOLUMETRIC ESTIMATIONS - PRACTICAL

List of Practicals	Hours
Volumetric Estimation Practicals 9. Estimation of Sodium Hydroxide (Na_2CO_3 *Vs* HCl *Vs* NaOH) 10. Estimation of Hydrochloric Acid ($H_2C_2O_4$ *Vs* NaOH *Vs* HCl) 11. Estimation of Oxalic Acid ($FeSO_4$ *Vs* $KMnO_4$ *Vs* $H_2C_2O_4$) 12. Estimation of Ferrous Sulphate ($H_2C_2O_4$ *Vs* $KMnO_4$ *Vs* $FeSO_4$) 13. Estimation of Ferrous Ammonium Sulphate ($H_2C_2O_4$*Vs* $KMnO_4$ *Vs* $(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O$ 14. Estimation of $KMnO_4$ ($K_2Cr_2O_7$ *Vs* FAS *Vs* $KMnO_4$) 15. Estimation of Zinc by EDTA ($MgSO_4$ *Vs* EDTA *Vs* $ZnSO_4$) 16. Estimation of Magnesium by EDTA ($MgSO_4$ *Vs* EDTA*Vs* $MgSO_4$) **Scheme of valuation** **Record** – 10 Marks **Procedure writing** – 10 Marks **For Estimation** – 60 Marks **For Estimation Results:** 1-2% - 60 marks 2-3% - 50 marks 3-4% - 40 marks >4% - 30 marks	**45**

Text Books:

1. Peter McPherson, Volumetric Analysis, Royal Society of Chemistry, 1st Edition 2014.
2. K.B. Baliga et al., College Analytical Chemistry, Himalaya Publishing House, 19th Edition, 2011
3. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 2nd Edition1997.

Reference Books:

1. Handbook Of Inorganic Qualitative Analysis by Maharudra Chakraborty, Scifinity Publication; 1st Edition 2019.
2. Vogel, Text Book of Quantitative Chemical Analysis,, Pearson Education, 6th edition ,2009.
3. Day R A., Underwood A l., Quantitative Analysis, New York: Pearson Emory University. Print. 6th edition, 1991

Web Resources:

1. https://www.studiestoday.com/useful-resources-chemistry-class-12-chemistry-practicals-volumetric-analysis-estimation-oxalic-0
2.https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXI/chemistry/kelm206.pdf

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Recall the principle of volumetric techniques and to classify the methods of preparation of solutions with different concentration.	**K1**
CO2	Estimate the concentration of a various solution	**K2**
CO3	Apply the principle of volumetric concept in the estimation	**K3**
CO4	Analyze the quality of portability of water	**K4**
CO5	Assess the quantity of chemical substance in a solution	**K5**

Relationship Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**1**	**2**	**2**	**2.5**
CO2	**3**	**3**	**3**	**3**	**1**	**3**	**3**	**2**	**2**	**2**	**2.5**
CO3	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**1**	**2.5**
CO4	**2**	**1**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2.6**
CO5	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2.7**
Mean Overall Score											**2.56**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. K. Periyasamy

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UCH2AC3:2	Allied – III	4	4	25	75	100

Course Title	Inorganic, Organic and Physical Chemistry – II

SYLLABUS

Unit	Contents	Hours
I	**INDIAN MEDICINAL PLANTS AND BIOLOGICALLY IMPORTANT COMPOUNDS** 1.1 **Indian Medicinal Plants:** Hibisous Rosa Sinesis - Adathoda Vasica - Azadirachta Indica – Solanum Trolobatum – Active Constituents and Medicinal uses. 1.2 **Biologically important compounds:** Haemoglobin and Chlorophyll- structure and biological role.	**12**
II	**NUCLEAR CHEMISTRY** 2.1 **Structure of nucleus -** Composition of nucleus, nuclear forces, nuclear stability-mass defect, binding energy, n/p ratio and magic numbers, *Definition of isotopes, isobars, isotones and isomers* 2.2 **Radioacitivity**- Definition, types of radioactivity, Properties of α, β and γ rays: Detection and measurement – Wilson cloud chamber and G.M. Counter, nuclear fusion and fission reactions, applications of radio isotopes – in analytical chemistry, in medicine, rock dating and carbon dating	**12**
III	**VITAMINS AND DRUGS** 3.1 **Vitamins –** Definition, classification. Sources and deficiency diseases of vitamins A, D, E, K, B_6, B_{12} and C. 3.2 **Drugs:** Sulpha drugs - Definition, structure and uses of sulphapyridine and sulphathiazole. Antibiotics – Definition, structure and uses of penicillin and Chloromycetin. Antipyretics - Definition, structure and uses of paracetamol and aspirin. Anti inflammatory - Definition, structure and uses of ibuprofen and Naproxen.	**12**
IV	**ENZYMES AND HORMONES** 4.1 **Enzymes**- Classification of enzymes, chemical nature, factors affecting rate of enzyme action, specifity of enzyme action, mechanisms of enzyme action – lock and key, biological functions of enzymes, applications of enzymes- therapeutic, analytical, industrial uses. 4.2. **Hormones**- introduction, structure and physiological functions - Adrenaline, thyroxine, oxytocin and insulin.	**12**
V	**COLLOIDS** 5.1. **Colloids:** Definition, colloidal solution and suspension, phases of colloidal solution-Electrical properties – *Electrophoresis and Electro osmosis (definition and uses only)* - protection of colloids – Gold number- medicinal applications of colloids. 5.2 **Emulsion:** definition, types, preparation, properties and applications. 5.3. **Gels:** definition, types, preparation, properties and applications.	**12**

……. Self Study

Text Book(s):

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand & Co. New Delhi, 23rd, 1993
2. P. L. Soni and H.M. Chawla, Text Book of Organic Chemistry, S. Chand & Co., New Delhi, 28th Edition, 1999
3. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co., New Delhi, First Edition, 2006

Reference Book(s):
1. R. D Madan, Modern Inorganic Chemistry, S. Chand & Co., New Delhi, 2nd reprint, 1987 2. A .K. Srivastava, Organic Chemistry, New Age International Publishers, New Delhi, 1st Edition, 2002 3. R. L. Madan, G.D. Tuli, Simplified Course in Physical Chemistry, S. Chand & Co., New Delhi5th revised and enlarged Edition, 2009
Web Resource(s):
1. https://onlinecourses.nptel.ac.in/noc22_cy20/preview 2. https://www.toppr.com/ 3. https://byjus.com/chemistry/

Course Outcomes		
Upon successful completion of this course, the student will be able to:		
CO No.	**CO Statement**	**Cognitive Level (K-Level)**
CO1	Describe the Indian medicinal plants, types of radioactivity and physiological functions of hormones	**K1**
CO2	Discuss the properties of alpha, beta and comma rays	**K2**
CO3	predict the sources and deficiency diseases of vitamins and illustrate the various drugs	**K3**
CO4	Classify the enzymes and explain the mechanism of enzyme action	**K4**
CO5	Compare the phases of colloidal solutions and predict the applications	**K5**

Relationship Matrix:

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**					**Mean Score of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO1	3	3	3	3	3	3	3	3	3	3	**3**
CO2	2	2	2	2	2	2	2	2	2	2	**2**
CO3	2	2	2	2	2	2	2	2	2	2	**2**
CO4	2	2	2	2	2	2	2	2	2	2	**2**
CO5	2	2	2	2	2	2	2	2	2	2	**2**
										Mean Overall Score	**2.2**
										Correlation	**Medium**

Mean Overall Score	**Correlation**
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinators: Dr. R. Abdul Vahith

Semester	Course Code	Course Category	Hours/ Week	Credits	Marks for Evaluation		
					CIA	ESE	Total
II	23UCH2AC4P	Allied - IV	3	2	20	80	100

Course Title	Organic Analysis - Practical

List of Practicals	Hours
Qualitative analysis of the following organic compounds: 1. Carbohydrate 2. Amide 3. Aldehyde 4. Ketone 5. Monocarboxylicacid 6. Dicarboxylic acid 7. Amine **Scheme of valuation** **Record** – 10 Marks **Procedure writing** – 10 Marks **For Organic Analysis** – 60 Marks **For Organic Analysis Results Marks Distribution:** (i) Special Elements Present/ Absent - 20 marks (ii) Aromatic/ Aliphatic - 10 marks (iii) Saturated/ Unsaturated - 10 marks (iv) Functional Group Present - 20 marks	**45**

Text Books:

1. Ganapragasm N S and Ramamurthy G, Organic Chemistry Lab Manual, S. Vishwanathan Printers and Publishers (P) Ltd., Chennai, 2nd Edition, 2007.
2. Venkateswaran V. Veerasamy R. Kulandaivelu A.R, Basic Principles of Practical Chemistry, S. Chand & Co Pvt. Ltd, New Delhi, 2nd Edition, 1997.
3. Furniss B S, et al., Vogel's Textbook of Practical Organic Chemistry, ELBS Longman, London, 7th Edition, 1984.

Reference Books:

1. A. I. Vogel's, Text Book of Practical Organic Chemistry, Prentice Hall, 5th Edition, 1989.

Web Resources:

1.https://jru.edu.in/studentcorner/lab-manual/bpharm/Lab%20Manual%20-%20%20Pharmaceutical%20Organic%20Chemistry.pdf
2.https://ncert.nic.in/pdf/publication/sciencelaboratorymanuals/classXII/chemistry/lelm108.pdf
3.https://faculty.chas.uni.edu/~manfredi/860-121/ORG%20LAB%20MAN%20S08.pdf

Course Outcomes

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

CO No.	CO Statement	Cognitive Level (K-Level)
CO1	Recall the preliminary tests of organic qualitative analysis.	**K1**
CO2	Differentiate the aliphatic and aromatic nature of the organic compounds	**K2**
CO3	Examine the nature of the organic compound	**K3**
CO4	Separate the functional groups through appropriate chemical reactions	**K4**
CO5	Summarize their results of the organic analysis in a scientific way.	**K5**

Relationship Matrix:

	Programme Outcomes (POs)	Programme Specific Outcomes (PSOs)	

Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of COs
CO1	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**2**	**2.7**
CO2	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**1**	**2.6**
CO3	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**2**	**2.4**
CO4	**3**	**2**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2.6**
CO5	**3**	**2**	**3**	**1**	**2**	**3**	**3**	**2**	**3**	**1**	**2.3**
Mean Overall Score											**2.52**
Correlation											**High**

Mean Overall Score	Correlation
< 1.5	Low
≥ 1.5 and < 2.5	Medium
≥ 2.5	High

Course Coordinator: Dr. S. Syed Abuthahir