DEPARTMENT OF CHEMISTRY

The Outcomes of UG Course, B. Sc. in Chemistry

At the completion of B. Sc. in Chemistry the students are able to:

After completion of degree, students gained the theoretical as well as practical knowledge of handling chemicals. Also they expand the knowledge available opportunities related to chemistry in the government services through public service commission particularly in the field of food safety, health inspector, pharmacist etc**.** Afford a broad foundation in chemistry that stresses scientific reasoning and analytical problem solving with a molecular perspective. Achieve the skills required to succeed in graduate school, professional school and the chemical industry like cement industries, agro product, Paint industries, Rubber industries, Petrochemical industries, Food processing industries, Fertilizer industries etc. Got exposures of a breadth of experimental techniques using modern instrumentation. Understand the importance of the elements in the periodic table including their physical and chemical nature and role in the daily life. Understand the concept of chemistry to inter relate and interact to the other subject like mathematics, physics, biological science etc. Learn the laboratory skills and safely to transfer and interpret knowledge entirely in the working environment.

ARUMUGAM PILLAI SEETHAI AMMAL COLLEGE, TIRUPPATTUR

SYLLABUS UNDER CBCS PATTERN w.e.f. 2017-18

B.Sc. CHEMISTRY – PROGRAMME STRUCTURE

Sem	Part	Course Code	Title of the Course	Cr.	Hrs./ Week	Marks		Total
						Int.	Ext.	
I	I	711T	**Tamil/other languages – I**	3	6	25	75	100
	II	712E	**English – I**	3	6	25	75	100
	III	7BCH1C1	**Core-I-**Fundamentals of Chemistry	4	6	25	75	100
		7BCH1P1	**Core – II –** Inorganic and organic Volumetric Analysis Practical – I	4	6	**40**	**60**	100
		-----	**Allied – I –** (Theory only) **(or)** **Allied – I** – (Theory cum Practical)	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I	-	2**	--	--	---
	IV	7NME1A / 7NME1B / 7NME1C	**(1) Non-Major Elective – I (A)** தமிழ்மொழியின் அடிப்படைகள்;/ **(B)** இக்கால இலக்கியம் / **(C)** Communicative English	2	1	25	75	100
			Total(Allied – Theory only)	**21**	**30**	-	-	**600**
			Total(Allied-Theory cum Practical)	**20**				**575**
II	I	721T	**Tamil/other languages – II**	3	6	25	75	100
	II	722E	**English – II**	3	6	25	75	100
	III	7BCH2C1	**Core –III–** Physical Chemistry –I	4	5	25	75	100
		7BCH2C2	**Core – IV –** Inorganic Chemistry–I	4	6	25	75	100
			Allied – II – (Theory only) **(or)** **Allied– II –** (Theory cum Practical)	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I	2	2	20	30	50
	IV	7BES2	**(3) Environmental Studies**	2	2	25	75	100
			Total(Allied – Theory only)	**21**	**30**	-	-	**600**
			Total(Allied-Theory cum Practical)	**22**				**625**
III	I	731T	**Tamil /other languages – III**	3	6	25	75	100
	II	732E	**English – III**	3	6	25	75	100
	III	7BCH3C1	**Core – V –**Organic Chemistry – I	4	5	25	75	100
		7BCH3P1	**Core – VI –** Inorganic and organic Qualitative Analysis Practical – II	4	5	**40**	**60**	100
			Allied – III – (Theory only) **(or)** **Allied– III –**(Theory cum Practical)	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I	-	2**	--	--	---
	IV	7NME3A/ 7NME3B/ 7NME3C	**(1) Non-major Elective – II – (A)**இலக்கியமும் மொழிப்பயன்பாடும்.·. **(B)** பழந்தமிழ் இலக்கியங்களும் இலக்கியவரலாறும்.·. **(C)**Employability Skills	2	1	25	75	100
		7SBS3A1/ 7SBS3A2/ 7SBS3A3	**(2) Skill Based Subjects – I**	2	2	25	75	100
	V	7BEA3	**Extension activities**	1	--	100	--	100

			Total(Allied – Theory only)	**24**	**30**	**-**	**-**	**800**
			Total(Allied-Theory cum Practical)	**23**				**775**
IV	I	741T	**Tamil /other languages – IV**	3	6	25	75	100
	II	742E	**English – IV**	3	6	25	75	100
	III	7BCH4C1	**Core– VII–** Physical Chemistry– II	4	4	25	75	100
		7BCH4C2	**Core–VIII–**Inorganic Chemistry–II	4	5	25	75	100
			Allied – IV – (Theory only) **(or)** **Allied– IV –**(Theory cum Practical)	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I	2	2	20	30	50
	IV	7SBS4B1/ 7SBS4B2/ 7SBS4B3	**(2) Skill Based Subjects – II**	2	2	25	75	100
		7BVE4/ 7BMY4/ 7BWS4	**(4) Value Education /Manavalakalai Yoga /Women's Studies**	2	2	25	75	100
			Total(Allied – Theory only)	**23**	**30**	**-**	**-**	**700**
			Total(Allied-Theory cum Practical)	**24**				**725**
V	III	7BCH5C1	**Core –IX–**Organic Chemistry– II	4	5	25	75	100
		7BCH5C2	**Core–X –** Physical Chemistry–III	4	5	25	75	100
		7BCH5P1	**Core–XI–**Gravimetric Estimation and Organic Preparation Practical-III	4	4	**40**	**60**	100
		7BCH6P1	**Core–XII–**Physical Chemistry– Practical–IV	-	2*	--	--	---
		7BCHE1A/ 7BCHE1B	**Elective–I–A)**Analytical Chemistry **(or) B)**Agricultural Chemistry	5	5	25	75	100
		7BCHE2A/ 7BCHE2B	**Elective–II–A)**Industrial Chemistry **(or) B)**Medicinal Chemistry	5	5	25	75	100
	IV	7SBS5A4/ 7SBS5A5/ 7SBS5A6/ 7SBS5A7	**(2) Skill Based Subjects – I**	2	2	25	75	100
			(2) Skill Based Subjects – I	2	2	25	75	100
			Total	**26**	**30**	**-**	**-**	**700**
VI	III	7BCH6P1	**Core–XII–**Physical Chemistry – Practical – IV	4	4	**40**	**60**	100
		7BCH6C1	**Core–XIII–**Inorganic Chemistry–III	4	6	25	75	100
		7BCH6C2	**Core–XIV–**Organic Chemistry-III	4	6	25	75	100
		7BCH6P2	**Core–XV–**Applied Chemistry Practical – V	4	5	**40**	**60**	100
		7BCHE3A/ 7BCHE3B/ 7BCHEPR	**Elective–III–A)**Polymer Chemistry **(or) B)**Material Chemistry & Nano-Science **(or) C)**Project*	5	5	25 **40***	75 **60***	100
	IV	7SBS6B4/ 7SBS6B5/ 7SBS6B6 7SBS6B7	**(2) Skill Based Subjects – II**	2	2	25	75	100
			(2) Skill Based Subjects – II	2	2	25	75	100
Total				**25**	**30**	**-**	**-**	**700**
Grand Total				**140**	**180**	**-**	**-**	**4100**

COURSE OUTCOME FOR B.Sc. CHEMISTRY

SEMESTER - I

Part-I (any one of Tamil, Hindi, Sanskrit, Arabic).

Tamil -I [711T]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-II

English – I [712E]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-III

Core –I Fundamental of Chemistry [7BCH1C1]

Course Description:

This course covers fundamental principles and laws of chemistry. Topics include quantum mechanics, quantum numbers and electronic configurations of the atomic structure, periodicity, chemical reactions and chemical bonding. Laboratory experiments and computer-based exercises augment and reinforce the basic principles discussed in lecture as well as provide practical examples.

Course Objectives:

- "Advanced Inorganic Chemistry", Sathyaprakash.
- "Inorganic Chemistry", Puri and Sharma
- Know the discovery of electron, proton and neutron and their characteristics.
- To understand the nature electromagnetic radiation and quantum theory.
- To understand the periodic law and significance of atomic no and electronic configuration as the basic for periodic classification.
- To classify elements into a s,p,d and f blocks and learn their main characteristics.
- To understand the concept of organic reactions mechanism.
- To recognize the type of organic reactions
- To describe the term – paramagnetic, diamagnetic and ferromagnetic substances.

- To calculate the percentage of ionic character of moleculs
- To produce programmers equipped with an understanding of. fundamental computational concepts underlying most programming languages
- a range of problem solving techniques using computers

Course Outcome (COs):

Upon successful completion students should be able to:

- The above two books are prescribed texts for first two semesters.
- Apply the fundamental principles of measurement, matter, atomic theory, chemical periodicity, chemical bonding, general chemical reactivity and solution chemistry to subsequent courses in science.

Core –II Inorganic and Organic Volumetric Analysis Practical-I [7BCH1P1]

Course Description:

This course aims to familiarize students with the principles of analytical chemistry and basic analytical techniques including volumetric analysis. This course is not open to Chemistry or Analytical and Testing Sciences major students.

Course Objectives:

- Experimental practice of quantitative volumetric analysis.
- The objective of the titration is the determination of the concentration or the mass of the minimum formula from the titrated chemical material composing a pure liquid or a solution.
- The main objective of volumetric analysis is to determine the amount of a substance in a given sample. When dealing with volumetric analysis the concept of concentration cannot be avoided. Molarity i.e. moles per litre or decimeter is widely used unit of concentration.

Course Outcome (COs):

Upon successful completion students should be able to:

- Facilitate the learner to make solutions of various molar concentrations. This may include: The concept of the mole; Converting moles to grams; Converting grams to moles; Defining concentration; Dilution of Solutions; Making different molar concentrations.

Allied Course I Ancillary Mathematics-I [7BMAA1]

Course Description:

Course Objectives:

Course Outcome (COs):

Allied Course I Ancillary General and applied Zoology[7BZOA1]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-IV

Non-Major Elective-I

a. பள்ளியில் தமிழ் பயிலாத மாணாக்கர்களுக்கான அடிப்படைத் தமிழ்ப் பாடங்கள்தாள் 1 – தமிழ் மொழியின் அடிப்படைகள் **[7NME1A]**

Course Description:

Course Objectives:

Course Outcome

b. பள்ளியில் மேல்நிலைப் படிப்பு வரை தமிழ் பயின்று கல்லூரியில் பகுதி 1– இல் தமிழ் பயிலாத மாணாக்கர்களுக்கான சிறப்புத் தமிழ்ப் பாடங்கள் -தாள் – 1 இக்கால இலக்கியம் **[7NME1B]**

Course Description:

Course Objectives:

Course Outcome :

Communicative Engligh [7NME1C]

Course Description:

Course Objectives:

Course Outcome (COs):

SEMESTER - II

Part-I

Tamil -II [721T]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-II

English – II [722E]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-III

Core –III Physical Chemistry –I [7BCH2C1]

Course Description:

The course covers the basic physical principles that are the foundation of essentially all materials and biological chemistry. Topics include gaseous state, behavior of real gases, surface chemistry and chemical equilibrium.

Course Objectives:

- Principles of Physical Chemistry", B.R.Puri, L.R.Sharma and M.S.Pathania
- "Physical Chemistry", N.Kundu and SN.Jain
- To apply gas laws in various real life situations.
- To explain the behavior of real and ideal gas.
- To differentiate between gaseous state and vapour.
- To explain the kinetic theory of gases.
- Explain the properties of liquids.
- To describe condition required for liquefaction of gases.
- To write the expressions for equilibrium constants.
- To study the laws of equilibrium.
- To understand various types of colloids and its applications.

Course Outcome (COs):

Upon successful completion students should be able to:

- State and apply the laws of thermodynamics; perform calculations with ideal and real gases; design practical engines by using thermodynamic cycles; predict chemical equilibrium and spontaneity of reactions by using thermodynamic principles.
- To apply the concepts of colloids and gels
- To learn depth knowledge about liquid states.

Core –IV Inorganic Chemistry-I [7BCH2C2]

Course Description:

This course is an introduction to modern inorganic chemistry. Topics include principles of structure, bonding, and chemical reactivity with application to compounds of the main group and transition elements, including organometallic chemistry, solid state chemistry, metallurgy and nuclear chemistry.

Course Objectives:

- Advanced Inorganic Chemistry", R.D.Madan
- "Inorganic Chemistry", P.L. Soni
- To explain the formation of different types of bonding.
- To explain the concepts of geometry of simple molecules.
- To identify mode of occurrence and describe isotopes of hydrogen.
- To understand the preparation and uses of ozone and hydrogen peroxide.
- To explain the term mineral ore concentration, roasting etc.,
- To explain why specific reducing agents are used for the reduction purposes.
- To apply the thermodynamic concepts like heat energy and entropy to the principles of extraction of Arsenic, Antimony and Bismuth.
- To understand the principles of oxidation and reduction as applied to the extraction procedure.
- To know the types of nuclear reactions and its applications.

To calculate half life period and average life period

Course Outcome (COs):

Upon successful completion students should be able to:

- The above two books are prescribed texts for first two semesters.
- the bonding fundamentals for both ionic and covalent compounds, including electro negativities, bond distances and bond energies using MO diagrams and thermodynamic data.
- Predicting geometries of simple molecules
- The fundamentals of the chemistry of the main group elements, and important real world applications of many of these species
- The bonding models, structures, reactivity's, and applications of Hydrogen peroxide, ozone and hydrides.
- Basic knowledge of nuclear structure, stable and unstable atomic nuclei, nuclear reactions and different modes of radioactive decay and also methods for measurements of radioactivity.
- The fundamentals of radiochemistry, isotopic chemistry, radiation chemistry and the applications of these in measuring technology, kinetics, radical chemistry, biotechnology and materials and process technology.
- Skills in handling and measurement of radioactive material.

Allied course II Ancillary Mathematics-I [7BMAA2]

Course Description:

Course Objectives:

Course Outcome (COs):

Or

Allied Course II Ancillary Conceptual Zoology-I [7BZOA2]

Course Description:

Course Objectives:

Course Outcome (COs):

Allied Course II General and applied zoology and conceptual zoology Practical [7BZOAP1]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-IV

Environmental Studies [7BES2]

Course Description:

Environmental science is the study of patterns and processes in the natural world and their modification by human activity. To understand current environmental problems, we need to consider physical, biological and chemical processes that are often the basis of those problems. This course will give you the skills necessary to address the environmental issues we are facing today by examining scientific principles and the application of those principles to natural systems. This course will survey some of the many environmental science topics at an introductory level, ultimately considering the sustainability of human activities on the planet.

Course Objectives:

- To consider how the natural and built environments shape and are shaped by multiple socio-cultural and political factors.
- To think across and beyond existing disciplinary boundaries, mindful of the diverse forms of knowledge and experience that arise from human interactions with the world around them.

Course Outcome (COs):

The Environmental Studies major prepares students for careers as leaders in understanding and addressing complex environmental issues from a problem-oriented, interdisciplinary perspective. Students:

- Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
- Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and/or practitioners.

Semester III

Part-I

Tamil -III [731T]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-II

English – III [732E]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-III

Core –V Organic Chemistry –I [7BCH3C1]

Course Description:

Students continue their study of organic chemistry by discussing aromatic compounds, aldehydes and ketones, carboxylic acids and their derivatives, and organic nitrogen compounds. Synthesis using carbanion and hydrocarbons, oils and fats emphasized. Students also explore the chemistry of various organic compounds found in biological systems: carbohydrates, amino acids, proteins and peptides, and nucleic acids.

Course Objectives:

After studying this, the students will able to:

- "Advanced Organic Chemistry", B.S.Bahl and Arun Bahl
- "Organic Chemistry", R.T.Morrison and R.W.Boyd
- Discuss electrophilic and nucleophilic in aromatic compounds.
- Difference between activating and deactivating groups.
- Correlate the preparation of types of phenol.
- Explain the mechanism of phenol.
- Study about the chemistry of Aromatic aldehyde, aromatic ketones and acids.
- Study about the chemistry of aromatic sulphonic acid and Nitro compounds.
- Calculate the saponification, Iodine and acid value for acids and fats.

Course Outcome (COs):

Working through this course, students are expected to apply their knowledge to problem-solve, deduce structures, and synthesize simple organic molecules using the studied reactions. Relationships between organic chemistry and other disciplines are noted.

Core –VI Inorganic and Organic qualitative analysis Practical-II [7BCH3P1]

Course Description:

This course aims to familiarize students with the principles of analytical chemistry and basic analytical techniques to analyze organic compounds including volumetric analysis. This course is not open to Chemistry or Analytical and Testing Sciences major students.

Course Objectives:

- Experimental practice of quantitative and qualitative analysis.
- The objective of the titration is the determination of the concentration or the mass of the minimum formula from the titrated chemical material composing a pure liquid or a solution.
- The main objective of volumetric analysis is to determine the amount of a substance in a given sample. When dealing with volumetric analysis the concept of concentration cannot be avoided. Molarity i.e. moles per litre or decimeter is widely used unit of concentration.

Course Outcome (COs):

Upon successful completion students should be able to:

- Facilitate the learner to make solutions of various molar concentrations. This may include: The concept of the mole; Converting moles to grams; Converting grams to moles; Defining concentration; Dilution of Solutions; Making different molar concentrations.

Allied Course III Ancillary Physics-I [7BPHA1]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-IV

Non-Major Elective-II

[7NME3A] பள்ளியில் தமிழ் பயிலாத மாணாக்கர்களுக்கான அடிப்படைத் தமிழ்ப் பாடங்கள்

தாள் 2 – இலக்கியமும் மொழிப் பயன்பாடும்

Course Description:

Course Objectives:

Course Outcome (COs):

[7NME3B] பள்ளியில் மேல்நிலைப் படிப்பு வரை தமிழ் பயின்று கல்லூரியில் பகுதி 1-இல் தமிழ் பயிலாத மாணாக்கர்களுக்கான சிறப்புத் தமிழ்ப்பாடங்கள்.

தாள் 2 – பழந்தமிழ் இலக்கியங்களும் இலக்கியவரலாறும்.

Course Description:

Course Objectives:

Course Outcome (COs):

[7NME3C] Employability Skills

Course Description:

Course work will emphasize individual skill assessments, interpersonal communication skills, workplace responsibilities, teamwork skills, safety issues, and personal management skills for the workplace.

Course Objectives:

- To value clarification and matching assessment skills into employment
- To long term and short term goals
- To dealing with barriers to employment
- To decision-making strategies
- To setting priorities in work and personal life
- To factors that contribute to confidence and self-esteem
- To communicating effectively with employers, supervisors, and co-workers
- To teamwork approach to completing tasks
- To strategies for handling stress
- To appropriate clothing choices for interviews and the work site

Course Outcome (COs):

- To help students explore their values and career choices through individual skill assessments
- To make realistic employment choices and to identify the steps necessary to achieve a goal
- To develop and practice self management skills for the work site
- To explore and practice basic communication skills
- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming
- To promote safety awareness including rules and procedures on the work site

[7SBS3A1] Competitive examination skills

Course Description:

The course aims to help participants develop their English language skills , particularly those planning to appear for competitive exams that test their English language abilities. During a span of 30 hours, students will be exposed to material that facilitates aspects of grammar, writing and vocabulary.

Course Objectives:

- To know the pattern of Various Examinations.
- To get the information about the exams conducted for the entry into jobs.
- To become aware about the various soft skills.
- To use the time effectively.
- To become aware about the goals of life

Course Outcome (COs):

Upon successful completion students should be able to:
Apply the knowledge to attend the various examinations, soft skills and time effectively

[7SBS3A2] Executive Skills

Course Description:

This course is designed to develop
Mathematical aptitude, Scientific temperament, Logical thinking, Reasonings kills & Problem solving skills of the student and prepare them for future competitive examinations while they are studying in the school to take early lead in competitive scenario. This course focus on developing student's Intelligence quotient (IQ), & competitive quotient (C.Q.) at the early stage of learning so that each young student achieve success in school/board examination as well as in various scholarship and competitive examinations to ensure a grand successful career

Course Objectives:

The High Potentials Leadership Program provides you with strategies to handle the formidable challenges associated with moving into new and increasingly more complex leadership roles. You will gain a better understanding of your own approach to leadership and acquire new ideas to optimize and sustain your potential.

Course Outcome (COs):

- You will leave the program with fresh perspectives and tangible action plans for taking charge and inspiring leadership throughout your organization. Specifically, you will be better prepared to:

- ❖ Understand, recognize, and foster the right leadership qualities in yourself and others
- ❖ Stay on the fast track, while dealing with new responsibilities and operating contexts
- ❖ Manage organizational politics and build relationships to achieve both professional and personal goals
- ❖ Receive—and deliver—feedback with grace
- ❖ Lead effectively through situations involving conflict
- ❖ Balance your personal leadership style with the demands of the organization without compromising your principles
- ❖ Create opportunities for personal reflection amid day-to-day issues and crises of management
- ❖ Spot and develop the next class of high-potential leaders within the organization

[7SBS3A3] Disaster Management

Course Description:

Emergency Management Course Descriptions. The history and development ofemergency management as a professional field of study will be reviewed along with an exploration of the four phases of emergency management (preparedness, mitigation, response, recovery).

Course Objectives:

- ❖ To provide students an exposure to disaster, their significance and types.
- ❖ To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- ❖ To gain a preliminary understanding of approaches of disaster risk reduction.
- ❖ To enhance awareness of institutional processes in the country

Course Outcome (COs):

Capacity to work theoretically and practically in the processes of disaster management (disaster risk reduction, response, and recovery) and relate their interconnections, particularly in the field of the Public Health aspects of the disasters. Capacity to manage the Public Health aspects of the disasters.

Part-V

Extension Activities [7BEA3]

Course Description:

The students understand the role of Practice national integration and social harmony.

Course Objectives:

- Understand the community in which they work
- Understand themselves in relation to their community
- Identify the needs and problems of the community and involve them in problem solving process
- Develop among themselves a sense of social and civic responsibility

- Utilize their knowledge in finding practical solution to individual and community problems
- Develop competence required for group-living and sharing of responsibilities
- Gain skills in mobilizing community participation
- Acquire leadership qualities and democratic attitude
- Develop capacity to meet emergencies and natural disaster and
- Practice national integration and social harmony

Course Outcome (COs):

1. Identify and apply art and design elements, principles, and terminology in the creation and improvement of work.
2. Demonstrate effective use of media and techniques while creating works of art and/or design.
3. Express themselves aesthetically and/or creatively while making works of art and /or design.
4. Identify visual strengths and weaknesses to promote aesthetic resolution and clear intentions in works of art and/or design.
5. Distinguish between subjective and objective assessment through critique of art/design work.
6. Demonstrate inventiveness through the use of problem-defining and problem-solving processes and skills.
7. Identify and apply sustainable art and design practices in their chosen media.

Semester IV

Part-I

Tamil -IV [741T]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-II

English – IV [732E]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-III

Core –VII Physical Chemistry-II [7BCH4C1]

Course Description:

This course is aimed to provide the students with a solid understanding of all the fundamental concepts physical chemistry necessary for the study of the more advanced or specialized courses that follow. The topics discussed include Thermodynamics and Electrochemistry.

Course Objectives:

- To understand laws of thermodynamics.
- To know about the acid bases concept of Arrhenius, Lowry and Bronsted.
- To discuss the conductance and transferences

Course Outcome (COs):

Students will gain an understanding of:

- The application of mathematical tools to calculate thermodynamics.
- the relationship between microscopic properties of molecules with macroscopic thermodynamic observables
- the derivation of rate equations from mechanistic data
- the use of simple models for predictive understanding of physical phenomena associated to chemical thermodynamics and kinetics
- the limitations and uses of models for the solution of applied problems involving chemical thermodynamic and kinetics.
- Students learn depth concepts about electrochemistry.

Core –VIII Inorganic Chemistry –II [7BCH4C2]

Course Description:

This course is aimed to provide the students with a solid understanding of all the fundamental concepts inorganic chemistry necessary for the study of the more advanced or specialized courses that follow. The topics discussed include Halogens, per acids and per salts, transition elements, lanthanides, actinides and solid state chemistry.

Course Objectives:

- "Inorganic Chemistry", Puri and Sharma
- "Advanced Inorganic Chemistry", R.D.Madan
- To understand types and structure of halogen compounds.
- To understand types and structure of inorganic carbon compounds.
- To classify acids as permonosulphuric and disulphuric.
- To distinguish between intra and inter molecular hydrogen bonding.
- To explain extraction, properties and uses of transition elements.
- To understand the chemistry of transition metal oxide.
- To understand the positions of lanthanide and actinide in the periodic table.
- To correlate the optical and magnetic properties of lanthanide.

Course Outcome (COs):

Upon successful completion students should be able to:

- Describe bonding models that can be applied to a consideration of the properties of transition metal compounds.
- The students familiar about the inorganic halogen compounds, coordination compounds and transition elements.

- They get well exposure about solids.

Allied Course IV Ancillary Physics-IV [7BPHA2]

Course Description:

Course Objectives:

Course Outcome (COs):

Allied Practical Ancillary Physics [7BPHAP1]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-IV

Accounting Skill [7SBS4B1]

Course Description:

This course is designed to analyze special accounting issues, which may include business combinations, partnerships, international accounting, estates, and trusts. Emphasis is on analyzing transactions and preparing working papers and financial statements.

Course Objectives:

- Students will demonstrate their knowledge of the fundamental and technical concepts of accounting.
- Students will demonstrate critical-thinking and problem-solving skills.
- Students will demonstrate skills in oral and written communications.
- Students will demonstrate an awareness of their role in the global environment.
- Students will demonstrate an awareness of their own values.
- Students will demonstrate a sense of responsibility and a capacity for service.
- Students will demonstrate the ability to recognize when change is appropriate, to adapt to change as it occurs, and to take the lead in creating change
- Students will demonstrate an understanding of their personal interests, abilities, strengths, and weaknesses as they pertain to professional career fields.
- Students will demonstrate a basic understanding of career options available to them and will establish career objectives.

Course Outcome (COs):

- Recognize and understand ethical issues related to the accounting profession.
- Prepare financial statements in accordance with Generally Accepted Accounting Principles.
- Employ critical thinking skills to analyze financial data as well as the effects of differing financial accounting methods on the financial statements.

- ❖ Effectively define the needs of the various users of accounting data and demonstrate the ability to communicate such data effectively, as well as the ability to provide knowledgeable recommendations.
- ❖ Recognize circumstances providing for increased exposure to fraud and define preventative internal control measures.
- ❖ Demonstrate an understanding of current auditing standards and acceptable practices, as well as the impact of audit risk on the engagement.
- ❖ Understand the audit process from the engagement planning stage through completion of the audit, as well as the rendering of an audit opinion via the various report options.
- ❖ Apply cost accounting methods to evaluate and project business performance.
- ❖ Demonstrate an understanding of the taxation of individual income.
- ❖ Apply appropriate judgment derived from knowledge of accounting theory, to financial analysis and decision making.
- ❖ The student will experience real-world learning and application of skills via their internship. Note: Specific outcomes will vary by assigned internship experience.

Emergency and Medical lab Skills [7SBS4B2]

Course Description:

This course introduces basic emergency medical care to students. The subject include preparatory,
rescue measure like accident,burning,natural disaster,drowning,snake,animal,rodent bites**.**

Course Objectives:

- Explain the first aid methods.
- Discuss the traffic rules and emergency steps to be taken on the spot.
- Assess the basic clinical lab tests like blood, urine, saliva and stool tests.
- Narrate the awareness programmes on the importance of locally available herbal plants and vegetables.
- Understand to do projects on locally available native treatments for various health problems

Course Outcome (COs):

- This course is about managing trauma, from minor injury to humanitarian emergencies, including injuries in women, children and the elderly, with the principal goal of improving quality of care and patient safety.
- Basic emergency resuscitation skills in adults and children .
- Students are well prepared to improve their performs life-saving procedures.
- To make the students awareness to blood, eye ,organs, herbal plants and vegetables

Youth Red Cross [7SBS4B3]

Course Description:

The Red Cross is an international organisation meant for humanitarian services. It is a non-religious, non-political and a non-sectarian international body. YRC is a part of the Indian Red Cross Society

Course Objectives:

- ❖ To inculcate in the Youth of our country.

- An awareness on the care of their own health and that of others.
- The understanding and acceptance of civic responsibilities and acting accordingly with humanitarian concern, to fulfill the same.

Course Outcome (COs):

Our Red Cross programs support educational curriculum outcomes in health, social sciences, and the humanities. Youth Symposium participants will also develop critical self-awareness and skills in decision making, communication, conflict management, empathy, critical thinking, and social action to promote healthy.

Value Education [7BVE4]

Course Description:

This course will involve lecture/discussion of values education; thrust as a challenge to Philippine Education, theoretical foundations in the study of values etc.

Course Objectives:

To create an awareness to values among learners and help them adopt them in their lives.

Course Outcome (COs):

Upon completion, students should be able to demonstrate the skills necessary to achieve .

Value-education tries to achieve two goals. First to develop a critical ability to distinguish between essence and form or between what is of value and what is superficial, in life. Second, to develop commitment and courage to act on one's beliefs in real life situations. What makes it difficult is the fact that the ability is to be developed no

Manavalakalai Yoga [7BMY4]

Course Description:

Manavalaikkalai Yogafor the younger generations to benefit physically, mentally, socially and spiritually from his teachings and practices.

Course Objectives:

- To enable the student to have good health.
- To practice mental hygiene.
- To possess emotional stability.
- To integrate moral values.
- To attain higher level of consciousness.

Course Outcome (COs):

- Knowledge of classical and theoretical foundations of the field of Yoga Therapy
- Knowledge of biomedical systems from an integrative and holistic perspective, as needed for the practice of Yoga Therapy
- Ability to apply knowledge learned in this curriculum and in previous yoga teacher trainings to assess the needs of clients, to design and implement effective programs, and to assess the effectiveness of these programs
- Ability to effectively use yoga as a therapeutic modality through the integration of diverse approaches to this field
- Knowledge and ability to use professional conduct during the practice of Yoga Therapy
- Ability to use relationship-based approaches to catalyze positive change or transformation with clients
- Critical thinking skills and science-based literacy to advance the evolution of Yoga Therapy as an integrative health practice

Women's Studies [7BWS4]

Course Description

Learning goal: Students will demonstrate knowledge of social, economic, political, intellectual and cultural contributions of women past and present.

Objectives:

1. describe the social, economic, political, intellectual or cultural contributions of one or more women
2. analyze scholarship, literature, art, music, dance, theatre, or film created by or performed by one or more women

Learning goal: Students will develop an understanding of how gender combines with nationality, race and ethnicity, religion, social class, sexual orientation, and physical ability to shape the experiences of men and women, including themselves.

3. read and respond to feminist scholarship
4. examine the similarities and differences among women within and across cultures and at different historical moments
5. describe gender socialization and its consequences in a particular society
6. identify gender and sex-based inequalities in a particular society
7. analyze how these factors with the privileges and disadvantages they confer have shaped one's own experiences, presumptions, viewpoints, and sense of identity

Course Outcome (COs)

Texts Prescribed

Explain diversity and difference in women's experiences due to race, ethnicity, and class.
Identify ways in which gender is a social construct.
Analyze how women are represented in language and culture.
Compare and contrast women's experiences in the paid and unpaid labor force.
Identify the impact of sexuality and body image on women's lives.
Analyze the causes of violence against women.

Semester V

Part-III

Core –IX Organic Chemistry-II [7BCH5C1]

Course Description:

Students review the basic principles of chemical bonding as they apply to organic molecules and are introduced to the concepts of functional groups, nomenclature, stereochemistry, and reaction mechanisms. The systematic chemistry of alkanes, alkenes, alkynes, alkyl halides, alcohols,carboxylic acid, amines, ethers and dyes and pigments are discussed

Course Objectives:

- "Organic Chemistry", P.L.Soni
- "Advanced Organic Chemistry", B.S.Bahl and Arun Bahl

- ❖ To learn about various methods of preparation and applications of hydrocarbons.
- ❖ To understand the mechanism of alkyl halides.
- ❖ To estimate no of hydroxyl groups and alkoxy group in alcohol and ether.
- ❖ To understand the term rectified spirit and methylated spirit.
- ❖ To explain the mechanism of few selected reactions of aldehyde and ketones.
- ❖ To describe the methods of preparation and reactions of acids.
- ❖ To know about the concepts of stereochemistry.
- ❖ To understand the difference between configuration and conformation.
- ❖ To describe the structure and properties of various types of carbohydrates.

Course Outcome (COs):

Students will gain an understanding of:

a. the use of nuclear magnetic resonance spectroscopy, mass spectrometry and infrared spectroscopy for organic structure elucidation
b. the fundamentals of electronic structure and bonding in conjugated and aromatic systems
c. reactivity patterns of conjugated and aromatic molecules
d. the fundamental electronic structure and bonding in carbonyl compounds
e. substituent effects on pK_a (in the case of carboxylic acids)
f. the reactivity of carbonyl compounds with both hard and soft nucleophiles (carboxylic acids, aldehydes and ketones)
g. the kinetics and thermodynamics of carbonyl condensation reactions
h. the fundamental properties and reactivity of biologically important molecules (e.g. carbohydrates, amines and amino-acids)

Core –X Physical Chemistry-III [7BCH5C2]

Course Description:

This course presents to students the physical concepts in photochemistry, phase rule, chemical kinetics and prerequisite to spectroscopic techniques in structure determination, applied spectroscopy and Group theory.

Course Objectives:

- ❖ To impart the students the knowledge on phase rule, its applications and alloys, their importance, composition and applications.
- ❖ To demonstrate the application of spectroscopic and electrochemical methods in mechanistic studies of photochemical reactions
- ❖ To make students familiar with a broad variety of photochemical systems and their applications.
- ❖ To learn depth knowledge about group theory.

Course Outcome (COs):

Students will gain an understanding of:

- ❖ The photoredox processes at the surface of solids. An introduction to the current theoretical models of electron transfer dynamics is provided.
- ❖ Current technological applications, as well as the most recent advances in the field are then detailed.

- ❖ Defines the importance of Phase Diagrams in the field of materials science and engineering
- ❖ Explains the basic definitions and terms in a phase diagram
- ❖ Defines phase, equilibrium, component, degree of freedom and phase rule concepts.
- ❖ Relates this concept.

Core-XI Gravimetric estimations and Organic Preparation
Practical-III [7BCH5P1]

Course Description:

By the end of this course, students should be able to: Handle organic chemicals in a safe and competent manner. Perform the standard techniques used in practical organic chemistry. Carry out an organic preparation following a prescribed procedure. Read and explain the information labels on chemical bottles.

Course Objectives:

The course provides training in:

- ❖ Recognise many functional groups and their reactivity
- ❖ Set up glassware and apparatus to conduct experiments in Organic Chemistry.
- ❖ Interpret data from a range of physical techniques to characterise Organic componds.
- ❖ Present the results of a practical investigation in a concise manner.
- ❖ Recognise many fundamental bond forming reactions and how to apply them in synthesis
- ❖ Describe bonding models and appreciate how these impact on the properties of a simple molecule
- ❖ Apply curly arrow nomenclature to depict the mechanistic course of a reaction
- ❖ Appreciate when different reactions are likely to compete and ways to bias reactions towards a single outcome
- ❖ Understand and apply the concept of protecting groups
- ❖ Understand how spectroscopic techniques can be used to delineate a molecule's structure
- ❖ Understand the influence of bond polarization on a molecule's structure and reactivity
- ❖ Evaluate the risks associated with an experiment and understand how to mitigate against those risks.

Course Outcome (COs):

Students will gain an understanding of:

a. How to calculate a limiting reagent, yield, and percent yield
b. How to maintain a detailed scientific notebook
c. How to critically evaluate data collected to determine the identity, purity, and yield of products.
d. How to summarize findings in writing in a clear and concise manner
e. How to use the scientific method to create, test, and evaluate a hypothesis
f. How to engage in safe laboratory practices handling laboratory glassware, equipment, and chemical reagents
g. How to perform common laboratory techniques, including reflux, distillation, steam distillation, recrystallization, vacuum filtration, aqueous extraction, thin layer chromatography, column chromatography
h. How to predict the outcome and mechanism of some simple organic reactions, using a basic understanding of the relative reactivity of functional groups

ELECTIVE SUBJECTS-I

Analytical Chemistry [7BCHE1A]

Course Description:

Instrumental techniques like spectroscopy, flame emission and atomic absorption, solvent extraction and chromatography will be studied. This course forms the basis for advanced studies
in instrumental analysis, environmental studies and industrial studies. Topics covered include laboratory hugiene, instrumental analysis and separation & purification techniques.

- **Course Objectives:**
- R.Gopalan, P.S.Subramanian and K.Rengarajan, Elements of Analytical Chemistry, Sultan Chand & Sons, New Delhi, 1995.
- Douglas A.Skoog and D.M.West, Principles of Instrumental Analysis, W.B.Saunders, New York, 1982.
- To provide a basic knowledge and understanding of essential chemical and physical principles for analytical chemistry.
- To introduce basic analytical techniques and practical aspects of classical chemical analysis.
- To solve problems related to chemical analysis and interpret analytical results.

Course Outcome (COs):

After examination the student should be able to:
- Explain the theoretical principles and important applications of classical analytical methods within titration (acid/base titration, complexometric titration, redox titration), and various techniques within gravimetric and coulometric methods.
- Explain the theoretical principles of selected instrumental methods within electroanalytical and spectrometric/spectrophotometric methods, and main components in such analytical instruments.
- Explain the theoretical principles of various separation techniques in chromatography, and typical applications of chromatographic techniques.
- Assess and suggest a suitable analytical method for a specific purpose, and evaluate sensitivity, important sources of interferences and errors, and also suggest alternative analytical methods for quality assurance.
- Performing risk assessment of chemical experiments and chemical analytical activity
- Performing classical analytical experiments, and make observations and assessments of important factors that could affect the analytical result.
- Be familiar with calculations in analytical chemistry, be able to calculate titration errors for method evaluation, and perform statistical evaluation of results from classical and instrumental chemical experiments and analyses.
- Make scientific reports from chemical experiments and present the results in a transparent manner.

Or

Agricultural Chemistry[4BCHE1B]

Course Description:

Agricultural Chemistry is an introductory chemistry course. Students will receive an in-depth look at chemical and biochemical properties and processes, which are integral to soils, agriculture and the environment.

Course Objectives:

- Understand basic concepts (including history of, resources needed, and the future of) production agriculture.
- Describe important historical developments in production agriculture.
- Understand factors influencing food security.
- Describe the differences between macro and micro nutrients, calories, cholesterol, carbohydrates, proteins, vitamins, and minerals.

Course Outcome (COs):

- Students acquire the basic knowledge of inorganic, analytical, organic and biochemistry.
- Student is able to understand the molecular mechanisms that regulate the activity of Agro ecosystem function
- Accumulate skills for scientific research work and agricultural works in the future.
- Demonstrate a comprehensive understanding of the fundamental principles and multidisciplinary concepts in the field of agriculture.
- Demonstrate skills in laboratory techniques and field work relevant to agriculture as well as the use of the instrumentation for analysis.

ELECTIVE SUBJECTS-II

Industrial Chemistry [7BCHE2A]

Course Description:

The course is designed to teach you the essential skills and knowledge involved in industrial chemistry. The course content is wide ranging with limited detailed theory and includes some factual information that simply will need to be memorized. A key skill emphasized is problem solving, both quantitative and qualitative. The topic also cover the paints, pigments varnishes, ceramics, galss, cements, soaps, detergents, refractories, ferti;ozers, adhesives, enamels, explosives and different industries.

Course Objectives:

The specific objectives of Industrial Chemistry program are to:

- Make the students well-grounded in the principles and through knowledge of scientific techniques of industrial Chemistry.
- Educate and train Chemists to acquire a meaningful picture of Chemical industries.
- Prepare students for professional participation in Chemical industries so as to adapt themselves to jobs which are problem solving
- Train students to be result-oriented in the chemical, petrochemical, biochemical and allied technological fields.

Course Outcome (COs):

- Industrial Chemistry is designed to provide graduates with the skills, knowledge and learning tools required to carry out professional research, and development and production activities in the field of chemistry, including the following sectors: health, food, cosmetics, the environment and energy.

Medicinal Chemistry [7BCHE2B]

Course Description:

The course includes theoretical studies in the field of Medicinal Chemistry. It also includes physical chemical factors, diagnostic medical instruments such as ECG, EEG, CT, etc. Also, it includes disease and treatment.

Course Objectives:

The main objectives of this master in medicinal chemistry are:

- Understanding of the basic biological and pharmacological interactions by using both natural products and total synthesis of bioactive molecules.
- Use of corresponding knowledge for the development of biologically and clinically active drugs.
- It will include advanced courses in natural products, organic synthesis, medicinal chemistry; fundamentals of cell biology, molecular biology, drug design, and analytical methods.

Course Outcome (COs):

The main objectives of this master in medicinal chemistry are:

- Understanding of the basic biological and pharmacological interactions by using both natural products and total synthesis of bioactive molecules.
- Use of corresponding knowledge for the development of biologically and clinically active drugs.
- It will include advanced courses in natural products, organic synthesis, medicinal chemistry; fundamentals of cell biology, molecular biology, drug design, and analytical methods.

Part-IV

Entrepreneurial Development Skills [7SBS5A4]

Course Description:

This course provides business and non-business majors with the skills necessary to succeed as an entrepreneur. The fundamentals of starting and operating a business, developing a business plan, obtaining financing, marketing a product or service and developing an effective accounting system.

Course Objectives:

The following learning objectives:

- Our graduates will have a strategic understanding of entrepreneurship and innovation and be able to take into account the relationships between this discipline and other areas of business to make holistic judgments when analyzing business situations.
- Our graduates will assess the interdependent, fast-changing, and diverse world of entrepreneurship and innovation, as well as global economic/financial

interdependencies that signify current geopolitical, economic and financial relationships, to make business decisions that make a difference in the world.

- Our graduates will demonstrate critical thinking skills, making the intellectual connection between quantitative and qualitative tools, theories and context to properly and effectively solve problems and make decisions, as well as develop new and innovative business opportunities to strategically navigate the complex demands of the current and dynamic national and international business environments.
- Our graduates will utilize interpersonal and leadership skills to be highly effective business managers and leaders; demonstrating self-awareness, emotional intelligence, curiosity, visionary and strategic thinking, teamwork, reflection and knowledge transfer skills.
- Our graduates will demonstrate ethical reasoning skills, understand social, civic, and professional responsibilities and aspire to add value to society.
- Our graduates will effectively communicate using business specific terminology in written and verbal form and facilitate information flow in a variety of organizational, social, and intercultural contexts.

Course Outcome (COs):

Entrepreneurship programme provides you with cutting-edge knowledge and skills on how to successfully develop captivating products and services to solve challenging problems in a highly uncertain environment, often under considerable time constraints with very limited resources. You will be able to apply these skills in the context of both new ventures as well as in established companies.

Heritage and Tourism [4SBS5A5]

Course Description:

This course examines the development of cultural heritage tourism resources as primary or secondary destination products. Students examine the range of cultural and heritage assets that can become viable tourism attractions including museums, the performing arts, historic sites, etc

Course Objectives:

The aim of the course is for students to understand the significance of culture and cultural heritage for tourism development. Religion is an important aspect of culture and the exploitation of religious-cultural heritage contributes to tourism development.

Course Outcome (COs):

On successful completion of the course students will be able to:

1. Demonstrate a critical understanding of the relationships between culture, heritage and tourism.
2. Critically discuss a range of theories which describe and explain tourism as a cultural phenomenon.
3. Analyze the role that tourism plays in the production and consumption of culture.
4. Evaluate both the positive and negative impacts of tourism on cultures and communities.
5. Identify current issues in the development and management of cultural and heritage tourism products;
6. Describe cultural and heritage tourism policy, planning and management issues.

7. Explain cultural sustainability and sustainable tourism principles and practices.

Marketing and Sales Management [5SBS5A6]

Course Description:

The goal of the Sales Management course is to examine the elements of an effective sales force as a key component of the organization's total marketing effort. The course will extend student's understanding of marketing's reach and potential impact in achieving its overarching goals.

Course Objectives:

Graduates of this program will be able to:

- Communicate effectively in a variety of organizational settings.
- Evaluate complex qualitative and quantitative data to support strategic and operational decisions.
- Develop comprehensive strategic and tactical plans for an organization.
- Work independently and collaboratively in inter and/or multi-disciplinary and diverse environments.
- Use creative, critical and reflective thinking to address organizational opportunities and challenges.
- Apply problem solving and decision making frameworks that propose defensible solutions to organizational opportunities, challenges, change and risk.

Course Outcome (COs):

The course is designed to provide students with an understanding of the processes involved in personal selling and sales management. The course examines the elements that enable a sales force to be an effective component of an organization's overall marketing strategy. The course will extend students' understanding of: the sales process, the relationship between sales and other organizational functions, the various types of sales force structures, customer relationship management (CRM), the use of technology to improve sales force effectiveness, and issues concerning recruiting, selecting, training, motivating, compensating, and retaining salespeople.

Urban Planning [5SBS5A7]

Course Description:

In this course you will acquire and develop and apply a range of urban design skills and professional knowledge. You will respond to a contemporary urban design brief focusing on a case study site. You will develop urban design analyses and proposals that will be presented and critiqued. You will engage in independent as well as collaborative fieldwork, research, analysis and design activities to inform your ideas and proposals. You will be expected to demonstrate that you can work productively with others to establish processes and to allocate responsibilities and roles to address the design brief.

Course Objectives:

- ❖ To introduce basic accounting principles, ethics in accounting and preparation of financial statements.
- ❖ To analyze the business problem by incorporating diverse perspective of accounting techniques and to develop competent decision skills in the areas of accounting.

Course Outcome (COs):

Upon successful completion of this course, you will be able to:
• Apply a range of key urban design, research and problem solving skills to complex real-world situations
• Analyse a case study site, drawing on theoretical approaches and a range of available documents including plans, photographs and written documents
• Create and communicate urban design ideas and proposals to a wide audience using a range of presentation skills and media, including drawings
• Demonstrate effective interpersonal communication and project management skills both as part of a team and independently

Semester VI

Part-III

Core-XII Physical Chemistry Practical IV [7BCH6P1]

Course Description:

These courses provide students with practical work related to the principles studied in Physical Chemistry I & II. This course is open to Chemistry majors only.

Course Objectives:

- The course provides training in advanced physical chemistry laboratory techniques.
- The experiments are guided by demonstrators and are designed both to illustrate applications of theory covered in the Chemical Physics and lecture courses, and to introduce typical instrumentation.
- The investigation provides an introduction to research methods: a group of 3-4 students are given a theme or problem and some apparatus; they must devise, build and execute experiments using less guidance than for the standard experiments. Data analysis and structured report writing are key components of the course.

Course Outcome (COs):

On successful completion of the course students will be able to:
1. Developed expertise relevant to the professional practice of chemistry
2. Developed an understanding of the breadth and concepts of physical chemistry
3. An appreciation of the role of physical chemistry in the chemical sciences and engineering
4. Developed an understanding of the role of the chemist and chemical engineer in tasks employing physical chemistry
5. An understanding of methods employed for problem solving in physical chemistry
6. Experience in some scientific methods employed in basic and applied physical chemistry
7. Developed skills in procedures and instrumental methods applied in analytical and practical tasks of physical chemistry
8. Developed skills in the scientific method of planning, developing, conducting, reviewing and reporting experiments
9. Developed some understanding of the professional and safety responsibilities residing in working with chemical systems.

Core XV Applied Chemistry Practical V [7BCH6P2]

Course Description:

These courses provide students with practical work related to the principles studied in Physical Chemistry I & II. This course is open to Chemistry majors only.

Course Objectives:

- ❖ The course provides training in advanced physical chemistry laboratory techniques.
- ❖ The experiments are guided by demonstrators and are designed both to illustrate applications of theory covered in the Chemical Physics and lecture courses, and to introduce typical instrumentation.
- ❖ The investigation provides an introduction to research methods: a group of 3-4 students are given a theme or problem and some apparatus; they must devise, build and execute experiments using less guidance than for the standard experiments. Data analysis and structured report writing are key components of the course.

Course Outcome (COs):

On successful completion of the course students will be able to:

1. Developed expertise relevant to the professional practice of chemistry
2. Developed an understanding of the breadth and concepts of physical chemistry
3. An appreciation of the role of physical chemistry in the chemical sciences and engineering
4. Developed an understanding of the role of the chemist and chemical engineer in tasks employing physical chemistry
5. An understanding of methods employed for problem solving in physical chemistry
6. Experience in some scientific methods employed in basic and applied physical chemistry
7. Developed skills in procedures and instrumental methods applied in analytical and practical tasks of physical chemistry
8. Developed skills in the scientific method of planning, developing, conducting, reviewing and reporting experiments
9. Developed some understanding of the professional and safety responsibilities residing in working with chemical systems.

Core XIII Inorganic Chemistry III [7BCH6C1]

Course Description:

This course is aimed to provide the students with a solid understanding of all the fundamental concepts and physical principles in modern inorganic chemistry necessary for the study of the more advanced or specialized courses that follow. The topics discussed include coordination chemistry, organometallics chemistry, bioinorganic chemistry and material chemistry.

Course Objectives:

- ❖ To understand the key features of coordination compounds, including:
  - the variety of structures.
  - oxidation numbers and electronic configurations.
  - coordination numbers.
  - ligands, chelates.
  - bonding, stability of complexes.
- ❖ To be able to use Crystal Field Theory to understand the magnetic properties (and in simple terms the colour) of coordination compounds.
- ❖ To be able to describe the shapes and structures of coordination complexes with coordination numbers ranging from 4 to 12.
- ❖ To be able to describe the stability of metal complexes by the use of formation constants and to calculate thermodynamic parameters from them.

- ❖To be able to recognize the types of isomers in coordination compounds.
- ❖To be able to name coordination compounds and to be able to draw the structure based on it's name.
- ❖To become familiar with some applications of coordination compounds.
- ❖To study about the concepts of Biochemistry and material chemistry.

Course Outcome (COs):

Students will gain an understanding of:

- ❖ predicting geometries of simple molecules
- ❖ the fundamentals of the chemistry of the main group elements, and important real world applications of many of these species
- ❖ the use of group theory to recognize and assign symmetry characteristics to molecules and objects, and to predict the appearance of a molecule's vibrational spectra as a function of symmetry
- ❖ the bonding models, structures, reactivity's, and applications of coordination complexes, boron hydrides, metal carbonyls, and organometallics
- ❖ Apply the knowledge in biochemical reactions.

Core XIV Organic Chemistry III [7BCH6C2]

Course Description:

Introduces to Carbohydrate, Natural products, Biochemistry, dyes organic chemistry spectroscopy and molecular rearrangements.

Course Objectives:

- ❖ This course will give an introduction to modern spectroscopic techniques including time-resolved laser methods. Theory and application to chemical research problems on will be discussed, including mass spectrometry, ultraviolet and visible spectroscopy, infrared spectroscopy, Raman, fluorescence, nuclear magnetic resonance spectroscopy, time-resolved spectra including lifetime measurements, etc.
- ❖ Comprehension of principles of photochemistry and learning of current applications.
- ❖ The primary goal of this course is to make students aware of how chemical processes can be designed, developed and run in a sustainable way.
- ❖ Students acquire the competence to think of chemistry as a sustainable activity.

Course Outcome (COs):

Students will gain an understanding of:

- ❖ How to use their understanding of organic mechanisms to predict the outcome of reactions
- ❖ How to design syntheses of organic molecules
- ❖ How to determine the structure of organic molecules using IR and NMR spectroscopic techniques
- ❖ Students will demonstrate an advanced level of knowledge in Organic photochemistry.
- ❖ Improve their theoretical knowledge about chemical reactions which are carried out by light.
- ❖ the use of nuclear magnetic resonance spectroscopy, mass spectrometry and infrared spectroscopy for organic structure elucidation

- ❖ the fundamentals of electronic structure and bonding in conjugated and aromatic systems
- ❖ reactivity patterns of conjugated and aromatic molecules

ELECTIVE SUBJECTS

Polymer Chemistry [7BCHE3A]

Course Description:
Polymer Chemistry is a course that introduces students to Polymer science, engineering and technology, where types of polymer, reactions to form polymer, polymerization mechanisms, structures, properties and applications.

Course Objectives:
The aim of the course is to familiarise students with electrochemical processes occurring in the solid state:

- ❖ The subject provides an introduction to polymer science with respect to synthesis, polymerization kinetics and network formation/gelation of macomolecules formed by step-growth and chain-growth polymerization.
- ❖ Polymer structure/conformation and transitions from liquid (melt, solutions) to solid (polymer crystals and –glass) states are discussed using equilibrium thermodynamics, kinetics and free volume considerations.
- ❖ Polymer solubility/miscibility and phase diagrams are determined using thermodynamic parameters. Molecular weight determination of polymers is shown using osmotic pressure, viscosimetry and size exclusion chromatography (SEC).
- ❖ An overview of mechanical and rheological properties of polymers is also given. Specialized synthesis for flow assurance industry.

Course Outcome (COs):

After studying this course, you should be able to:

- ❖ isolate the key design features of a product which relate directly to the material(s) used in its construction
- ❖ indicate how the properties of polymeric materials can be exploited by a product designer
- ❖ describe the role of rubber-toughening in improving the mechanical properties of polymers
- ❖ identify the repeat units of particular polymers and specify the isomeric structures which can exist for those repeat units
- ❖ Estimate the number- and weight-average molecular masses of polymer samples given the degree of polymerisation and mass fraction of chains present.
- ❖ Differentiate between natural and man-made polymers.
- ❖ Explain polymerization methods.
- ❖ understand polymerization kinetics
- ❖ Uses of polymers.

Or

Meterial Chemistry and Nano Science[7BCHE3B]
Course Description:

This course will focus on nanomaterials, chemical synthesis and technological developments. This is a multidisciplinary module involving chemistry, physics and biology.

Course Objectives:

- Topics include: introduction to different classes of nanomaterials, including both inorganic and organic constituents; synthesis of nanomaterials , including chemical and physical vapor transport, solutionchemistry, and nanofabrication methods; characterization of nanomaterials, including x-ray techniques, scanning probe ...

Course Outcome (COs):

Students will gain an understanding of:

a. the historical evolution and current revolution that is nanoscience
b. the fundamental uniqueness of the chemical and physical properties of nanomaterials and their potential impact in science, engineering, medicine, and the environment
c. the interdisciplinary nature of nanoscience
d. top down and bottom up methods of nanomaterials preparation
e. the tools behind nanomaterials characterization (e.g., the scanning tunneling microscope)
f. the importance of diffusion as a primary means of movement by nanomaterials
g. micro- and nano-fluidics
h. approaches to the development of chemical and biological sensors based on plasmonics, spintronics, nanoporosity and issues related to their translation from the research laboratory to the clinic and to point-of-care applications
i. nanotherapeutics and nanotoxicity
j. futuristic concepts like nanorobots, nanorockets, and fantastic voyage-like submarines. These objectives are packaged with discussion sessions designed to enforce out-of-the-box thinking skills, teaming work, and communications

Or

Project [7BCHEPR]

Course Description:

This course develops a foundation of concepts and solutions that supports the planning, scheduling, controlling, resource allocation, and performance measurement activities required for successful completion of a project.

Course Objectives:

Manage the selection and initiation of individual projects and of portfolios of projects in the enterprise.
Conduct project planning activities that accurately forecast project costs, timelines, and quality. Implement processes for successful resource, communication, and risk and change management.
Demonstrate effective project execution and control techniques that result in successful projects.
Conduct project closure activities and obtain formal project acceptance.
Demonstrate a strong working knowledge of ethics and professional responsibility.
Demonstrate effective organizational leadership and change skills for managing projects, project teams, and stakeholders.

Course Outcome (COs):

Manage the scope, cost, timing, and quality of the project, at all times focused onproject success as defined by project stakeholders. Align the project to the organization's strategic plans and business justification throughout its lifecycle.

Part-IV

Fruit, vegetable preservation skills [7SBS6B4]

Course Description:

This course introduces students to the practice of food preservation in a time of energy descent. Topics include canning, dehydrating, fermenting, food preservation history and philosophical approaches associated with insuring food security.

Course Objectives:

- Maintain momentum in current base programs in vegetable and fruit research.
- Identify major needs of the vegetable and fruit industry and form interdisciplinary teams.
- Promote the visibility of existing research programs and develop new programs.
- Develop new technology in vegetable and fruit research programs.
- Implement new strategies for funding research projects.
- Provide authoritative and credible technical information to consumer and producer clientele groups.
- Enrich graduate education by offering students the opportunity to interact with interdisciplinary research teams.

Course Outcome (COs):

Diets rich in fruit and vegetables are associated with better health status. A number of school-based programs have shown positive effects on children's dietary behaviors; some have focused broadly on nutrition, physical activity, and heart health whereas others have focused more specifically on fruit and vegetable consumption. Despite these successes, consumption of fruit and vegetables among adolescents is generally below recommended levels, supporting a need to identify effective strategies for promoting fruit and vegetable consumption, among other healthful dietary patterns.

Equipment handling skills for events [7SBS6B5]

Course Description:

This course introduces students to the practice of VCD/DVD handling, videography, PA system, Audio recording, LCD operations PPT and Photography.

Course Objectives:

This course will focus on

- To know about the basic electric tools.
- To learn about PA system and Audio recording.
- To discuss about VCD/DVD handling and Videography.

- To study about LCD operations and power-point presentation.
- To practice photography and image editing.

Course Outcome (COs):

Students will gain an understanding of about the basic electric tools, PA System, Audio recording,VCD/DVD handling,Videography, LCD operations and power-point presentation,photography and image editing.

DEPARTMENT OF CHEMISTRY

The Outcomes of UG Course, B. Sc. in Chemistry

At the completion of B. Sc. in Chemistry the students are able to:

After completion of degree, students gained the theoretical as well as practical knowledge of handling chemicals. Also they expand the knowledge available opportunities related to chemistry in the government services through public service commission particularly in the field of food safety, health inspector, pharmacist etc**.** Afford a broad foundation in chemistry that stresses scientific reasoning and analytical problem solving with a molecular perspective. Achieve the skills required to succeed in graduate school, professional school and the chemical industry like cement industries, agro product, Paint industries, Rubber industries, Petrochemical industries, Food processing industries, Fertilizer industries etc. Got exposures of a breadth of experimental techniques using modern instrumentation. Understand the importance of the elements in the periodic table including their physical and chemical nature and role in the daily life. Understand the concept of chemistry to inter relate and interact to the other subject like mathematics, physics, biological science etc. Learn the laboratory skills and safely to transfer and interpret knowledge entirely in the working environment.

ARUMUGAM PILLAI SEETHAI AMMAL COLLEGE, TIRUPPATTUR

SYLLABUS UNDER CBCS PATTERN w.e.f. 2014-15

B.Sc. CHEMISTRY – PROGRAMME STRUCTURE

Sem	Course			Cr.	Hrs./ Week	Marks		Total
	Part	Subject Code	Name			Int.	Ext.	
I	I	411T	**Tamil/other languages – I**	3	6	25	75	100
	II	412E	**English – I**	3	6	25	75	100
	III	4BCH1C1	**Core – I** – Fundamental Concepts of Chemistry	4	5	25	75	100
		4BCH1C2	**Core – II** –Inorganic Chemistry - I	4	4	25	75	100
		----	**Core – III** – Inorganic Volumetric Analysis Practical – I	-	3**	-	-	-
			Allied – I (Theory only) **(or)** **Allied – I** (Theory cum Practical)	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I (For subjects other than Mathematics)	-	2**	--	--	---
	IV	4NME1A / 4NME1B / 4NME1C	**Non-Major Elective – I** – (a)தமிழ்மொழியின் அடிப்படைகள் ∴ (b) இக்கால இலக்கியம ∴ (c) Communicative English	2	1	25	75	100
			Total(Allied-Theory only)	**21**	**30**	**-**	**-**	**600**
			Total(Allied-Theory cum Practical)	**20**				**575**
II	I	421T	**Tamil/other languages – II**	3	6	25	75	100
	II	422E	**English – II**	3	6	25	75	100
	III	4BCH2P1	**Core – III** – Inorganic Volumetric Analysis Practical – I	4	3	40	60	100
		4BCH2C1	**Core-IV –** Organic Chemistry - I	4	4	25	75	100
		4BCH2C2	**Core – V** – Physical Chemistry –I	4	4	25	75	100
			Allied – II (Theory only) (or) **Allied– II(Theory cum Practical)**	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I (For subjects other than Mathematics)	2	2	20	30	50
	IV	4BES2	**(3) Environmental Studies**	2	2	25	75	100
			Total(Allied-Theory only)	**25**	**30**	**-**	**-**	**700**
			Total(Allied-Theory cum Practical)	**26**				**725**
III	I	431T	**Tamil /other languages – III**	3	6	25	75	100
	II	432E	**English – III**	3	6	25	75	100
		4BCH3C1	**Core –VI** –Inorganic Chemistry-II	4	5	25	75	100
	III	-----	**Core – VII** – Inorganic Qualitative Analysis - Practical – II	-	4	--	--	---
			Allied –III (Theory) (or) **Allied–III**(Theory cum Practical)	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I (For subjects other than Mathematics)	--	2**	--	--	---

	IV	4NME3A/ 4NME3B/ 4NME3C	**(1) Non-major Elective – II** – (a) இலக்கியமும் மொழிப் பயன்பாடும் /(b) பழந்தமிழ் இலக்கியங்களும் இலக்கிய வரலாறும் / (c) Effective Employability Skills	2	2	25	75	100
		4SBS3A1/ 4SBS3A2	**(2) Skill Based Subjects – I**	2	2	25	75	100
	V	4BEA3	**Extension activities**	1	--	100	--	100
			Total(Allied-Theory only)	**19**	**30**	**-**	**-**	**675**
			Total(Allied-Theory cum Practical)	**20**				**700**
IV	I	441T	**Tamil /other languages – IV**	3	6	25	75	100
	II	442E	**English – IV**	3	6	25	75	100
	III	4BCH4P1	**Core – VII** – Inorganic Qualitative Analysis Practical – II	4	4	40	60	100
		4BCH4C1	**Core –VIII**–Organic Chemistry–II	4	5	25	75	100
			Allied – IV (Theory only) (or) **Allied–IV(Theory cum Practical)**	5 4	5 3	25 15	75 60	100 75
			Allied Practical – I - (For subjects other than Mathematics **)**	2	2	20	30	50
	IV	4SBS4B1/ 4SBS4B2	**(2) Skill Based Subjects – II**	2	2	25	75	100
	IV	4BVE4/ 4BMY4/ 4BWS4	**(4) Value Education / Manavalakalai Yoga / Women's Studies**	2	2	25	75	100
			Total(Allied-Theory only)	**23**	**30**	**-**	**-**	**700**
			Total(Allied-Theory cum Practical)	**24**				**725**
V	III	4BCH5C1	**Core – IX**–Physical chemistry – II	4	5	25	75	100
		4BCH5C2	**Core–X**–Inorganic Chemistry-III	4	5	25	75	100
		4BCH5P1	**Core–XI**–Gravimetric estimations, Colorimetric estimations and Organic Preparation Practical– III	4	3	40	60	100
		-----	**Core – XII**– Physical Chemistry – Practical – IV	--	3	--	--	---
		4BCHE1A / 4BCHE1B	**Elective–I**– Analytical Chemistry **(or)** Agricultural Chemistry	5	5	25	75	100
		4BCHE2A / 4BCHE2B	**Elective – II**–Industrial Chemistry **(or)** Medicinal Chemistry	5	5	25	75	100
	IV	4SBS5A3/ 4SBS5A4/ 4SBS5A5	**(2) Skill Based Subjects – III**	2	2	25	75	100
			(2) Skill Based Subjects – IV	2	2	25	75	100
			Total	**26**	**30**	**-**	**-**	**700**
VI		4BCH6P1	**Core–XII**–Physical Chemistry–Practical – IV	4	4	40	60	100
		4BCH6C1	**Core–XIII–**Organic chemistry-III	4	6	25	75	100
		4BCH6C2	**Core–XIV–**Physical Chemistry-III	4	6	25	75	100
		4BCH6P2	**Core – XV** – Organic estimation and Organic Analysis Practical – V	4	5	40	60	100

	III	4BCHE3A / 4BCHE3B 4BCHEPR	**Elective – III** –Polymer Chemistry **(or)** Material Chemistry & Nano-Science **(or)** Project	5	5	25	75	100
	IV	4SBS6B3/ 4SBS6B4/ 4SBS6B5	**(2) Skill Based Subjects – V**	2	2	25	75	100
			(2) Skill Based Subjects – VI	2	2	25	75	100
Total				**25**	**30**	**-**	**-**	**700**
Grand Total				**140**	**180**	**-**	**-**	**4100**

COURSE OUTCOME FOR B.Sc. CHEMISTRY

SEMESTER - I

Part-I

Tamil -I [411T]

Part I – Language Courses (LC) (any one of Tamil, Hindi, Sanskrit, Arabic).

Part-II

English – I [412E]

Part II – There are 4 Part II English courses. Students have to study them for 2 years. Every year they will be undertaking 2 English courses. They are meant to develop the students' communicative skill at the UG level.

Part-III

Core –I. Fundamental Concepts of Chemistry [4BCH1C1]

Course Description:

This course covers fundamental principles and laws of chemistry. Topics include measurement, atomic and molecular structure, periodicity, chemical reactions and chemical bonding. Laboratory experiments and computer-based exercises augment and reinforce the basic principles discussed in lecture as well as provide practical examples.

Course Objectives:

- "Advanced Inorganic Chemistry", R.D.Madan
- "Inorganic Chemistry", Puri and Sharma
- Know the discovery of electron, proton and neutron and their characteristics.
- To understand the nature electromagnetic radiation and quantum theory.
- To understand the periodic law and significance of atomic no and electronic configuration as the basic for periodic classification.
- To classify elements into a s,p,d and f blocks and learn their main characteristics.
- To understand the concept of organic reactions mechanism.
- To recognize the type of organic reactions
- To describe the term – paramagnetic, diamagnetic and ferromagnetic substances.
- To calculate the percentage of ionic character of moleculs

- To produce programmers equipped with an understanding of. fundamental computational concepts underlying most programming languages
- a range of problem solving techniques using computers
- the role of programming within the overall software development process;

Course Outcome (COs):

Upon successful completion students should be able to:

- The above two books are prescribed texts for first two semesters.
- Apply the fundamental principles of measurement, matter, atomic theory, chemical periodicity, chemical bonding, general chemical reactivity and solution chemistry to subsequent courses in science.

Core –II Inorganic Chemistry-I [4BCH1C2]

Course Description:

This course is an introduction to modern inorganic chemistry. Topics include principles of structure, bonding, and chemical reactivity with application to compounds of the main group and transition elements, including organometallic chemistry and nuclear chemistry.

Course Objectives:

- "Advanced Inorganic Chemistry", R.D.Madan
- "Inorganic Chemistry", P.L. Soni
- To explain the formation of different types of bonding.
- To explain the concepts of geometry of simple molecules.
- To identify mode of occurrence and describe isotopes of hydrogen.
- To understand the preparation and uses of ozone and hydrogen peroxide.
- To explain the term mineral ore concentration, roasting etc.,
- To explain why specific reducing agents are used for the reduction purposes.
- To apply the thermodynamic concepts like heat energy and entropy to the principles of extraction of Arsenic, Antimony and Bismuth.
- To understand the principles of oxidation and reduction as applied to the extraction procedure.
- To know the types of nuclear reactions and its applications.
- To calculate half life period and average life period.

Course Outcome (COs):

Upon successful completion students should be able to:

- The above two books are prescribed texts for first two semesters.
- the bonding fundamentals for both ionic and covalent compounds, including electro negativities, bond distances and bond energies using MO diagrams and thermodynamic data.
- Predicting geometries of simple molecules
- The fundamentals of the chemistry of the main group elements, and important real world applications of many of these species
- The bonding models, structures, reactivity's, and applications of Hydrogen peroxide, ozone and hydrides.
- Basic knowledge of nuclear structure, stable and unstable atomic nuclei, nuclear reactions and different modes of radioactive decay and also methods for measurements of radioactivity.

- ❖ The fundamentals of radiochemistry, isotopic chemistry, radiation chemistry and the applications of these in measuring technology, kinetics, radical chemistry, biotechnology and materials and process technology.
- ❖ Skills in handling and measurement of radioactive material.

Allied Course I Ancillary Mathematics-I [4BMAA1] Or

Course Description:

Course Objectives:

Course Outcome (COs):

[Refer from the department of Mathematics]

Allied Course I Ancillary Zoology[4BZOA1]

Course Description:

Course Objectives:

Course Outcome (COs):

[Refer from the department of Zoology]

Part-IV

Non-Major Elective-I

c. பள்ளியில் தமிழ் பயிலாத மாணாக்கர்களுக்கான அடிப்படைத் தமிழ்ப் பாடங்கள்தாள் 1 – தமிழ் மொழியின் அடிப்படைகள் **[4NME1A]**

d. பள்ளியில் மேல்நிலைப் படிப்பு வரை தமிழ் பயின்று கல்லூரியில் பகுதி 1– இல் தமிழ் பயிலாத மாணாக்கர்களுக்கான சிறப்புத் தமிழ்ப் பாடங்கள் -தாள் – 1 இக்கால இலக்கியம்; **[4NME1B]**

2. **[Refer from the department of Tamil]**

a. Communicative Engligh [4NME1C]

Course Description:

Course Objectives:

Course Outcome (COs):

[Refer from the department of English]

SEMESTER - II

Part-I

Tamil -II [421T]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-II

English – II [422E]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-III

Core –III Inorganic Volumetric Analysis Practical –I [4BCH2P1]

Course Description:

This course aims to familiarize students with the principles of analytical chemistry and basic analytical techniques including volumetric analysis. This course is not open to Chemistry or Analytical and Testing Sciences major students.

Course Objectives:

- Experimental practice of quantitative volumetric analysis.
- The objective of the titration is the determination of the concentration or the mass of the minimum formula from the titrated chemical material composing a pure liquid or a solution.
- The main objective of volumetric analysis is to determine the amount of a substance in a given sample. When dealing with volumetric analysis the concept of concentration cannot be avoided. Molarity i.e. moles per litre or decimeter is widely used unit of concentration.

Course Outcome (COs):

Upon successful completion students should be able to:

- Facilitate the learner to make solutions of various molar concentrations. This may include: The concept of the mole; Converting moles to grams; Converting grams to moles; Defining concentration; Dilution of Solutions; Making different molar concentrations.

Core –IV Organic Chemistry-I [4BCH2C1]

Course Description:

Students review the basic principles of chemical bonding as they apply to organic molecules and are introduced to the concepts of functional groups, nomenclature, stereochemistry, and reaction mechanisms. The systematic chemistry of alkanes, alkenes, alkynes, alkyl halides, alcohols, and ethers are discussed.

Course Objectives:

- "Organic Chemistry", P.L.Soni
- "Advanced Organic Chemistry", B.S.Bahl and Arun Bahl
- To learn about various methods of preparation and applications of hydrocarbons.
- To understand the mechanism of alkyl halides.
- To estimate no of hydroxyl groups and alkoxy group in alcohol and ether.
- To understand the term rectified spirit and methylated spirit.
- To explain the mechanism of few selected reactions of aldehyde and ketones.
- To describe the methods of preparation and reactions of acids.
- To know about the concepts of stereochemistry.
- To understand the difference between configuration and conformation.
- To describe the structure and properties of various types of carbohydrates.

Course Outcome (COs):

Upon successful completion students should be able to:

- The reactivity and stability of an organic molecule based on structure, including conformation and stereochemistry.
- The prediction of mechanisms for organic reactions.
- How to use their understanding of organic mechanisms to predict the outcome of reactions.
- How to design syntheses of organic molecules.
- Students are expected to apply their knowledge to problem-solve, deduce structures, and synthesize simple organic molecules using the studied reactions.
- The relationships between organic chemistry and other disciplines are noted.

Core –V Physical Chemistry-I [4BCH2C2]

Course Description:

The course covers the basic physical principles that are the foundation of essentially all materials and biological chemistry. Topics include electronic structure, chemical bonding, non-covalent and intermolecular interactions,chemical kinetics and surface chemistry.

Course Objectives:

- "Principles of Physical Chemistry", B.R.Puri, L.R.Sharma and M.S.Pathania
- "Physical Chemistry", N.Kundu and SN.Jain
- To apply gas laws in various real life situations.
- To explain the behavior of real and ideal gas.
- To differentiate between gaseous state and vapour.
- To explain the kinetic theory of gases.
- Explain the properties of liquids.
- To describe condition required for liquefaction of gases.

- ❖ To write the expressions for equilibrium constants.
- ❖ To study the laws of equilibrium.
- ❖ To understand various types of colloids and its applications.

Course Outcome (COs):

Upon successful completion students should be able to:

- ❖ State and apply the laws of thermodynamics; perform calculations with ideal and real gases; design practical engines by using thermodynamic cycles; predict chemical equilibrium and spontaneity of reactions by using thermodynamic principles.
- ❖ To apply the concepts of colloids and gels.
- ❖ To learn depth knowledge about liquid states.

Allied Course II Ancillary Mathematics-I [4BMAA2] Or

Course Description:

Course Objectives:

Course Outcome (COs):

Allied Course II Ancillary Zoology [4BZOA2]

Course Description:

Course Objectives:

Course Outcome (COs):

Allied Practical-I, General and Applied Zoology and Conceptual zoology [4BZOAP1]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-IV

Environmental Studies [4BES2]

Course Description:

Environmental science is the study of patterns and processes in the natural world and their modification by human activity. To understand current environmental problems, we need to consider physical, biological and chemical processes that are often the basis of those problems. This course will give you the skills necessary to address the environmental issues we are facing today by examining scientific principles and the application of those principles to natural systems. This course will survey some of the many environmental science topics at an introductory level, ultimately considering the sustainability of human activities on the planet.

Course Objectives:

- To consider how the natural and built environments shape and are shaped by multiple socio-cultural and political factors.
- To think across and beyond existing disciplinary boundaries, mindful of the diverse forms of knowledge and experience that arise from human interactions with the world around them.
- To live responsibly and appreciate the environmental and cultural histories of the places they inhabit.
- To cultivate compassion, curiosity, collaboration, and hope.
- To nurture knowledge, respect, and love for the natural and human communities of central Maine, the place where they spend four formative years of their lives.
- To develop skills of analysis and communication, bearing in mind disciplinary traditions and diverse publics.

Course Outcome (COs):

The Environmental Studies major prepares students for careers as leaders in understanding and addressing complex environmental issues from a problem-oriented, interdisciplinary perspective. Students:

- Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
- Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and/or practitioners.

Semester III

Part-I

Tamil -III [431T]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-II

English – III [432E]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-III

Core –VI Inorganic Chemistry –II [4BCH3C1]

Course Description:

This course is aimed to provide the students with a solid understanding of all the fundamental concepts inorganic chemistry necessary for the study of the more advanced or specialized courses that follow. The topics discussed include Halogens, per acids and per salts, transition elements, lanthanides, actinides and solid state chemistry.

Course Objectives:

- "Inorganic Chemistry", Puri and Sharma
- "Advanced Inorganic Chemistry", R.D.Madan
- To understand types and structure of halogen compounds.
- To understand types and structure of inorganic carbon compounds.
- To classify acids as permonosulphuric and disulphuric.
- To distinguish between intra and inter molecular hydrogen bonding.
- To explain extraction, properties and uses of transition elements.
- To understand the chemistry of transition metal oxide.
- To understand the positions of lanthanide and actinide in the periodic table.
- To correlate the optical and magnetic properties of lanthanide.
- To know the crystal size, structure and properties in solid state chemistry.

Course Outcome (COs):

Upon successful completion students should be able to:

- Describe bonding models that can be applied to a consideration of the properties of transition metal compounds.
- The students familiar about the inorganic halogen compounds, coordination compounds and transition elements.
- They get well exposure about solids.

Allied Course III Ancillary Physics-I [4BPHA1]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-IV

Non-Major Elective-II

[4NME3A] பள்ளியில் தமிழ் பயிலாத மாணாக்கர்களுக்கான அடிப்படைத் தமிழ்ப் பாடங்கள்

தாள் 2 – இலக்கியமும் மொழிப் பயன்பாடும்

Course Description:

Course Objectives:

Course Outcome (COs):

[4NME3B] பள்ளியில் மேல்நிலைப் படிப்பு வரை தமிழ் பயின்று கல்லூரியில் பகுதி 1-இல் தமிழ் பயிலாத மாணாக்கர்களுக்கான சிறப்புத் தமிழ்ப்பாடங்கள்.

தாள் 2 – பழந்தமிழ் இலக்கியங்களும் இலக்கியவரலாறும்.

Course Description:

Course Objectives:

Course Outcome (COs):

[4NME3C] Effective Employability Skills

Course Description:

Course work will emphasize individual skill assessments, interpersonal communication skills, workplace responsibilities, teamwork skills, safety issues, and personal management skills for the workplace.

Course Objectives:

- To value clarification and matching assessment skills into employment
- To long term and short term goals
- To dealing with barriers to employment
- To decision-making strategies
- To setting priorities in work and personal life
- To factors that contribute to confidence and self-esteem
- To communicating effectively with employers, supervisors, and co-workers
- To teamwork approach to completing tasks
- To strategies for handling stress
- To appropriate clothing choices for interviews and the work site

Course Outcome (COs):

- To help students explore their values and career choices through individual skill assessments
- To make realistic employment choices and to identify the steps necessary to achieve a goal
- To develop and practice self management skills for the work site

- To explore and practice basic communication skills
- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming
- To promote safety awareness including rules and procedures on the work site

[4SBS3A1] Competitive examination skills

Course Description:

The course aims to help participants develop their English language skills , particularly those planning to appear for competitive exams that test their English language abilities. During a span of 30 hours, students will be exposed to material that facilitates aspects of grammar, writing and vocabulary.

Course Objectives:

- To know the pattern of Various Examinations.
- To get the information about the exams conducted for the entry into jobs.
- To become aware about the various soft skills.
- To use the time effectively.
- To become aware about the goals of life

Course Outcome (COs):

Upon successful completion students should be able to:

Apply the knowledge to attend the various examinations, soft skills and time effectively.

[4SBS3A2] Executive SKILLS

Course Description:

This course is designed to develop

Mathematical aptitude, Scientific temperament, Logical thinking, Reasonings kills & Problem solving skills of the student and prepare them for future competitive examinations while they are studying in the school to take early lead in competitive scenario. This course focus on developing student's Intelligence quotient (IQ), & competitive quotient (C.Q.) at the early stage of learning so that each young student achieve success in school/board examination as well as in various scholarship and competitive examinations to ensure a grand successful career

Course Objectives:

The High Potentials Leadership Program provides you with strategies to handle the formidable challenges associated with moving into new and increasingly more complex leadership roles. You will gain a better understanding of your own approach to leadership and acquire new ideas to optimize and sustain your potential.

Course Outcome (COs):

- You will leave the program with fresh perspectives and tangible action plans for taking charge and inspiring leadership throughout your organization. Specifically, you will be better prepared to:
- Understand, recognize, and foster the right leadership qualities in yourself and others

- ❖ Stay on the fast track, while dealing with new responsibilities and operating contexts
- ❖ Manage organizational politics and build relationships to achieve both professional and personal goals
- ❖ Receive—and deliver—feedback with grace
- ❖ Lead effectively through situations involving conflict
- ❖ Balance your personal leadership style with the demands of the organization without compromising your principles
- ❖ Create opportunities for personal reflection amid day-to-day issues and crises of management
- ❖ Spot and develop the next class of high-potential leaders within the organization

Part-V

Extension Activities [4BEA3]

Course Description:

The course aims to help participants to develop their social responsibilities.

Course Objectives:

- ❖ Understand the community in which they work
- ❖ Understand themselves in relation to their community
- ❖ Identify the needs and problems of the community and involve them in problem solving process
- ❖ Develop among themselves a sense of social and civic responsibility
- ❖ Utilize their knowledge in finding practical solution to individual and community problems
- ❖ Develop competence required for group-living and sharing of responsibilities
- ❖ Gain skills in mobilizing community participation
- ❖ Acquire leadership qualities and democratic attitude
- ❖ Develop capacity to meet emergencies and natural disaster and
- ❖ Practice national integration and social harmony

Course Outcome (COs):

8. Identify and apply art and design elements, principles, and terminology in the creation and improvement of work.
9. Demonstrate effective use of media and techniques while creating works of art and/or design.
10. Express them aesthetically and/or creatively while making works of art and /or design.
11. Identify visual strengths and weaknesses to promote aesthetic resolution and clear intentions in works of art and/or design.
12. Distinguish between subjective and objective assessment through critique of art/design work.
13. Demonstrate inventiveness through the use of problem-defining and problem-solving processes and skills.
14. Identify and apply sustainable art and design practices in their chosen media.

Semester IV

Part-I

Tamil -IV [441T]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-II

English – IV [432E]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-III

Core –VII Inorganic Qualitative Analysis Practical-II [4BCH4P1]

Course Description:

This course aims to familiarize students with the principles of inorganic chemistry.

Course Objectives:

- The course is designed to develop research skills.
- The labwork will have a somewhat bioanalytical focus, e.g. the chemical analysis of biological molecules or biologically related ions and the use of biomolecules in assays.
- We will work to develop good laboratory practice, both conceptually and practically, and consider how to do good science.
- The combined lecture/lab approach will be used to help you understand quantitative approaches to analysis, sources of error, and the utility but also limitations of laboratory measurements.
- You will be asked to apply a portion of this knowledge to your own laboratory determinations.
- We will also discuss more advanced analytical methods involving chemical separations and instrumental analyses. This course fills one of the requirements for a minor in chemistry.

Course Outcome (COs):

Students will gain an understanding of:

a. the distinction between qualitative and quantitative chemical analysis
b. the application of statistical methods for the evaluation of laboratory data
c. methods for calibration and sampling applied to quantitative analysis
d. assessment methods of analysis related to chemical analysis goals such as detection limits

e. the use chemical equilibrium theory to design quantitative analyses and interpret results
f. the performance of graphical analysis to analyze laboratory results
g. the design and application of an analysis related to a question of relevance based on experience in the laboratory and research of the scientific literature

Core –VIII Organic Chemistry –II [4BCH4C1]

Course Description:

Students continue their study of organic chemistry by discussing aromatic compounds, aldehydes and ketones, carboxylic acids and their derivatives, and organic nitrogen compounds. Synthesis using carbanion and hydrocarbons, oils and fats emphasized. Students also explore the chemistry of various organic compounds found in biological systems: carbohydrates, amino acids, proteins and peptides, and nucleic acids.

Course Objectives:

After studying this, the students will able to:

- "Advanced Organic Chemistry", B.S.Bahl and Arun Bahl
- "Organic Chemistry", R.T.Morrison and R.W.Boyd
- Discuss electrophilic and nucleophilic in aromatic compounds.
- Difference between activating and deactivating groups.
- Correlate the preparation of types of phenol.
- Explain the mechanism of phenol.
- Study about the chemistry of Aromatic aldehyde, aromatic ketones and acids.
- Study about the chemistry of aromatic sulphonic acid and Nitro compounds.
- Calculate the saponification, Iodine and acid value for acids and fats.

Course Outcome (COs):

Working through this course, students are expected to apply their knowledge to problem-solve, deduce structures, and synthesize simple organic molecules using the studied reactions. Relationships between organic chemistry and other disciplines are noted.

Allied Course IV Ancillary Physics-IV [4BPHA2]

Course Description:

Course Objectives:

Course Outcome (COs):

Allied Practical Ancillary Physics [4BPHAP1]

Course Description:

Course Objectives:

Course Outcome (COs):

Part-IV

Accounting Skill [4SBS4B1]

Course Description:

This course is designed to analyze special accounting issues, which may include business combinations, partnerships, international accounting, estates, and trusts. Emphasis is on analyzing transactions and preparing working papers and financial statements.

Course Objectives:

- Students will demonstrate their knowledge of the fundamental and technical concepts of accounting.
- Students will demonstrate critical-thinking and problem-solving skills.
- Students will demonstrate skills in oral and written communications.
- Students will demonstrate an awareness of their role in the global environment.
- Students will demonstrate an awareness of their own values.
- Students will demonstrate a sense of responsibility and a capacity for service.
- Students will demonstrate the ability to recognize when change is appropriate, to adapt to change as it occurs, and to take the lead in creating change
- Students will demonstrate an understanding of their personal interests, abilities, strengths, and weaknesses as they pertain to professional career fields.
- Students will demonstrate a basic understanding of career options available to them and will establish career objectives.

Course Outcome (COs):

- Recognize and understand ethical issues related to the accounting profession.
- Prepare financial statements in accordance with Generally Accepted Accounting Principles.
- Employ critical thinking skills to analyze financial data as well as the effects of differing financial accounting methods on the financial statements.
- Effectively define the needs of the various users of accounting data and demonstrate the ability to communicate such data effectively, as well as the ability to provide knowledgeable recommendations.
- Recognize circumstances providing for increased exposure to fraud and define preventative internal control measures.
- Demonstrate an understanding of current auditing standards and acceptable practices, as well as the impact of audit risk on the engagement.
- Understand the audit process from the engagement planning stage through completion of the audit, as well as the rendering of an audit opinion via the various report options.
- Apply cost accounting methods to evaluate and project business performance.
- Demonstrate an understanding of the taxation of individual income.
- Apply appropriate judgment derived from knowledge of accounting theory, to financial analysis and decision making.
- The student will experience real-world learning and application of skills via their internship. Note: Specific outcomes will vary by assigned internship experience.

Emergency and Medical lab Skills [4SBS4B2]

Course Description:

This course introduces basic emergency medical care. Topics include preparatory, airway, patient assessment, medical emergencies, trauma, infants and children, and operations.

Course Objectives:

- Explain the first aid methods.
- Discuss the traffic rules and emergency steps to be taken on the spot.
- Assess the basic clinical lab tests like blood, urine, saliva and stool tests.
- Narrate the awareness programmes on the importance of locally available herbal plants and vegetables.
- Understand to do projects on locally available native treatments for various health problems

Course Outcome (COs):

Upon completion, students should be able to demonstrate the skills necessary to achieve .

- This course is about managing trauma, from minor injury to humanitarian emergencies, including injuries in women, children and the elderly, with the principal goal of improving quality of care and patient safety.
- Basic emergency resuscitation skills in adults and children .
- Students are well prepared to improve their performs life-saving procedures.
- To make the students awareness to blood, eye ,organs, herbal plants and vegetables

Value Education [4BVE4]

Course Description:

This course will involve lecture/discussion of values education; thrust as a challenge to Philippine Education, theoretical foundations in the study of values etc.

Course Objectives:

To create an awareness to values among learners and help them adopt them in their lives.

Course Outcome (COs):

Upon completion, students should be able to demonstrate the skills necessary to achieve .

Value-education tries to achieve two goals. First to develop a critical ability to distinguish between essence and form or between what is of value and what is superficial, in life. Second, to develop commitment and courage to act on one's beliefs in real life situations. What makes it difficult is the fact that the ability is to be developed no

Manavalakalai Yoga [4BMY4]

Course Description:

Manavalaikkalai Yogafor the younger generations to benefit physically, mentally, socially and spiritually from his teachings and practices.

Course Objectives:

- To enable the student to have good health.
- To practice mental hygiene.
- To possess emotional stability.
- To integrate moral values.
- To attain higher level of consciousness.

Course Outcome (COs):

- Knowledge of classical and theoretical foundations of the field of Yoga Therapy
- Knowledge of biomedical systems from an integrative and holistic perspective, as needed for the practice of Yoga Therapy
- Ability to apply knowledge learned in this curriculum and in previous yoga teacher trainings to assess the needs of clients, to design and implement effective programs, and to assess the effectiveness of these programs
- Ability to effectively use yoga as a therapeutic modality through the integration of diverse approaches to this field
- Knowledge and ability to use professional conduct during the practice of Yoga Therapy
- Ability to use relationship-based approaches to catalyze positive change or transformation with clients
- Critical thinking skills and science-based literacy to advance the evolution of Yoga Therapy as an integrative health practice

Women's Studies [4BWS4]

Course Description:

The course will examine past and present literature, social institutions, intellectual history, and the contributions of women to science, art, and other disciplines.

Course Objectives:

- describe the social, economic, political, intellectual or cultural contributions of one or more women
- analyze scholarship, literature, art, music, dance, theatre, or film created by or performed by one or more women
- *Learning goal:* Students will develop an understanding of how gender combines with nationality, race and ethnicity, religion, social class, sexual orientation, and physical ability to shape the experiences of men and women, including themselves.

- read and respond to feminist scholarship
- examine the similarities and differences among women within and across cultures and at different historical moments
- describe gender socialization and its consequences in a particular society
- identify gender and sex-based inequalities in a particular society
- analyze how these factors with the privileges and disadvantages they confer have shaped one's own experiences, presumptions, viewpoints, and sense of identity

Course Outcome (COs):

- Explain diversity and difference in women's experiences due to race, ethnicity, and class.
- Identify ways in which gender is a social construct.
- Analyze how women are represented in language and culture.
- Compare and contrast women's experiences in the paid and unpaid labor force.
- Identify the impact of sexuality and body image on women's lives.
- Analyze the causes of violence against women.

Semester V

Part-III

Core –IX Physical Chemistry-II [4BCH5C1]

Course Description:

This course presents to students the physical concepts in quantum chemistry, chemical kinetics and symmetry, and is an important prerequisite to spectroscopic techniques in structure determination, applied spectroscopy and materials science.

Course Objectives:

- To Understand and correctly use thermodynamic terminology.
- To Define the concepts of heat, work, and energy.
- To Explain fundamental thermodynamic properties.
- To Develop the General Energy Equation.
- To Derive and discuss the first law of thermodynamics.
- To Understand the properties and relationships of thermodynamic fluids.
- To Analyze basic thermodynamic cycles.
- To Develop and discuss the second law of thermodynamics.

Course Outcome (COs):

Students will gain an understanding of:

- the application of mathematical tools to calculate thermodynamic and kinetic properties
- the relationship between microscopic properties of molecules with macroscopic thermodynamic observables
- the derivation of rate equations from mechanistic data
- the use of simple models for predictive understanding of physical phenomena associated to chemical thermodynamics and kinetics
- the limitations and uses of models for the solution of applied problems involving chemical thermodynamic and kinetics

Core –X Inorganic Chemistry-III [4BCH5C2]

Course Description:

This course gives an introduction to the basic concepts of biochemistry. Topics covered include co-ordination chemistry, theories of MO and VB silicones and silicates.

Course Objectives:

- To understand the key features of coordination compounds, including:
  - the variety of structures.
  - oxidation numbers and electronic configurations.
  - coordination numbers.
  - ligands, chelates.
  - bonding, stability of complexes.
- To be able to use Crystal Field Theory to understand the magnetic properties (and in simple terms the colour) of coordination compounds.

- ❖To be able to describe the shapes and structures of coordination complexes with coordination numbers ranging from 4 to 12.
- ❖To be able to describe the stability of metal complexes by the use of formation constants and to calculate thermodynamic parameters from them.
- ❖To be able to recognize the types of isomers in coordination compounds.
- ❖To be able to name coordination compounds and to be able to draw the structure based on it's name.
- ❖To become familiar with some applications of coordination compounds.
- ❖To study about the concepts of Biochemistry.

Course Outcome (COs):

Students will gain an understanding of:

- ❖ predicting geometries of simple molecules
- ❖ the fundamentals of the chemistry of the main group elements, and important real world applications of many of these species
- ❖ the use of group theory to recognize and assign symmetry characteristics to molecules and objects, and to predict the appearance of a molecule's vibrational spectra as a function of symmetry
- ❖ the bonding models, structures, reactivity's, and applications of coordination complexes, boron hydrides, metal carbonyls, and organometallics
- ❖ Apply the knowledge in biochemical reactions.

Core-IX Gravimetric estimations, Colorimetric estimation and Organic Preparation Practical-III [4BCH5P1]

Course Description:

This course aims to familiarize students with the principles of analytical chemistry and basic analytical techniques including volumetric, gravimetric and instrumental analysis. This course is
not open to Chemistry or Analytical and Testing Sciences major students

Course Objectives:

To give practical exposure to estimations gravimetrically andorganic preparations.

Course Outcome (COs):

Students will gain an understanding of:

- ❖ how to calculate limiting reagent, theoretical yield, and percent yield
- ❖ how to engage in safe laboratory practices by handling laboratory glassware, equipment, and chemical reagents appropriately
- ❖ how to dispose of chemicals in a safe and responsible manner
- ❖ how to work effectively as a member of a team. Communicate productively with lab mates, teaching assistant and instructor
- ❖ how to maintain a detailed scientific notebook
- ❖ how to use the scientific method to create, test, and evaluate a hypothesis

- how to characterize products by physical and spectroscopic means including mp, IR, NMR, GC, and MS
- how to consult the scientific literature for physical data and experimental procedures
- how to perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration,and thin-layer chromatography
- how to create and carry out work up and separation procedures
- how to critically evaluate data collected to determine the identity, purity, and percent yield of products and to summarize findings in writing in a clear and concise manner
- how to predict the outcome of organic reactions using a basic understanding of the general reactivity of functional groups and mechanism

ELECTIVE SUBJECTS-I

Analytical Chemistry [4BCHE1A]

Course Description:

Instrumental techniques like spectroscopy, flame emission and atomic absorption, solvent extraction and chromatography will be studied. This course forms the basis for advanced studies
in instrumental analysis, environmental studies and industrial studies. Topics covered include laboratory hugiene, instrumental analysis and separation & purification techniques.

Course Objectives:

- R.Gopalan, P.S.Subramanian and K.Rengarajan, Elements of Analytical Chemistry, Sultan Chand & Sons, New Delhi, 1995.
- Douglas A.Skoog and D.M.West, Principles of Instrumental Analysis, W.B.Saunders, New York, 1982.
- To provide a basic knowledge and understanding of essential chemical and physical principles for analytical chemistry.
- To introduce basic analytical techniques and practical aspects of classical chemical analysis.
- To solve problems related to chemical analysis and interpret analytical results.

Course Outcome (COs):

- After examination the student should be able to:
- Explain the theoretical principles and important applications of classical analytical methods within titration (acid/base titration, complexometric titration, redox titration), and various techniques within gravimetric and coulometric methods.
- Explain the theoretical principles of selected instrumental methods within electroanalytical and spectrometric/spectrophotometric methods, and main components in such analytical instruments.
- Explain the theoretical principles of various separation techniques in chromatography, and typical applications of chromatographic techniques.
- Assess and suggest a suitable analytical method for a specific purpose, and evaluate sensitivity, important sources of interferences and errors, and also suggest alternative analytical methods for quality assurance.
- Performing risk assessment of chemical experiments and chemical analytical activity.

- ❖ Performing classical analytical experiments, and make observations and assessments of important factors that could affect the analytical result.
- ❖ Be familiar with calculations in analytical chemistry, be able to calculate titration errors for method evaluation, and perform statistical evaluation of results from classical and instrumental chemical experiments and analyses.
- ❖ Make scientific reports from chemical experiments and present the results in a transparent manner.

Or

Agricultural Chemistry [4BCHE1B]

Course Description:

Agricultural Chemistry is an introductory chemistry course. Students will receive an in-depth look at chemical and biochemical properties and processes, which are integral to soils, agriculture and the environment.

Course Objectives:

- ❖ Understand basic concepts (including history of, resources needed, and the future of) production agriculture.
- ❖ Describe important historical developments in production agriculture.
- ❖ Understand factors influencing food security.
- ❖ Describe the differences between macro and micro nutrients, calories, cholesterol, carbohydrates, proteins, vitamins, and minerals.
- ❖ Understand and define the green revolution, and how it affected food production around the world.
- ❖ Understand the major segments of the horticulture industry, and the food and ornamental crops that are produced as a result.
- ❖ Describe the major areas of study within the discipline of soil science, and why they are important to production agriculture.

Course Outcome (COs):

- ❖ Students acquire the basic knowledge of inorganic, analytical, organic and biochemistry.
- ❖ Student is able to understand the molecular mechanisms that regulate the activity of Agro ecosystem function
- ❖ Accumulate skills for scientific research work and agricultural works in the future.
- ❖ Demonstrate a comprehensive understanding of the fundamental principles and multidisciplinary concepts in the field of agriculture.
- ❖ Demonstrate skills in laboratory techniques and field work relevant to agriculture as well as the use of the instrumentation for analysis.

ELECTIVE SUBJECTS-II

Industrial Chemistry [4BCHE2A]

Course Description:

The course is designed to teach you the essential skills and knowledge involved in industrial chemistry. The course content is wide ranging with limited detailed theory and includes some factual information that simply will need to be memorized. A key skill emphasized is problem solving, both quantitative and qualitative.

Course Objectives:

The specific objectives of Industrial Chemistry program are to:

- ❖ Make the students well-grounded in the principles and through knowledge of scientific techniques of industrial Chemistry.
- ❖ Educate and train Chemists to acquire a meaningful picture of Chemical industries.
- ❖ Prepare students for professional participation in Chemical industries so as to adapt themselves to jobs which are problem solving
- ❖ Train students to be result-oriented in the chemical, petrochemical, biochemical and allied technological fields.

Course Outcome (COs):

- ❖ Industrial Chemistry is designed to provide graduates with the skills, knowledge and learning tools required to carry out professional research, and development and production activities in the field of chemistry, including the following sectors: health, food, cosmetics, the environment and energy.

Medicinal Chemistry [4BCHE2B]

Course Description:

The course includes theoretical studies in the field of Medicinal Chemistry. This encompasses the interaction between low molecular-weight compounds and proteins, DNA and RNA and methods for identification, design, synthesis and evaluation of drug candidates. In addition, the course includes practical exercises in the field of Medicinal Chemistry. This includes theoretical and practical elements concerning methods for the identification, design, synthesis and evaluation of low molecular organic substances from the perspective of medicinal chemistry.

Course Objectives:

The main objectives of this master in medicinal chemistry are:

- ❖ Understanding of the basic biological and pharmacological interactions by using both natural products and total synthesis of bioactive molecules.
- ❖ Use of corresponding knowledge for the development of biologically and clinically active drugs.
- ❖ It will include advanced courses in natural products, organic synthesis, medicinal chemistry; fundamentals of cell biology, molecular biology, drug design, and analytical methods.

Course Outcome (COs):

This subject helps in correlating between the pharmacology of a disease and its mitigation or cure. This also acts as a stepping stone for use of sophisticated analytical and computational tools by these students.

Part-IV

Entrepreneurial Development skills [4SBS5A3]

Course Description:

This course provides business and non-business majors with the skills necessary to succeed as an entrepreneur. The fundamentals of starting and operating a business, developing a business plan, obtaining financing, marketing a product or service and developing an effective accounting system.

Course Objectives:

The following learning objectives:

- Our graduates will have a strategic understanding of entrepreneurship and innovation and be able to take into account the relationships between this discipline and other areas of business to make holistic judgments when analyzing business situations.
- Our graduates will assess the interdependent, fast-changing, and diverse world of entrepreneurship and innovation, as well as global economic/financial interdependencies that signify current geopolitical, economic and financial relationships, to make business decisions that make a difference in the world.
- Our graduates will demonstrate critical thinking skills, making the intellectual connection between quantitative and qualitative tools, theories and context to properly and effectively solve problems and make decisions, as well as develop new and innovative business opportunities to strategically navigate the complex demands of the current and dynamic national and international business environments.
- Our graduates will utilize interpersonal and leadership skills to be highly effective business managers and leaders; demonstrating self-awareness, emotional intelligence, curiosity, visionary and strategic thinking, teamwork, reflection and knowledge transfer skills.
- Our graduates will demonstrate ethical reasoning skills, understand social, civic, and professional responsibilities and aspire to add value to society.
- Our graduates will effectively communicate using business specific terminology in written and verbal form and facilitate information flow in a variety of organizational, social, and intercultural contexts.

Course Outcome (COs):

Entrepreneurship programme provides you with cutting-edge knowledge and skills on how to successfully develop captivating products and services to solve challenging problems in a highly uncertain environment, often under considerable time constraints with very limited resources. You will be able to apply these skills in the context of both new ventures as well as in established companies.

Heritage and Tourism [4SBS5A4]

Course Description:

This course examines the development of cultural heritage tourism resources as primary or secondary destination products. Students examine the range of cultural and heritage assets that can become viable tourism attractions including museums, the performing arts, historic sites, etc

Course Objectives:

The aim of the course is for students to understand the significance of culture and cultural heritage for tourism development. Religion is an important aspect of culture and the exploitation of religious-cultural heritage contributes to tourism development.

Course Outcome (COs):

On successful completion of the course students will be able to:

1. Demonstrate a critical understanding of the relationships between culture, heritage and tourism;
2. Critically discuss a range of theories which describe and explain tourism as a cultural phenomenon;

3. Analyze the role that tourism plays in the production and consumption of culture;
4. Evaluate both the positive and negative impacts of tourism on cultures and communities;
5. Identify current issues in the development and management of cultural and heritage tourism products;
6. Describe cultural and heritage tourism policy, planning and management issues;
7. Explain cultural sustainability and sustainable tourism principles and practices;
8. Demonstrate professional skills in cultural and heritage tourism management through the analysis, evaluation and synthesis of academic research with field observations.

Marketing and Sales Management [4SBS5A5]

Course Description:

The goal of the Sales Management course is to examine the elements of an effective sales force as a key component of the organization's total marketing effort. The course will extend student's understanding of marketing's reach and potential impact in achieving its overarching goals.

Course Objectives:

Graduates of this program will be able to:

- Communicate effectively in a variety of organizational settings.
- Evaluate complex qualitative and quantitative data to support strategic and operational decisions.
- Develop comprehensive strategic and tactical plans for an organization.
- Work independently and collaboratively in inter and/or multi-disciplinary and diverse environments.
- Use creative, critical and reflective thinking to address organizational opportunities and challenges.
- Apply problem solving and decision making frameworks that propose defensible solutions to organizational opportunities, challenges, change and risk.

Course Outcome (COs):

The course is designed to provide students with an understanding of the processes involved in personal selling and sales management. The course examines the elements that enable a sales force to be an effective component of an organization’s overall marketing strategy. The course will extend students’ understanding of: the sales process, the relationship between sales and other organizational functions, the various types of sales force structures, customer relationship management (CRM), the use of technology to improve sales force effectiveness, and issues concerning recruiting, selecting, training, motivating, compensating, and retaining salespeople.

Semester VI

Part-III

[4BCH6P1]- PHYSICAL CHEMISTRY PRACTICAL – IV

Course Description:

These courses provide students with practical work related to the principles studied in Physical Chemistry I & II. This course is open to Chemistry majors only.

Course Objectives:

- The course provides training in advanced physical chemistry laboratory techniques.
- The experiments are guided by demonstrators and are designed both to illustrate applications of theory covered in the Chemical Physics and lecture courses, and to introduce typical instrumentation.
- The investigation provides an introduction to research methods: a group of 3-4 students are given a theme or problem and some apparatus; they must devise, build and execute experiments using less guidance than for the standard experiments. Data analysis and structured report writing are key components of the course.

Course Outcome (COs):

On successful completion of the course students will be able to:
1. Developed expertise relevant to the professional practice of chemistry
2. Developed an understanding of the breadth and concepts of physical chemistry
3. An appreciation of the role of physical chemistry in the chemical sciences and engineering
4. Developed an understanding of the role of the chemist and chemical engineer in tasks employing physical chemistry
5. An understanding of methods employed for problem solving in physical chemistry
6. Experience in some scientific methods employed in basic and applied physical chemistry
7. Developed skills in procedures and instrumental methods applied in analytical and practical tasks of physical chemistry
8. Developed skills in the scientific method of planning, developing, conducting, reviewing and reporting experiments
9. Developed some understanding of the professional and safety responsibilities residing in working with chemical systems.

[4BCH6P2]- ORGANIC ESTIMATION AND ORGANIC ANALYSIS PRACTICAL – V

Course Description:

By the end of this course, students should be able to: Handle organic chemicals in a safe and competent manner. Perform the standard techniques used in practical organic chemistry. Carry out an organic preparation following a prescribed procedure. Read and explain the information labels on chemical bottles.

Course Objectives:

The course provides training in:
- Recognise many functional groups and their reactivity
- Set up glassware and apparatus to conduct experiments in Organic Chemistry.
- Interpret data from a range of physical techniques to characterise Organic componds.
- Present the results of a practical investigation in a concise manner.
- Recognise many fundamental bond forming reactions and how to apply them in synthesis
- Describe bonding models and appreciate how these impact on the properties of a simple molecule
- Apply curly arrow nomenclature to depict the mechanistic course of a reaction
- Appreciate when different reactions are likely to compete and ways to bias reactions towards a single outcome
- Understand and apply the concept of protecting groups
- Understand how spectroscopic techniques can be used to delineate a molecule's structure
- Understand the influence of bond polarization on a molecule's structure and reactivity

- ❖ Evaluate the risks associated with an experiment and understand how to mitigate against those risks.

Course Outcome (COs):

Students will gain an understanding of:

i. How to calculate a limiting reagent, yield, and percent yield
j. How to maintain a detailed scientific notebook
k. How to critically evaluate data collected to determine the identity, purity, and yield of products.
l. How to summarize findings in writing in a clear and concise manner
m. How to use the scientific method to create, test, and evaluate a hypothesis
n. How to engage in safe laboratory practices handling laboratory glassware, equipment, and chemical reagents
o. How to perform common laboratory techniques, including reflux, distillation, steam distillation, recrystallization, vacuum filtration, aqueous extraction, thin layer chromatography, column chromatography
p. How to predict the outcome and mechanism of some simple organic reactions, using a basic understanding of the relative reactivity of functional groups

[4BCH6C1]- ORGANIC CHEMISTRY – III

Course Description:

Introduces green chemistry, chemothrapy, heterocyclic compounds, spectroscopy and molecular rearrangements.

Course Objectives:

- ❖ This course will give an introduction to modern spectroscopic techniques including time-resolved laser methods. Theory and application to chemical research problems on will be discussed, including mass spectrometry, ultraviolet and visible spectroscopy, infrared spectroscopy, Raman, fluorescence, nuclear magnetic resonance spectroscopy, time-resolved spectra including lifetime measurements, etc.
- ❖ Comprehension of principles of photochemistry and learning of current applications.
- ❖ The primary goal of this course is to make students aware of how chemical processes can be designed, developed and run in a sustainable way.
- ❖ Students acquire the competence to think of chemistry as a sustainable activity.

Course Outcome (COs):

Students will gain an understanding of:

- ❖ How to use their understanding of organic mechanisms to predict the outcome of reactions
- ❖ How to design syntheses of organic molecules
- ❖ How to determine the structure of organic molecules using IR and NMR spectroscopic techniques
- ❖ Students will demonstrate an advanced level of knowledge in Organic photochemistry.
- ❖ Improve their theoretical knowledge about chemical reactions which are carried out by light.
- ❖ the use of nuclear magnetic resonance spectroscopy, mass spectrometry and infrared spectroscopy for organic structure elucidation
- ❖ the fundamentals of electronic structure and bonding in conjugated and aromatic systems
- ❖ reactivity patterns of conjugated and aromatic molecules

[4BCH6C2]-PHYSICAL CHEMISTRY-III

Course Description:

This course presents to students the physical concepts in photochemistry, phase rule, electrochemistry and prerequisite to spectroscopic techniques in structure determination, applied spectroscopy and materials science.

Course Objectives:

- The aim of the course is to familiarise students with electrochemical processes occurring in the solid state.
- The basic mechanisms and principles of ionic conduction in solids and the electrochemical processes occurring at the interfaces of solid-state electrochemical systems will be discussed.
- The course will cover important technologies in energy conversion and storage in detail, including lithium ion batteries and fuel cells.
- Operating principles, materials requirements, advantages and disadvantages will be discussed. The course will be given in three parts: 1. Fundamental Electrochemistry (JTSI); 2. Fuel Cell Technology (RTB) and 3. Energy Storage and Batteries (ARA).
- To impart the students the knowledge on phase rule, its applications and alloys, their importance, composition and applications.
- To demonstrate the application of spectroscopic and electrochemical methods in mechanistic studies of photochemical reactions
- To make students familiar with a broad variety of photochemical systems and their applications.

Course Outcome (COs):

Students will gain an understanding of:

- The photoredox processes at the surface of solids. An introduction to the current theoretical models of electron transfer dynamics is provided.
- Current technological applications, as well as the most recent advances in the field are then detailed.
- Defines the importance of Phase Diagrams in the field of materials science and engineering
- Explains the basic definitions and terms in a phase diagram
- Defines phase, equilibrium, component, degree of freedom and phase rule concepts.
- Applies above mentioned concepts to the field of Materials Science and Engineering.
- Relates these concepts.
- define central parts of electrochemical cells and electrochemical equipment such as anode, cathode, membrane, diaphragm, liquid junction, reference electrode, and potentiostat - define and relate mathematically basic physical and thermodynamic ...

ELECTIVE SUBJECTS

Polymer Chemistry [4BCHE3A]

Course Description:

Polymer Chemistry is a course that introduces students to Polymer science, engineering and technology, where types of polymer, reactions to form polymer, polymerization mechanisms, structures, properties and applications.

Course Objectives:

The aim of the course is to familiarise students with electrochemical processes occurring in the solid state:

- ❖ The subject provides an introduction to polymer science with respect to synthesis, polymerization kinetics and network formation/gelation of macomolecules formed by step-growth and chain-growth polymerization.
- ❖ Polymer structure/conformation and transitions from liquid (melt, solutions) to solid (polymer crystals and –glass) states are discussed using equilibrium thermodynamics, kinetics and free volume considerations.
- ❖ Polymer solubility/miscibility and phase diagrams are determined using thermodynamic parameters. Molecular weight determination of polymers is shown using osmotic pressure, viscosimetry and size exclusion chromatography (SEC).
- ❖ An overview of mechanical and rheological properties of polymers is also given. Specialized synthesis for flow assurance industry.

Course Outcome (COs):

After studying this course, you should be able to:

- ❖ isolate the key design features of a product which relate directly to the material(s) used in its construction
- ❖ indicate how the properties of polymeric materials can be exploited by a product designer
- ❖ describe the role of rubber-toughening in improving the mechanical properties of polymers
- ❖ identify the repeat units of particular polymers and specify the isomeric structures which can exist for those repeat units
- ❖ Estimate the number- and weight-average molecular masses of polymer samples given the degree of polymerisation and mass fraction of chains present.
- ❖ Differentiate between natural and man-made polymers.
- ❖ Explain polymerization methods.
- ❖ understand polymerization kinetics
- ❖ Uses of polymers.

Or

Material Chemistry and Nano Science [4BCHE3B]

Course Description:

This course will focus on nanomaterials, chemical synthesis and technological developments. This is a multidisciplinary module involving chemistry, physics and biology.

Course Objectives:

- ❖ Topics include: introduction to different classes of nanomaterials, including both inorganic and organic constituents; synthesis of nanomaterials , including chemical and physical vapor transport, solutionchemistry, and nanofabrication methods; characterization of nanomaterials, including x-ray techniques, scanning probe ...

Course Outcome (COs):

Students will gain an understanding of:

k. the historical evolution and current revolution that is nanoscience
l. the fundamental uniqueness of the chemical and physical properties of nanomaterials and their potential impact in science, engineering, medicine, and the environment
m. the interdisciplinary nature of nanoscience
n. top down and bottom up methods of nanomaterials preparation
o. the tools behind nanomaterials characterization (e.g., the scanning tunneling microscope)
p. the importance of diffusion as a primary means of movement by nanomaterials

q. micro- and nano-fluidics
r. approaches to the development of chemical and biological sensors based on plasmonics, spintronics, nanoporosity and issues related to their translation from the research laboratory to the clinic and to point-of-care applications
s. nanotherapeutics and nanotoxicity
t. futuristic concepts like nanorobots, nanorockets, and fantastic voyage-like submarines. These objectives are packaged with discussion sessions designed to enforce out-of-the-box thinking skills, teaming work, and communications

Part-IV

Basic internet and office automation lab [4SBS6B3]

Course Description:
The course will have a professional computer skill and practical oriented.
Course Objectives:

- Office tools course would enable the students in crafting professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools.
- To familiarize the students in preparation of documents and presentations with office automation tools.

Course Outcome (COs):

- By learning the course, the students will be able.
- To perform documentation.
- To perform accounting operations.
- To perform presentation skills

Fruit, vegetable preservation skills [4SBS6B4]

Course Description:
This course introduces students to the practice of food preservation in a time of energy descent. Topics include canning, dehydrating, fermenting, food preservation history and philosophical approaches associated with insuring food security.
Course Objectives:

- Maintain momentum in current base programs in vegetable and fruit research.
- Identify major needs of the vegetable and fruit industry and form interdisciplinary teams.
- Promote the visibility of existing research programs and develop new programs.
- Develop new technology in vegetable and fruit research programs.
- Implement new strategies for funding research projects.
- Provide authoritative and credible technical information to consumer and producer clientele groups.
- Enrich graduate education by offering students the opportunity to interact with interdisciplinary research teams.

Course Outcome (COs):

- ❖ Diets rich in fruit and vegetables are associated with better health status. A number of school-based programs have shown positive effects on children's dietary behaviors; some have focused broadly on nutrition, physical activity, and heart health whereas others have focused more specifically on fruit and vegetable consumption.
- ❖ Despite these successes, consumption of fruit and vegetables among adolescents is generally below recommended levels, supporting a need to identify effective strategies for promoting fruit and vegetable consumption, among other healthful dietary patterns.

Equipment handling skills for events [4SBS6B5]

Course Description:

This course introduces students to the practice of VCD/DVD handling, videography, PA system, Audio recording, LCD operations PPT and Photography.

Course Objectives:

This course will focus on

- ❖ To know about the basic electric tools.
- ❖ To learn about PA System and Audio recording.
- ❖ To discuss about VCD/DVD handling and Videography.
- ❖ To study about LCD operations and power-point presentation.
- ❖ To practice photography and image editing.

Course Outcome (COs):

Students will gain an understanding of about the basic electric tools, PA System, Audio recording,VCD/DVD handling,Videography, LCD operations and power-point presentation,photography and image editing.